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Cristian Torres *, Katherine Esparza, Verónica Celi

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Article

Urinary Incontinence and Its Relationship with Obstetric, Age, and Ethnic Factors. A Cross-Sectional Study

Cristian Santiago Torres *, Katherine Geovanna Esparza and Verónica Alexandra Celi

Universidad Técnica del Norte

* Correspondence: cstorresa@utn.edu.ec

Abstract

Background/Objetives: To relate types of Urinary Incontinence (UI) with obstetric, age, and ethnic factors of interest—a cross-sectional study **Methods:** A descriptive cross-sectional study was conducted with a population of 2,039 women with urinary incontinence (UI). Data were collected between October and November 2022 in various areas of the provinces of Imbabura, Carchi, and Esmeraldas. Information was obtained through characterization questionnaires and the International Consultation on Incontinence Questionnaire – Urinary Incontinence Short Form (ICIQ-UI-SF). The results were analyzed using descriptive and inferential statistics (Pearson's chi-square test, odds ratio [OR], and 95% confidence interval [CI]) to determine the associations and the likelihood ratio between UI and the variables of interest. **Results:** were analyzed using descriptive and inferential statistics (Pearson's chi-square, odds ratio, and 95% confidence intervals) to determine associations and odds ratios between UI and the variables of interest. A significant association was found, with increased risk, between Stress Urinary Incontinence (SUI) and women who were nulliparous or had cesarean sections; based on number of children, nulliparous and primiparous women; young adults; Karanki and Afro-descendant ethnicities. Regarding Urge Urinary Incontinence (UUI), the highest risk factors were normal delivery, grand multiparity, advanced age, and Awá and Mestizo ethnicity; protective factors included nulliparity and cesarean section, young adulthood, and White, Afro-descendant, and Karanki ethnicities. Finally, Mixed Urinary Incontinence (MUI) was strongly associated with cesarean section, grand multiparity, advanced age, and certain ethnicities (White and Mestizo), while being primiparous, young, or of Awá ethnicity was protective. **Conclusions:** Female urinary incontinence is statistically associated with obstetric, age, and ethnic factors.

Keywords: urinary incontinence; obstetric factors; ethnicity; peoples; nationalities

1. Introduction

Acording to the World Health Organization (WHO), urinary incontinence (UI) is defined as the involuntary loss of urine that constitutes a hygienic or social problem and can be objectively demonstrated [1]. The global prevalence of UI in females ranges from 13% to 38.7%. In middle-aged women, prevalence is 30–40% and exceeds 50% in older women, making it the main symptom of the genitourinary syndrome of menopause, affecting 50% of postmenopausal women [2].

Urinary incontinence represents a significant economic burden for both health systems and patients and their families. The direct costs of routine incontinence care are 2.4 times higher among African American women than White women, especially in severe cases, reaching up to $900 annually [3]. The financial burden of UI care is significant, with an estimated direct cost of $19.5 billion in the United States alone [4].

Spending on urinary incontinence services for insured adult women increased from $1,401 in 2004 to $932 in 2013. There are significant differences by race/ethnicity and insurance type: White and

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Hispanic women generally have higher expenditures than Black and Asian women [5]. Annual costs per person can exceed $3,500 in those over 65 [6].

Urinary incontinence is a common complication after childbirth, and its risk varies by type of delivery. Vaginal delivery is associated with an almost twofold increase in the risk of long-term stress urinary incontinence, with an absolute increase of 8%, and a greater effect in young women [7]. Forceps-assisted delivery is linked to a significantly increased long-term risk of stress urinary incontinence compared to other vaginal deliveries in women under 50 [8].

Middle-aged women who delivered vaginally had a significantly higher prevalence of all types of urinary incontinence compared to nulliparous women or those who gave birth by other methods [9]. Both pregnancy and vaginal delivery increase the risk of urinary incontinence in women aged 40–64, while cesarean section confers a significant protective effect [10].

The relationship between the number of children and urinary incontinence has been studied, especially in postpartum women. Studies have found a significant relationship between the number of children and the severity of urinary incontinence, suggesting that more births lead to more severe symptoms [11].

This health condition is common in women, and its prevalence increases significantly with age. Among older women in low- and middle-income countries, prevalence varies widely, with higher rates among women aged 70 or older, highlighting the need for awareness, access to healthcare, and culturally appropriate interventions [12].

Urinary incontinence varies in prevalence and type by ethnicity for both women and men. However, the distress associated with incontinence is high in all ethnic groups, and differences in access and type of treatment are also influenced by ethnicity. Black and Asian-American women have a lower risk of stress urinary incontinence compared to White women, while Hispanic women have the highest overall prevalence. Urge incontinence does not show significant ethnic differences after adjusting for risk factors [13–15].

A review by Lígia da Silva Leroy in Brazil noted that the prevalence of incontinence was higher in White women; stress urinary incontinence was more common in White women, while urge urinary incontinence was more frequent in Black women. White and Asian women experienced less urine loss compared to Black and Hispanic women. White and Latina women are at higher risk for urinary incontinence than Black and Asian women [16].

Therefore, this study aims to relate the types of urinary incontinence identified in the women studied to the variables of delivery type, number of children, age, and ethnicity.

Female urinary incontinence is statistically related to obstetric, age, and ethnic factors.

2. Materials and Methods

2.1. Study Design

A descriptive, cross-sectional study was conducted to characterize the different types of urinary incontinence in community health centers, their frequency, and their association with the proposed variables—namely obstetric, age, and ethnic factors— without establishing causality or evaluating temporal changes or incidence.

2.2. Setting

The women who participated in the study were located in different neighborhoods belonging to Ibarra, Caranqui, Natabuela, Cotacachi, and San Lorenzo, which correspond to the provinces of Imbabura, Carchi, and Esmeraldas, Ecuador.

2.3. Participants

The participants in this study were 2,039 non-institutionalized women, over 18 years old, who presented with urinary incontinence and belonged to the following ethnicities and nationalities: Afro-

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descendant, Awá, White, Karanki, Natabuelas, and Mestizo, residing in the provinces of Imbabura, Carchi, and Esmeraldas. All women provided informed consent freely and voluntarily, which ensured the confidentiality of their data; the data were used solely for research purposes. A total of 1,243 women were excluded for not meeting the inclusion criteria, such as having cognitive impairment or a diagnosis of mental disability, as well as those presenting with UI secondary to bladder cancer or spinal cord injury. The study population was randomly recruited in different neighborhoods belonging to Ibarra, Caranqui, Natabuela, Cotacachi, and San Lorenzo, which correspond to the provinces of Imbabura, Carchi, and Esmeraldas, through simple random sampling complemented by the snowball technique to ensure ethnic representativeness. No blinding was applied, as this was an observational design based on self-reports.

2.4. Feasibility and Data Collection

The study was feasible as validated instruments were available to ensure accurate data collection. Participants completed a general data form consisting of three items related to demographic information, family situation, and obstetric history for characterization purposes. To assess the types of urinary incontinence, the ICIQ-IU-SF (International Consultation on Incontinence Questionnaire – Urinary Incontinence Short Form), which consists of three scored items (frequency, amount, and impact), was used [17] along with a questionnaire for rapid and easy self-diagnosis that evaluates symptoms and the impact of urinary incontinence.

2.5. Data Analysis

Data processing was performed using Jamovi software [18] designed for accessible and reproducible statistical analysis. Tests were applied to analyze the relationship between UI and obstetric, age, and ethnic factors, such as Pearson's chi-square (χ^2) test, which allowed for assessment of associations or differences between categorical variables [19] and the odds ratio (OR), being the quotient between the values of the probabilities [20], with 95% confidence intervals (CIs) calculated to quantify the risk of UI associated with each factor. Significance was set at $p < 0.05$.

3. Results

The study population consisted of 3,282 women, who, upon characterization, were predominantly adults, with a majority belonging to the Mestizo ethnicity, multiparous, and most reported having had vaginal deliveries.

Table 1. Characterization of the study subjects by Age, Ethnicity, Numbre of Children and Type of Delivery.

	Age	
	Frequency	Percentage
Adult	886	43,5%
Young Adult	467	22,9%
Older Adult	495	24,3%
Younger Older Adult	10	0,5%
Middle Older Adult	108	5,3%
Elderly Older Adult	73	3,6%
Total	2039	100%
	Ethnicity	
Mestiza	1199	58,8%
Awá	207	10,2%
Karankis	111	5,4%

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Natabuelas	76	3,7%
Afro-descendant	203	10,0%
White	243	11,9%
Total	2039	100%
Number of children		
Nulliparous	265	13%
Primiparous	435	21,3%
Multiparous	1081	53%
Grand Multiparous	258	12,7%
Total	2039	100%
Type of Delivery		
No Delivery	265	13%
Vaginal delivery	1536	75,3%
Cesarean	238	11,7%
Total	2039	100%

Regarding the results obtained on the relationship between urinary incontinence and type of delivery, number of children, age, and ethnicity: the data show that nulliparous women are at higher risk of developing stress urinary incontinence, whereas vaginal delivery appears to have a protective effect. In terms of number of children, having one or no children is associated with a higher risk of stress incontinence, while multiparity seems to reduce this risk. With respect to age, young adults show a higher risk, whereas elderly older adults have a very low risk. Ethnicity also appears to play a role; women belonging to the Karanki and Afro-descendant groups are more likely to experience stress incontinence. However, for some ethnicities, such as Awá and White, the association was not statistically significant.

Table 2. Statistical Association Between Stress Urinary Incontinence and the Variables: Type of delivery, Number of Children, Age, and Ethnicity.

Stress Urinary Incontinence								
		n	**%**	X^2	**Valor-P**	**OR**	**IC 95%**	
							INF	**SUP**
Type of delivery	No Delivery	262	22.6	218.84	0.001	66.178	21.278	205.821
	Vaginal delivery	746	64.3	175.865	0.001	0.716	0.682	0.751
	Cesarean	152	13.1	5.345	0.021	1.339	1.044	1.719
Number of children	Nulliparous	262	22.6	218.84	0.001	66.178	21.278	205.821
	Primiparous	405	34.9	295.675	0.001	10.23	7.735	14.668
	Multiparous	474	40.9	159.579	0.001	0.592	0.545	0.642
	Grand Multiparous	19	1.6	295.415	0.001	0.06	0.038	0.095
Age	Adult	557	48	22.817	0.001	1.283	1.156	1.424
	Young Adult	399	34.4	201.294	0.001	4.446	3.491	5.662
	Older Adult	202	17.4	68.94	0.001	0.522	0.447	0.611
	Younger Older Adult			13.262	0.001			
	Middle Older Adult			150.497	0.001			
	Elderly Older Adult	22	0.2	90.522	0.001	0.021	0.005	0.087

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Ethnicity	Awá	117	10.1	0.013	0.91	0.985	0.759	1.278
	Afro-descendant	138	11.9	11.305	0.001	1.609	1.214	2.132
	White	129	11.1	1.628	0.202	0.857	0.677	1.086
	Karankis	87	7.5	22.101	0.001	2.747	1.763	4.279
	Mestiza	642	55.3	13.286	0.001	0.873	0.813	0.939
	Natabuelas	47	4.1	0.789	0.374	1.228	0.78	1.935

Vaginal delivery is associated with a higher risk of urge urinary incontinence, while both cesarean section and nulliparity appear to have a protective effect. There is a clear direct relationship between the number of children and the risk of urge incontinence: the higher the number of deliveries, the greater the risk; nulliparous and primiparous women demonstrate significant protection against this condition. Regarding age, mature adults and older adults are at greater risk for urge incontinence, whereas young adults have the lowest risk. It is noteworthy that the elderly older adult group appears to present significant protection; however, this result may be influenced by the small sample size (n=1), limiting its statistical validity. In terms of ethnicity, women of Awa and Mestizo backgrounds present a slightly higher risk of urge incontinence. Conversely, the Karanki, Afro-descendant, and White groups show a protective effect. For the Natabuelas ethnicity, no statistically significant evidence was found ($p > 0.05$).

Table 3. Statistical association between urge urinary incontinence and the variables: type of delivery, number of children, age, and ethnicity.

		Urge Urinary Incontinence						
		n	**%**	**X^2**	**Valor-P**	**OR**	**IC 95%**	
							INF	**SUP**
Type of delivery	No Delivery	3	0.5	133.852	0.001	0.024	0.0008	0.075
	Vaginal delivery	614	93.9	178.335	0.001	1.41	1.352	1.471
	Cesarean	37	5.7	33.787	0.001	0.39	0.278	0.547
Number of children	Nulliparous	3	0.5	133.852	0.001	0.024	0.008	0.075
	Primiparous	11	1.7	221.565	0.001	0.055	0.03	0.099
	Multiparous	494	75.5	196.014	0.001	1.782	1.653	1.922
	Grand Multiparous	146	22.3	81.476	0.001	2.761	2.198	3.467
Age	Adult	265	40.5	3.37	0.066	0.904	0.81	1.008
	Young Adult	49	7.5	129.501	0.001	0.248	0.187	0.329
	Older Adult	268	41	146.104	0.001	2.5	2.151	2.906
	Younger Older Adult	10	1.5	21.282	0.001			
	Middle Older Adult	61	9.3	31.181	0.001	2.749	1.901	3.975
	Elderly Older Adult	1	0.2	32.762	0.001	0.029	0.004	0.211
Ethnicity	Awá	83	12.7	6.805	0.009	1.418	1.091	1.842
	Afro-descendant	49	7.5	6.518	0.011	0.674	0.495	0.917

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White	60	9.2	6.903	0.009	0.694	0.527	0.915
Karankis	24	3.7	5.887	0.015	0.584	0.375	0.909
Mestiza	409	62.5	5.544	0.019	1.096	1.017	1.182
Natabuelas	29	4.4	1.341	0.247	1.307	0.83	2.056

Cesarean section is associated with a twofold increased risk of developing mixed urinary incontinence (MUI), while vaginal delivery does not show a statistically significant association. Being grand multiparous significantly increases the risk of MUI, with a probability 4.5 times higher. In contrast, primiparous women demonstrate a protective effect against this condition. The mature adult and elderly older adult age groups present the highest levels of risk for mixed incontinence, whereas the younger groups (adults and young adults) show a lower probability of developing this pathology. From an ethnic perspective, women of White and Mestizo ethnicities present a higher risk of MUI. Conversely, the Awá ethnicity shows significant protection. In the Afro-descendant group, no statistically significant differences were identified.

Table 4. Statistical association between mixed urinary incontinence and the variables: type of delivery, number of children, age, and ethnicity.

		Mixed Urinary Incontinence						
		n	**%**	**X^2**	**Valor-P**	**OR**	**IC 95%**	
							INF	**SUP**
Type of delivery	No Delivery			37.779	0.001			
	Vaginal delivery	176	78.2	1.138	0.286	1.043	0.969	1.123
	Cesarean	49	21.8	25.05	0.001	2.09	1.577	2.771
Number of children	Nulliparous			37.779	0.001			
	Primiparous	19	8.4	25.037	0.001	0.368	0.238	0.571
	Multiparous	113	50.2	0.793	0.373	0.941	0.821	1.079
	Grand Multiparous	93	41.3	188.223	0.001	4.544	3.672	5.623
Age	Adult	64	28.4	23.184	0.001	0.628	0.507	0.777
	Young Adult	19	8.4	29.943	0.001	0.342	0.221	0.53
	Older Adult	25	11.1	23.846	0.001	0.429	0.294	0.626
	Younger Older Adult			1.246	0.264			
	Middle Older Adult	47	20.9	122.576	0.001	6.212	4.359	8.853
	Elderly Older Adult	70	31.1	555.306	0.001	188.119	59.73	592.481
Etnia	Awá	7	3.1	13.745	0.001	0.282	0.135	0.592
	Afro-descendant	16	7.1	2.283	0.131	0.69	0.422	1.128
	White	54	24	35.171	0.001	2.303	1.76	3.014
	Karankis			14.561	0.001			
	Mestiza	148	65.8	5.078	0.024	1.135	1.025	1.257
	Natabuelas			9.792	0.002			

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4. Discussion

A study published in 2022 by Ushma and colleagues concluded that more than 60% of adult women in the United States have some type of urinary incontinence. The factors most strongly associated with this condition were age over 70 years—differing from our results—and a history of vaginal delivery, which is similar to our findings [21], On the other hand, in a retrospective cohort study of 172 multiparous women, it was observed that 30.2% had a higher prevalence of stress urinary incontinence (SUI), which is consistent with our results [22]; Finally, in a sample of 15,003 women with some type of urinary incontinence, 68% were non-Hispanic White women, 12% non-Hispanic Black women, 8% Mexican-American, 5% other Hispanic, and 7% from other ethnic groups [23], which differs from our research.

Women who underwent cesarean section had a moderate risk of SUI compared to vaginal delivery and some degree of protection against UUI, which coincides with the systematic review conducted by Press JZ et al., showing that cesarean section reduced the risk of postpartum stress urinary incontinence from 16% to 9.8% in 6 cross-sectional studies and from 22% to 10% in 12 cohort studies [24]. Similarly, in the study published by López et al. in 2021, which evaluated eleven systematic reviews, six found that, compared to vaginal delivery, there is a significant reduction in the risk of urinary incontinence associated with cesarean section [25].

On the other hand, Arias Amador (2021) reports that vaginal delivery causes greater injury to pelvic soft tissues and denervation of the pelvic floor, which is associated with MUI and SUI, but not with UUI [26], which differs from our study as the population with vaginal delivery had a higher risk of UUI, while SUI and MUI seem to exert a protective effect.

According to our data, nulliparous women have an extremely high risk of SUI, while for UUI and MUI the risk is very low, reflecting significant protection. Primiparous women have an elevated risk of SUI and a very low risk of MUI, showing a significant reduction; this is similar to the results by Pang et al., where the prevalence of SUI in nulliparous Chinese women was 0.9% compared to UUI (0.3%) and MUI (0.7%) [27]. In multiparous and grand multiparous women, the risk of SUI is very low, the probability of UUI increases, and there is a very high risk of MUI; this contrasts with the study by Alghamdi et al. in 2021, in which grand multiparity was associated with a higher risk of SUI (OR: 3.75, 95% CI: 1.68–8.40) and UUI (OR: 2.87, 95% CI: 1.07–7.73) [28].

Statistical data indicate that adult women have a higher risk of SUI compared to MUI, and UUI shows no significant results; young adult women are at high risk of SUI, while marked protection is observed for UUI and MUI. In older adults, the presence of UUI is high and there is moderate protection for MUI; in the middle older adult group, the risk of UUI and MUI is very high; finally, in the elderly group, there is an extreme risk of MUI compared to SUI, which is very low, and strong protection against UUI. This coincides with the nationally representative survey-based study by Nahar Q, which determined that in this group of women, SUI is the most prevalent (8.3%), followed by mixed (5.5%) and urge incontinence (2.1%) [29], it also coincides with the 2016 analysis by Komesu, which concluded that women aged 80–90 years predicted incident MUI [30]. The Norwegian EPINCONT study mentions that the prevalence of UI increases with age, with the lowest prevalence (12%) in women under 30 years and the highest (40%) in women over 90 years [31]. Finally, in 2024 Kozhumam et al. identified that the overall prevalence of UI was 2.6% (95% CI: 1.73%–3.85%), and increases descriptively with age: from 0.5% in women 40–49 years old to 6.6% in those over 70 [32].

According to different ethnicities, it was found that Awá women have a higher risk of UUI and a strong protective effect against MUI. In the Afro-descendant population, the risk of SUI is elevated and there is a protective effect against UUI. In the White population, a more than twofold risk of MUI with a protective effect against UUI was observed; the Karanki group shows significant protection against UUI and a very high risk of SUI; the Mestizo group presents a slight risk for UUI and MUI with a slight protective effect against SUI. The Natabuelas group shows no statistically significant

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relationship with SUI or UUI, and MUI has a significant association but without an odds ratio, which differs from Akbar et al., who in 2021 determined that SUI and MUI are significantly less prevalent among Black women compared to White women; in the prevalence of UUI, no racial or ethnic differences were observed [33]; However, it is noteworthy that most studies are conducted in White populations, as indicated by Joo Lee et al. in 2024, concluding that most clinical trials focus on non-Hispanic White women, who make up an average of 76% of participants, compared to 7.8% Hispanic women and 7% Black women, which could compromise the generalizability of results [34].

Our findings suggest that urinary incontinence, in its different types, is a health condition that affects women regardless of their age or ethnic group. It is also associated with the number of children and the type of delivery. Therefore, studying it in terms of promotion, prevention, and treatment plays a crucial role in reducing its negative impact on women's health, quality of life, and emotional well-being.

5. Conclusions

The study revealed that the different types of urinary incontinence (UI) are influenced by factors such as type of delivery, number of children, age, and ethnicity.

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Institutional Review Board Statement: This study was exempt from ethical review and approval because it is an observational, descriptive, and non-interventional study. It was classified as low-risk, in accordance with Agreement No. 00005 (Official Registry, Fifth Supplement No. 118, August 2, 2022) issued by the Ministry of Public Health of Ecuador. In this regard, and in accordance with Article 60 of the agreement, which establishes that studies based exclusively on open or public data do not require approval by the Human Research Ethics Committee (CEISH) for their execution or publication, such authorization was not necessary since it involved only the use of anonymized data, without interventions or invasive procedures. However, all participants gave their informed consent, ensuring the confidentiality and anonymity of the information collected at all times.

Informed Consent Statement: Informed consent was obtained freely and voluntarily from all participants, with the detailed research process included.

Data Availability Statement: Data are reported in the manuscript and at link https://zenodo.org/uploads/17041902

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Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

The following abbreviations have been used in this manuscript:

UI	Urinary Incontinence
UUI	Urge Urinary Incontinence
SUI	Stress Urinary Incontinence
MUI	Mixed Urinary Incontinence
ICIQ-IU-SF	International Consultation on Incontinence Questionnaire

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