Clinical and Experimental Obstetrics & Gynecology

Clin. Exp. Obstet. Gynecol. **2024**; 51(2): 53
https://doi.org/10.31083/j.ceog5102053

Original Research

Stigma in Elderly Females with Stress Urinary Incontinence: A Latent Profile Analysis

Haochong He[1], Xiue Huang[2], Bijun Yu[1], Ye Liu[1], Shuyuan Mai[1], Le Ouyang[1], Qiaoling Zhang[1], Xiaoying Yan[1,*]

[1]Department Community Nursing, Guangdong Pharmaceutical University, 510006 Guangzhou, Guangdong, China
[2]Department Rehabilitative Nursing, Shenzhen Longgang People's Hospital, 518172 Shenzhen, Guangdong, China
*Correspondence: yanxiaoyingtougao@163.com (Xiaoying Yan)
Academic Editor: Michael H. Dahan
Submitted: 14 August 2023 Revised: 1 October 2023 Accepted: 12 October 2023 Published: 23 February 2024

Abstract

Background: Stress urinary incontinence (SUI) is a commonly occurring urological disorder in females, particularly among the elderly population. Females with SUI often experience significant stigma associated with their condition. This study aimed to investigate the current status of stigma among elderly females with SUI and analyze its heterogeneous subtypes. **Methods**: The Stigma Scale for Chronic Illness (SSCI) was used to survey 245 participants in two tertiary hospitals in Guangdong from November 2021 to September 2022. Latent profile analysis was employed to create a classification model, and variance and correlation analyses were conducted to assess the influencing factors. **Results**: A total of 245 elderly females with SUI participated in the survey. They had an average stigma score of 83.70 $\pm$ 13.88, consisting of self-stigma (48.64 $\pm$ 8.04) and perceived stigma (35.06 $\pm$ 6.80) scores. Latent profile analysis identified three distinct and comparable subtypes: the low-self-low-perceived group (14.69%), the high-self-medium-perceived group (49.38%), and the high-self-high-perceived group (35.91%). These subtypes exhibited statistically significant differences in all dimensions and the overall stigma score ($p < 0.05$) and were found to be correlated with the patient's level of education, marital status, drinking habits, number of chronic illnesses, presence of diabetes, and frequency of urinary leakage ($p < 0.05$). **Conclusion**: This study demonstrates that elderly females with SUI face elevated levels of stigma, and it reveals distinct classification characteristics among them. Additionally, it emphasizes the importance of providing specific support and attention to individuals with higher levels of education, increased fluid intake, marital status, severe urinary leakage, and diabetes.

Keywords: stress urinary incontinence; elderly females; stigma; nursing; latent profile analysis

1. Introduction

Stress urinary incontinence (SUI) is a urinary system disorder characterized by involuntary urine leakage during activities like coughing, sneezing, physical exertion, or other situations that elevate intra-abdominal pressure, resulting in temporary urinary incontinence (UI) [1]. Among females, especially in the elderly demographic, SUI stands as a prevalent urologic condition. Studies have reported prevalence rates ranging from 18.9% to 40%, with a notably higher prevalence of up to 28.2% in females aged over 60 years [2–5]. A study has revealed that 60.6% of patients experiencing UI perceive it as significantly more embarrassing than depression and cancer [6]. This embarrassment often leads to a delay in seeking medical treatment due to the presence of qualitative shame. Consequently, patients find it challenging to access timely and effective therapeutic measures, which worsens disease symptoms and adds to their psychological stress. The intensifying symptoms and negative emotions further contribute to an increased sense of shame among patients, subsequently diminishing their social participation and reducing their inclination to seek medical treatment [7–10]. This creates a vicious circle that adversely impacts the overall quality of life of these patients. Additionally, it is important to acknowledge that several factors, including a lack of awareness and education, cultural norms, gender roles, and age, contribute to the stigma surrounding incontinence [8–10]. Currently, research concerning the experienced stigma among elderly females with SUI [9–12] predominantly focuses on evaluating clinical outcomes using composite scores, often without considering the heterogeneity among the items in these scales. However, latent profile analysis (LPA) is a clustering method based on a latent variable model, offering the capability to identify different groups within the data and describe the unique characteristics of each group [13]. Hence, this study aims to use LPA as a tool for exploring and analyzing the various subgroups of stigma characteristics present among elderly females with SUI. The results of this study provide evidence to furnish valuable insights for the development of targeted nursing interventions. These interventions are designed to reduce stigma, minimize its impact on patients' health-related behavior, and ultimately improve their overall quality of life.

2. Materials and Methods

2.1 Participants and Procedure

This cross-sectional study was conducted from November 2021 to September 2022 at two tertiary hospitals located in Guangzhou, Guangdong Province. The study specifically targeted participants admitted to the urology and geriatric departments, employing a simple random sampling method. The inclusion criteria were as follows: (1) Patients who met the diagnostic criteria outlined by the International Association of Urinary Control for UI [14]; (2) SUI diagnosis confirmed by a physician; (3) elderly females aged $\geq$60 years; (4) patients with clear consciousness, devoid of verbal communication impairments, possessing some level of text reading comprehension ability, and capable of independently completing the questionnaire; and (5) patients with relatively stable health conditions.

2.2 Sample Size

The current study was designed to conduct a cross-sectional assessment of the prevalence of morbidity and the stigma experienced by female patients with SUI in a specific location. We conducted a two-sided test with a significance level (alpha) set at 0.05, considering an expected standard deviation of 30 and a margin of error of 5. The sample size was determined using PASS 15 software (NCSS, LLC., Kaysville, UT, USA) [15], resulting in a calculation of N = 139 cases. Accounting for a 20% anticipated loss to follow-up rate, a minimum of 174 cases were required as study participants. Ultimately, the study successfully enrolled 245 elderly female patients with SUI.

2.3 Measures

2.3.1 Sociodemographic and Clinical Characteristics

Based on the existing literature, the survey questionnaire assessed various sociodemographic characteristics, including age, educational attainment, income, marital status, obesity, history of constipation, and water intake. It also collected data on participants' smoking and drinking habits. Furthermore, the questionnaire gathered information regarding clinical characteristics, encompassing the type and number of chronic diseases, history of genitourinary surgeries, and details pertaining to UI, such as the type of incontinence, number of leakage episodes, and frequency of micturition.

2.3.2 Stigma Assessment

The Stigma Scale for Chronic Illness (SSCI) is a comprehensive measurement tool developed by Rao *et al*. [16] in 2009. This tool was specifically designed to assess the extent of stigma experienced by patients with various chronic diseases and builds upon the foundation of the Patient-Reported Outcome Measurement Information System. The SSCI comprises 24 items classified into two dimensions: self-stigma and perceived stigma. Out of these, 13 items pertain to self-stigma, while the remaining 11 items are associated with perceived stigma. A 5-point Likert scale, ranging from 1 (none) to 5 (always), is employed in the scale, resulting in a total score range of 24 to 120 points. Higher scores indicate a greater degree of morbid shame. Deng *et al*. [17] adapted this scale into a Chinese version known as the Chronic Disease Stigma Scale. The adapted scale exhibited excellent internal consistency and stability, as reflected by Cronbach's alpha coefficient of 0.95. Moreover, the total scale exhibited a content validity of 0.932, while each individual item demonstrated a content validity ranging from 0.800 to 1.000.

2.4 Statistical Analysis

Mplus 8.3 software (Muthén & Muthén, Los Angeles, CA, USA) was employed to construct a latent profile classification model. This model used the SSCI scores as exogenous variables and targeted elderly female patients with SUI. Initially, the model consisted of a single category, and subsequent iterations expanded the number of category models. Model fitness was assessed based on multiple criteria, including Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), sample-corrected BIC (aBIC), entropy index, and the Roe-Mondale-Reuben-corrected likelihood ratio criterion (LMR), using the Bootstrap Likelihood Ratio Test (BLRT) [18,19]. The criteria for evaluating the model's fitness encompassed the following: (1) Smaller values of AIC, BIC, and aBIC indicate better model fit [18]; (2) Higher entropy values closer to 1, indicate a greater probability of accurate individual categorization [13,20]; (3) LMR and BLRT were employed to compare the fit difference between the "k" and "k-1" models. A p-value < 0.05 indicated that the k models outperformed the k-1 models. Iterations continued until an optimal model fit was achieved [21].

Upon determining the optimal model, sociodemographic and clinical characteristics were compared among profiles using the combined sample from the discovery and replication cohorts. IBM SPSS statistics for Windows (version 23; IBM Corp., Armonk, NY, USA) was utilized to analyze the sociodemographic and clinical characteristics across different profiles. Variations were examined through the analysis of variance (ANOVA), t-tests, and χ^2 tests [22].

2.5 Ethical Considerations

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by The Ethics Committee of the First Affiliated Hospital of Guangdong Pharmaceutical University (2022-87). Before we distributed the questionnaires, we assured the medical staff that the questionnaire will be used for academic research, their personal information will remain confidential, and they could withdraw at any stage. Moreover, the participants signed informed consent forms.

3. Results

3.1 Participant Characteristics

The mean scores for total, self, and perceived stigma were 83.70 ± 13.88, 48.64 ± 8.05, and 35.06 ± 6.80, respectively, constituting approximately 69.7%, 74.8%, and 63.7% of the total score. A total of 245 elderly females participated in this study, with a mean age of 73.91 ± 9.02 years. Table 1 provides detailed information about the participants, including the proportions of participants with various characteristics. Statistically significant differences in *p*-values were observed among participants with varying levels of education, water intake, smoking or drinking habits, the presence or absence of diabetes mellitus, and the frequency of urinary leakage and urination. Furthermore, significant differences were found in the total stigma and perceived stigma scores among participants with different marital statuses. Additionally, significant differences were observed in the total stigma and self-stigma scores among participants with varying income levels.

3.2 Latent Profile Analysis

The process began with the initial model, progressively constructing potential category models ranging from 1 to 6, with the results outlined in Table 2. As the number of model categories increased, both the AIC and BIC values exhibited a gradual decrease, indicative of an improved model fit. It is worth noting that each model maintained an entropy index >0.8, indicating a reliable classification. Furthermore, the Bootstrap Likelihood Ratio Test indexes for the 2 to 6 category models all registered values <0.05, indicating that the model with "k" categories outperformed the model with "k-1" profiles. Regarding the AIC and BIC indices, the 3-category model surpassed the 2-category model but was slightly inferior to the 4-category model. However, within the 3-category model, there were more substantial reductions of 7.80% and 6.47% in AIC and BIC, respectively, compared to the 4-category model, which showed decreases of 1.51% and 1.22%, respectively. This suggests that the decline in AIC and BIC was more significant in the 3-category model than in the 4-category model. Additionally, the proportion of the category with the lowest relative frequency in the 3-category model stood at 14%, which was slightly higher than that observed in the 4-category model. Considering a combination of the model fitting indices and model simplicity, it is concluded that the 3-category potential profile model represents the most suitable model.

The scores of the three potential categories on the SSCI scale are shown in Fig. 1. Class 1, comprising 14.69% of the population, exhibited scores below the mean in all dimensions and was consequently labeled as the "low-self-low-perceived" group. Class 2, constituting 49.38% of the population, scored close to the mean in perceived stigma and above the mean in self-stigma and was labeled as the "high-self-medium-perceived" group. Class 3, comprising 35.91% of the population, achieved scores above the mean in all dimensions and was labeled as the "high-self-high-perceived" group.

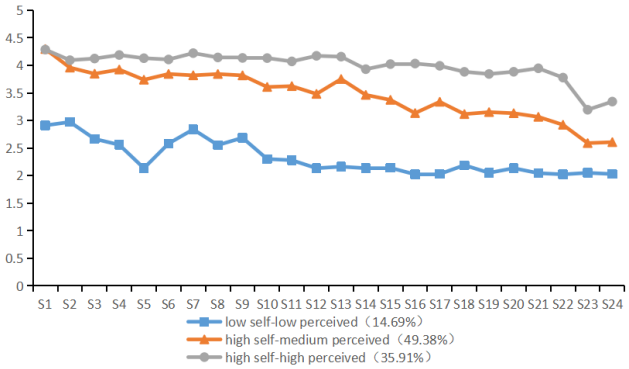


Fig. 1. Latent profile indicators mean values for the three profiles. Note: S1–S24 refers to entries 1 to 24 of the Stigma Scale for Chronic Illness (SSCI) scale.

An ANOVA was conducted, using the participants' potential categories as independent variables and the scores of the dimensions as well as the total scores as dependent variables, as outlined in Table 3. The results revealed statistically significant differences ($p < 0.05$) in self-morbid shame among the three potential categories, with the "high-self-high-perceived" group recording the highest score, followed by the "high-self-medium-perceived" and "low-self-low-perceived" groups. Similarly, significant differences ($p < 0.05$) were observed in perceived morbid shame among the three potential categories, with the "high-self-high-perceived" group having the highest score, followed by the "high-self-medium-perceived" and "low-self-low-perceived" groups. Similarly, the differences in the SSCI scores among the three potential categories were all statistically significant ($p < 0.05$), with the "high-self-high-perceived" group again recording the highest score, followed by the "high-self-medium-perceived" and "low-self-low-perceived" groups.

3.3 Participant Characteristics Across Potential Categories

The potential categories were analyzed using a χ^2 test and correlation analysis with the general data. This analysis uncovered statistically significant differences ($p < 0.05$) across various factors, including educational attainment, marital status, water intake, the number of chronic diseases, the presence of diabetes mellitus, and the frequency of urinary leakage. Among the potential categories, the "low-self-low-perceived" group exhibited the highest proportion of individuals with an elementary school education or below (50.0%), with an adjusted residual of 4.1. Conversely, the "high-self-high-perceived" group had the highest proportion of individuals with a junior high school education

Table 1. Participant characteristics.

Variable	Classification	Number (%)	Total stigma	Self-stigma	Perceive stigma
Age (year)	60–80	172 (70.2)	84.42 ± 13.62	49.00 ± 8.01	35.41 ± 6.65
	Over 80	73 (29.8)	82.01 ± 14.42	47.79 ± 8.12	34.21 ± 7.14
	t/z		1.242	1.072	1.262
	p		0.216	0.285	0.208
Educationlevel	Below elementary	57 (23.3)	78.79 ± 16.24	45.61 ± 9.18	33.17 ± 7.61
	Middle school	114 (46.5)	84.55 ± 13.07	48.83 ± 7.30	35.71 ± 6.68
	High school or above	74 (30.2)	86.18 ± 12.26	50.67 ± 7.59	35.50 ± 6.13
	F		4.140	5.640	2.433
	p		0.018	0.004	0.092
Income level (Yuan Renminbi/¥)	<3000	38 (15.5)	87.97 ± 11.58	50.86 ± 6.85	37.10 ± 5.92
	3000–5000	135 (55.1)	84.14 ± 13.55	49.09 ± 7.79	35.04 ± 6.82
	5000–7000	46 (18.8)	81.76 ± 15.04	47.06 ± 8.82	34.69 ± 7.07
	>7000	26 (10.6)	78.62 ± 15.03	45.80 ± 8.66	32.80 ± 7.01
	F		2.887	2.787	2.377
	p		0.041	0.047	0.077
Marital status	Married	177 (72.2)	84.94 ± 13.08	49.02 ± 7.34	35.90 ± 6.66
	Single	68 (27.8)	80.49 ± 15.40	47.63 ± 9.63	32.85 ± 6.72
	t/z		2.109	1.080	3.205
	p		0.037	0.283	0.002
Obesity (BMI >30 kg/m²)	Yes	54 (22.0)	83.74 ± 10.43	48.42 ± 6.33	35.31 ± 5.43
	No	191 (77.9)	83.69 ± 14.73	48.70 ± 8.48	34.98 ± 7.16
	t/z		0.028	–0.222	0.360
	p		0.978	0.825	0.757
Constipation frequency	Never	89 (36.3)	83.61 ± 14.19	48.51 ± 8.29	35.08 ± 6.85
	Occasionally	131 (53.5)	83.65 ± 14.39	48.41 ± 8.24	35.23 ± 7.04
	Frequently	25 (10.2)	84.32 ± 9.85	50.28 ± 5.94	34.04 ± 5.43
	F		0.028	0.580	0.324
	p		0.973	0.561	0.724
Water intake	0–1000 mL	17 (6.9)	69.53 ± 17.77	40.05 ± 9.16	29.47 ± 8.89
	1000–2000 mL	178 (72.7)	83.46 ± 13.20	48.60 ± 7.67	34.85 ± 6.51
	Over 2000 mL	50 (20.4)	89.38 ± 11.11	51.68 ± 6.88	37.70 ± 5.79
	F		11.204	11.897	8.197
	p		<0.001	<0.001	0.001
Smoking and alcohol use	Yes	76 (31.0)	88.87 ± 9.57	52.57 ± 6.14	36.28 ± 4.94
	No	169 (69.0)	81.38 ± 14.87	46.86 ± 8.18	34.50 ± 7.44
	t/z		4.722	6.038	2.209
	p		<0.001	<0.001	0.028
History of urogenital surgery	Yes	26 (10.6)	78.88 ± 19.40	44.65 ± 10.37	34.23 ± 9.25
	No	219 (89.4)	84.27 ± 13.01	49.11 ± 7.61	35.15 ± 6.47
	t/z		–1.38	–2.125	–0.498
	p		0.179	0.042	0.623
Multiple chronic diseases	1 or 2 types	101 (41.2)	84.72 ± 10.43	49.48 ± 6.33	35.23 ± 5.71
	3 types	58 (23.7)	83.21 ± 15.60	48.22 ± 9.04	34.98 ± 7.36
	4 types	63 (25.7)	84.51 ± 15.33	49.07 ± 8.75	35.42 ± 7.19
	More than 5	23 (9.4)	78.26 ± 17.59	44.78 ± 9.38	33.47 ± 8.71
	F		1.024	1.847	0.325
	p		0.387	0.146	0.807
High blood pressure	Yes	88 (35.9)	83.85 ± 15.48	48.43 ± 8.96	35.42 ± 7.30
	No	157 (64.1)	83.62 ± 12.94	48.75 ± 7.51	34.85 ± 6.53
	t/z		–0.127	0.289	–0.617
	p		0.899	0.773	0.538

Table 1. Continued.

Variable	Classification	Number (%)	Total stigma	Self-stigma	Perceive stigma
Coronary heart disease	Yes	77 (31.4)	82.09 ± 15.46	47.31 ± 8.79	35.19 ± 6.45
	No	168 (68.5)	84.44 ± 13.07	49.25 ± 7.63	34.77 ± 7.57
	t/z		1.157	1.757	0.413
	p		0.249	0.08	0.680
Chronic kidney disease	Yes	141 (57.5)	83.99 ± 12.22	48.84 ± 7.28	35.14 ± 6.23
	No	104 (42.4)	83.32 ± 15.91	48.36 ± 9.01	34.95 ± 7.54
	t/z		0.358	0.445	0.209
	p		0.721	0.657	0.834
Diabetes	Yes	76 (31.0)	92.95 ± 9.11	52.86 ± 5.59	40.07 ± 4.76
	No	169 (68.9)	79.54 ± 13.66	46.73 ± 8.27	32.80 ± 6.37
	t/z		–9.043	–6.784	–9.902
	p		<0.001	<0.001	<0.001
Others (Endometriosis, Osteoporosis, Autoimmune diseases, etc.)	Yes	67 (27.3)	85.99 ± 10.40	50.53 ± 6.02	35.44 ± 5.97
	No	178 (72.6)	82.84 ± 14.91	47.92 ± 8.59	34.91 ± 7.11
	t/z		1.857	2.668	0.544
	p		0.065	0.008	0.587
Number of leakage episodes	Once a week or less	64 (26.1)	77.89 ± 15.22	45.32 ± 8.89	32.56 ± 7.20
	2–3 times a week or more	93 (38.0)	83.83 ± 13.31	48.73 ± 7.65	35.09 ± 6.66
	Once a day	44 (18.0)	83.80 ± 13.39	48.97 ± 7.78	34.81 ± 6.71
	Several time a day	44 (18.0)	91.80 ± 8.81	52.93 ± 5.53	38.86 ± 4.75
	F		13.384	10.586	10.911
	p		<0.001	<0.001	<0.001
Frequency of micturition	2–3 times a day	42 (17.1)	79.26 ± 15.62	46.11 ± 9.58	33.14 ± 6.86
	3–5 times a day	111 (45.3)	82.60 ± 13.28	48.22 ± 7.59	34.37 ± 6.84
	More than 5 times	92 (37.6)	87.05 ± 13.08	50.29 ± 7.52	36.76 ± 6.42
	F		5.019	3.746	5.357
	p		0.008	0.027	0.006

BMI, body mass index. 1 USD ≈ 7 Yuan Renminbi/¥.

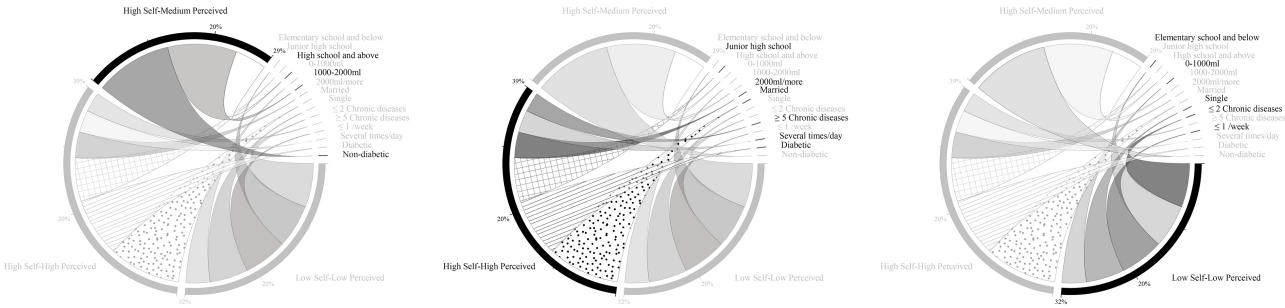
Table 2. Fit Statistics for the latent profile analysis.

	Log-likelihood	AIC	BIC	SSA-BIC	Relative frequecy of smallest class (%)	LMRT	BLRT	Enropy
1	–6989.473	14,074.947	14,243.007	14,090.851	-	-	-	-
2	–5693.488	11,532.976	11,788.568	11,557.164	14	0.0000	0.0000	0.998
3	–5275.590	10,747.180	11,090.303	10,779.650	14	0.0006	0.0000	0.961
4	–5096.284	10,438.567	10,869.222	10,479.321	9	0.0157	0.0000	0.965
5	–4910.355	10,116.710	10,634.896	10,165.747	7	0.7509	0.0000	0.958
6	–4819.996	9985.992	10,591.710	10,043.313	3	0.4184	0.0000	0.965

AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; SSA-BIC, Sample-Size Adjusted Bayesian Information Criterion; LMRT, Lo-Mendell-Rubin Adjusted Likelihood Ratio Test; BLRT, Bootstrap Likelihood Ratio Test.

Table 3. Variability of dimension scores among profiles.

Variable	Classification	Number (%)	Total score of Stigma	Self-Stigma	Perceive stigma
Various potential profiles	Class 1	36 (14.6)	55.69 ± 5.07	32.80 ± 3.91	22.88 ± 1.78
	Class 2	121 (49.3)	83.36 ± 4.77	49.54 ± 4.30	33.80 ± 3.17
	Class 3	88 (35.9)	95.64 ± 5.44	53.87 ± 4.16	41.76 ± 2.44
	F		754.156	363.804	1132.166
	p		0.000	0.000	0.000



(A)Correlation between Class 1 and participant characteristics (B)Correlation between Class 2 and participant characteristics (C)Correlation between Class 3 and participant characteristics

Fig. 2. Correlation chord plot depicting participant characteristics and potential categories.

(50.0%), but with an adjusted residual of –2.8. The "high-self-medium-perceived" group had the highest proportion of individuals with a senior high school education or above (36.4%), with an adjusted residual of 2.1. Regarding marital status, the "high-self-high-perceived" group had the highest proportion of individuals with a spouse (83.0%), with an adjusted residual of 2.8, whereas the "high-self-medium-perceived" group had the highest proportion of individuals without a spouse (44.4%), with an adjusted residual of 2.4.

Considering water intake, the "low-self-low-perceived" group had the highest proportion of individuals consuming 0–1000 mL (27.8%), with an adjusted residual of 5.3, while the "high-self-medium-perceived" group had the highest proportion of individuals consuming 1000–2000 mL (79.3%), with an adjusted residual of 2.3. Meanwhile, the "high-self-high-perceived" group had the highest proportion of individuals consuming $\geq$2000 mL (29.5%), with an adjusted residual of 2.7. Regarding the number of chronic diseases, the "high-self-medium-perceived" group had the highest proportion of individuals with $<$2 conditions (50.4%), with an adjusted residual of 2.9, whereas the "low-self-low-perceived" group had the highest proportion of individuals with $\geq$5 conditions (50.4%), also with an adjusted residual of 2.9. Regarding diabetes mellitus, the "high-self-high-perceived" group had the highest proportion of patients with diabetes (68%), with an adjusted residual of 2.9, while the "high-self-medium-perceived" group had the highest proportion of patients without diabetes (89.3%), with an adjusted residual of 6.8. As for urinary leakage, the "low-self-low-perceived" group had the highest proportion of individuals experiencing leaks $\leq$1 (50.0%), with an adjusted residual of 3.5, while the "high-self-high-perceived" group had the highest proportion of individuals experiencing leaks several times per day (26.1%), with an adjusted residual of 2.5. Fig. 2 shows a visual representation of the correlation between participant characteristics and potential categories.

4. Discussion

This study aimed to investigate the prevailing levels of stigma among elderly females experiencing SUI. Additionally, the study also employed the LPA technique to categorize participants according to their stigma experiences, leading to the identification of three distinctive profiles: low-self-low-perceived, high-self-medium-perceived, and high-self-high-perceived. The findings indicated that the most substantial proportion of participants fell into the "high-self-medium-perceived" group.

In this study, it was observed that elderly female patients experiencing SUI exhibited elevated levels of stigma. Furthermore, the patients' level of self-stigma was found to surpass their levels of perceived stigma. These findings can be attributed to several factors. Firstly, SUI can exert a significant impact on patients' social activities and overall quality of life. Consequently, patients may harbor increased concerns about their own physical well-being, leading to an increased sense of self-morbid shame [23–25]. Moreover, older adults often have limited social circles and may place less emphasis on external evaluations. Consequently, their perceived morbid shame scores tend to be relatively low [26,27]. A study involving 506 female patients experiencing UI, Guan *et al.* [27] also found that patients had the highest scores for intrinsic shame, which is consistent with the findings of this current study.

The study revealed that educational attainment (level of literacy), marital status, and water intake emerged as significant factors influencing the sense of shame among elderly female patients with SUI. Patients with varying levels of literacy may harbor different attitudes toward themselves and their illness, thereby impacting the degree of shame they experience [28]. Those with higher levels of literacy might place greater importance on etiquette and cultural refinement in social interactions, potentially leading to a greater mental and psychological burden when experiencing incontinence. This, in turn, may increase the likelihood of falling into the "high-self-medium-perceived" group. Conversely, patients with low levels of literacy may tend to belong to the "low-self-low-perceived" group. These findings align with those of Wang *et al.* [28], which

is a study investigating the relationship between stigma and healthcare-seeking behaviors in elderly females. The study found that marital status independently influenced the intention of patients to seek healthcare. However, that study did not identify a direct impact of marital status on the stigma of patients. Conversely, our study demonstrated that patients with a spouse were more inclined to belong to the "high-self-high-perceived" group, while patients without a spouse were more likely to fall into the "low-self-low-perceived" group. This difference could be attributed to patients with spouses being more concerned about their image and privacy, which may lead to an intensified sense of stigma. However, these findings should be further explored with larger sample sizes. The daily water intake exhibited a positive correlation with the stigma, with higher water intake associated with a higher likelihood of falling into the "low-self-low-perceived", "high-self-medium-perceived", and "high-self-high-perceived" groups. This might be because excessive water intake can burden the digestive system, exacerbating UI symptoms and intensifying feelings of shame and embarrassment. The findings from Andersen *et al*. [29] also suggest that a well-managed water intake regimen can help alleviate the UI symptoms, consequently reducing the stigma of the patient [30,31].

The study also found that the presence of diabetes mellitus, the frequency of urine leakage, and the number of chronic diseases can impact the perception of stigma in elderly females with SUI [32]. Patients with comorbid diabetes were more inclined to belong to the "high-self-high-perceived" group, whereas patients without diabetes were more likely to fall into the "high-self-medium-perceived" group. This phenomenon may be attributed to the fact that diabetes not only affects incontinence symptoms but can also lead to other health issues like retinopathy and neuropathy. These additional health concerns increase the susceptibility of patients to external influences, thereby amplifying their perception of stigma [33–37]. This finding is consistent with the findings of Akyirem *et al*. [33]. Furthermore, patients with less frequent urine leakage were more likely to fall into the "low-self-low-perceived" group, while those with more frequent leakage tended to belong to the "high-self-high-perceived" group. This observation can be attributed to the fact that urinary leakage not only impacts the social activities of the patients but also increases the burden and discomfort experienced by others. Consequently, patients become more acutely aware of their incontinence [7,8,38,39]. This aligns with the results reported by Cai [38], which indicated that patients with UI often have their social interactions and comfort affected by urine leakage. It is important to note that while some studies have shown that chronic diseases can lead to patients developing a sense of shame [40–42], the present study found that patients with $\geq$5 chronic diseases reported a lower sense of shame compared to those with $<$2 chronic diseases. This could be attributed to patients gradually accepting their condition and adapting to the impact of their illnesses on their lives when dealing with multiple chronic diseases. However, it is worth acknowledging that the study's conclusion may be limited by its small sample size and underrepresentation, highlighting the need for further investigation with a larger sample size.

In conclusion, this study highlights the significant impact of stigma on elderly females experiencing SUI. The comprehension of factors influencing these emotional responses, such as level of literacy, marital status, water intake, the presence of diabetes mellitus, the frequency of urinary leakage, and the number of chronic diseases, can help healthcare professionals design customized interventions and support systems aimed at enhancing the psychosocial well-being of these patients. Through the reduction of stigma and the promotion of acceptance, there is the potential to improve the overall quality of life for elderly females living with SUI.

Limitations

This study has certain limitations. First, due to its cross-sectional design, causal relationships could not be inferred from the results. Second, data collection was limited to participants from the two tertiary hospitals in Guangdong, China, and focused exclusively on older adults, thereby limiting the generalizability of the results.

5. Conclusion

In summary, this study used the potential profile analysis method alongside the SSCI scale to investigate the stigma among elderly female patients with SUI. The findings identified three distinct subgroups, with the majority falling into the "high-self-medium-perceived" group. Particular attention should be directed toward patients with high levels of literacy, elevated water intake, a spouse, serious urine leakage, and coexisting diabetes. Tailored nursing interventions should be implemented to enhance their mental well-being and diminish the burden of stigma they experience.

Availability of Data and Materials

The raw data supporting the findings of this study are available from the authors, without undue reservation.

Author Contributions

HH, BY, YL, and XY participated in the concept and design of the study. HH, YL and XH collected data and controlled quality. HH, BY, and QZ drafted and edited the manuscript. HH, QZ, and LO performed the statistical analyses. XY will be responsible for the paper's prepublication. All authors made substantial contributions to interpret data and revised the manuscript for important intellectual content. All authors contributed to the article and approved the final version.

Ethics Approval and Consent to Participate

The Ethics Committee of the First Affiliated Hospital of Guangdong Pharmaceutical University (2022-87) approved the study. Before we distributed the questionnaires, we assured the medical staff that the questionnaire will be used for academic research, their personal information will remain confidential, and they could withdraw at any stage. Moreover, the participants signed informed consent forms.

Acknowledgment

The authors would like to acknowledge the cooperation of the elderly population who participated in this study and express their gratitude for the valuable contributions of the research assistants.

Funding

This study received support from the Medical and Health Science and Technology Project funded by the Special Funds for Economic and Scientific Development of Longgang District, Shenzhen, China (LGWJ2021-042).

Conflict of Interest

The authors declare no conflict of interest.

References

[1] Nygaard IE, Heit M. Stress urinary incontinence. Obstetrics and Gynecology. 2004; 104: 607–620.

[2] Abufaraj M, Xu T, Cao C, Siyam A, Isleem U, Massad A, *et al*. Prevalence and trends in urinary incontinence among women in the United States, 2005-2018. American Journal of Obstetrics and Gynecology. 2021; 225: 166.e1–166.e12.

[3] Aoki Y, Brown HW, Brubaker L, Cornu JN, Daly JO, Cartwright R. Urinary incontinence in women. Nature Reviews. Disease Primers. 2017; 3: 17042.

[4] Li Q, Huang Y, Wang Q, Xue K, Zhou F. The prevalence and risk factors of different degrees of stress urinary incontinence in Chinese women: A community-based cross-sectional study. Nursing Open. 2023; 10: 5079–5088.

[5] Kharaji G, Nikjooy A, Amiri A, Sanjari, MA. Proprioception in stress urinary incontinence: a narrative review. Medical Journal of the Islamic Republic of Iran. 2019, 33: 60.

[6] Elenskaia K, Haidvogel K, Heidinger C, Doerfler D, Umek W, Hanzal E. The greatest taboo: urinary incontinence as a source of shame and embarrassment. Wiener Klinische Wochenschrift. 2011; 123: 607–610.

[7] Ferreira M, Abbade L, Bocchi SCM, Miot HA, Boas PV, Guimaraes HQCP. Incontinence-associated dermatitis in elderly patients: prevalence and risk factors. Revista Brasileira De Enfermagem. 2020; 73: e20180475. (In Portuguese, English)

[8] Gray M, Giuliano KK. Incontinence-Associated Dermatitis, Characteristics and Relationship to Pressure Injury: A Multisite Epidemiologic Analysis. Journal of Wound, Ostomy, and Continence Nursing: Official Publication of the Wound, Ostomy and Continence Nurses Society. 2018; 45: 63–67.

[9] Wang C, Wan X, Wang K, Li J, Sun T, Guan X. Disease stigma and intentions to seek care for stress urinary incontinence among community-dwelling women. Maturitas. 2014; 77: 351–355.

[10] Wang C, Li J, Wan X, Wang X, Kane RL, Wang K. Effects of stigma on Chinese women's attitudes towards seeking treatment for urinary incontinence. Journal of Clinical Nursing. 2015; 24: 1112–1121.

[11] Wójtowicz U, Płaszewska-Zywko L, Stangel-Wójcikiewicz K, Basta A. Barriers in entering treatment among women with urinary incontinence. Ginekologia Polska. 2014; 85: 342–347.

[12] Altaweel W, Alharbi M. Urinary incontinence: prevalence, risk factors, and impact on health related quality of life in Saudi women. Neurourology and Urodynamics. 2012, 31: 642–645.

[13] Hallquist MN, Wiley JF. MplusAutomation: An R package for facilitating large-scale latent variable analyses in M plus. Structural equation modeling: a multidisciplinary journal. 2018. 25: 621–638.

[14] Denisenko AA, Clark CB, D'Amico M, Murphy AM. Evaluation and management of female urinary incontinence. The Canadian Journal of Urology. 2021; 28: 27–32.

[15] Wang YY, Sun RH. Application of PASS in sample size estimation of non-inferiority, equivalence and superiority design in clinical trials. Zhonghua Liu Xing Bing Xue Za Zhi. 2016; 37: 741–744. (In Chinese)

[16] Rao D, Choi SW, Victorson D, Bode R, Peterman A, Heinemann A, *et al*. Measuring stigma across neurological conditions: the development of the stigma scale for chronic illness (SSCI). Quality of Life Research: an International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation. 2009; 18: 585–595.

[17] Lu Q, Deng C, Fu L, Wu R, Chang L, Qi H, *et al*. Reliability and validity of a Chinese version of the Stigma Scale for Chronic Illness (SSCI) in patients with stroke. Topics in Stroke Rehabilitation. 2019. 26: 312–317.

[18] Robertson J, Kaptein M. Modern Statistical Methods for HCI. Springer Cham: Switzerland. 2016.

[19] Burnham KP, Anderson DR. Multimodel Inference Understanding AIC and BIC in Model Selection. Sociological Methods & Research. 2004; 33: 261–304.

[20] Asparouhov T, Muthén B. Auxiliary Variables in Mixture Modeling: Three-Step Approaches Using Mplus. Structural Equation Modeling: A Multidisciplinary Journal. 2014; 21: 329–341.

[21] Lo Y, Mendell NR, Rubin DB. Testing the number of components in a normal mixture. Biometrika. 2001; 88: 767–778.

[22] Stull JC. IBM SPSS Statistics for Windows. 2013. Available at: https://xueshu.baidu.com/usercenter/paper/show?paperid=c7a2bf06b5a181725e4065b1b7bf5647&site=xueshu_se&hitarticle=1 (Accessed: 22 July 2023).

[23] Goforth J, Langaker M. Urinary Incontinence in Women. North Carolina Medical Journal. 2016; 77: 423–425.

[24] Pizzol D, Demurtas J, Celotto S, Maggi S, Smith L, Angiolelli G, *et al*. Urinary incontinence and quality of life: a systematic review and meta-analysis. Aging Clinical and Experimental Research. 2021; 33: 25–35.

[25] Yoshimura K, Nakayama T, Sekine A, Matsuda F, Kosugi S, Sugino Y, *et al*. Prevalence of postmicturition urinary incontinence in Japanese men: comparison with other types of incontinence. International Journal of Urology: Official Journal of the Japanese Urological Association. 2013; 20: 911–916.

[26] Stenzelius K, Molander U, Odeberg J, Hammarström M, Franzen K, Midlöv P, *et al*. The effect of conservative treatment of urinary incontinence among older and frail older people: a systematic review. Age and ageing. 2015. 44: 736–744.

[27] Wan X, Wang C, Xu D, Guan X, Sun T, Wang K. Disease stigma and its mediating effect on the relationship between symptom severity and quality of life among community-dwelling women with stress urinary incontinence: a study from a C hinese city. Journal of Clinical Nursing. 2014. 23: 2170–2180.

[28] Johnco C, Rapee R M. Depression literacy and stigma influence how parents perceive and respond to adolescent depressive symptoms. Journal of Affective Disorders. 2018. 241: 599–607.

[29] Andersen MM, Varga S, Folker AP. On the definition of stigma. Journal of Evaluation in Clinical Practice. 2022; 28: 847–853.
[30] Christofi N, Hextall A. An evidence-based approach to lifestyle interventions in urogynaecology. Menopause International. 2007, 13: 154–158.
[31] Wyman JF, Burgio KL, Newman DK. Practical aspects of lifestyle modifications and behavioural interventions in the treatment of overactive bladder and urgency urinary incontinence. International Journal of Clinical Practice. 2009, 63: 1177–1191.
[32] Mantzoukas S, Kotrotsiou S, Mentis M, Paschou A, Diamantopoulos E, Kotrotsiou E, *et al*. Exploring the impact of shame on health-related quality of life in older individuals. Journal of Nursing Scholarship. 2021; 53: 439–448.
[33] Akyirem S, Ekpor E, Namumbejja Abwoye D, Batten J, Nelson LE. Type 2 diabetes stigma and its association with clinical, psychological, and behavioral outcomes: A systematic review and meta-analysis. Diabetes Research and Clinical Practice. 2023; 202: 110774.
[34] Himmelstein MS, Puhl RM. At multiple fronts: Diabetes stigma and weight stigma in adults with type 2 diabetes. Diabetic Medicine: a Journal of the British Diabetic Association. 2021; 38: e14387.
[35] Norton JM, Dodson JL, Newman DK, Rogers RG, Fairman AD, Coons HL, *et al*. Nonbiologic factors that impact management in women with urinary incontinence: review of the literature and findings from a National Institute of Diabetes and Digestive and Kidney Diseases workshop. International Urogynecology Journal. 2017; 28: 1295–1307.
[36] Schabert J, Browne JL, Mosely K, Speight J. Social stigma in diabetes: a framework to understand a growing problem for an increasing epidemic. The Patient. 2013; 6: 1–10.
[37] Subramaniam M, Abdin E, Bhuvaneswari S, AshaRani PV, Devi F, Roystonn K, *et al*. Prevalence and Correlates of Social Stigma Toward Diabetes: Results From a Nationwide- Survey in Singapore. Frontiers in Psychology. 2021; 12: 692573.
[38] Batmani S, Jalali R, Mohammadi M, Bokaee S. Prevalence and factors related to urinary incontinence in older adults women worldwide: a comprehensive systematic review and meta-analysis of observational studies. BMC geriatrics. 2021. 21: 1–17.
[39] Luginbuehl H, Baeyens J P, Taeymans J, Maeder IM, Kuhn A, Radlinger L. Pelvic floor muscle activation and strength components influencing female urinary continence and stress incontinence: a systematic review. Neurourology and urodynamics. 2015. 34: 498–506.
[40] Bodenheimer T, Chen E, Bennett HD. Confronting the growing burden of chronic disease: can the U.S. health care workforce do the job? Health Affairs (Project Hope). 2009; 28: 64–74.
[41] Kato A, Fujimaki Y, Fujimori S, Isogawa A, Onishi Y, Suzuki R, *et al*. Association between self-stigma and self-care behaviors in patients with type 2 diabetes: a cross-sectional study. BMJ Open Diabetes Research & Care. 2016; 4: e000156.
[42] Whittle HJ, Palar K, Ranadive NA, Turan JM, Kushel M, Weiser SD. “The land of the sick and the land of the healthy”: Disability, bureaucracy, and stigma among people living with poverty and chronic illness in the United States. Social Science & Medicine (1982). 2017; 190: 181–189.