# The Prevalence of Fecal Incontinence and Associated Risk Factors in Older Adults Participating in the SABE Study

José Tadeu Nunes Tamanini,[1]* Felipe Alves de Jesus,[1] Rodrigo Aquino Castro,[2] Marair Gracio Ferreira Sartori,[2] Manoel João Batista Castello Girão,[2] Jair Lício Ferreita dos Santos,[3] Yeda Aparecida de Oliveira Duarte,[4] and Maria Lúcia Lebrão[5]

[1]*Department of Medicine, Federal University of São Carlos, São Paulo, Brazil*
[2]*Section of Urogynecology and Pelvic Surgery, Department of Gynecology, Federal University of São Paulo, São Paulo, Brazil*
[3]*Department of Social Medicine, Faculty of Medicine of Ribeirão Preto, University of São Paulo, São Paulo, Brazil*
[4]*Department of Medical-Surgical Nursing, Nursing School, University of Sao Paulo, São Paulo, Brazil*
[5]*Department of Epidemiology, Faculty of Public Health, University of São Paulo, São Paulo, Brazil*

**Aims:** To assess the prevalence of fecal incontinence (FI) and associated factors in older adults. **Methods:** The prevalence and factors associated with FI in older adults were studied by means the SABE study (Health, Well-being, and Aging). A group of 1,345 subjects were interviewed during the third wave of the SABE study performed in Sao Paulo, in 2010. The study included 64.3% females; the mean age of the participants was 70.4 years. The dependent variable was the positive answer for the question "In the last 12 months, have you ever lost control of bowel movements or stools?" Descriptive analysis and hierarchical logistic regression were performed. The independent variables were as follows: (a) demographics: gender, age and (b) clinical characteristics: self-reported chronic diseases, presence of cognitive and/or functional decline, depression and urinary incontinence symptoms, and nutritional status. **Results:** The overall prevalence of FI was 11,7%, being 8.3% and 13.2% for males and females respectively. Among male subjects, the presence of malnutrition was associated with FI and thus presented a high relative risk index for its occurrence. Among female subjects, age group 70–74 years and some self-reported diseases or conditions such as mild depression, heart disease, urinary incontinence, and polypharmacy were associated with FI. For the first time in literature, polypharmacy appeared as an associated factor for FI for female older adults. **Conclusions:** The prevalence of FI in older adults was 11.7% and was mainly associated with advanced age and presence of heart disease, symptoms of depression, polypharmacy and urinary incontinence and malnutrition. *Neurourol. Urodynam. 9999:1–6, 2015.* © **2015 Wiley Periodicals, Inc.**

**Key words:** epidemiology; fecal incontinence; health survey; older adults; polypharmacy; prevalence study; well-being and ageing (SABE study)

## INTRODUCTION

Fecal Incontinence (FI) is commonly defined as the involuntary loss of liquid or solid feces or mucus.[1] Anal incontinence (AI) includes involuntary passage of gas, mucus, liquid, or solid stool. Depending on the definition used, the prevalence of FI ranges from 2.2% to 24% among women in the USA.[2]

Overall, the prevalence of FI is unrelated to race or ethnicity.[3,4] It is a highly bothersome condition that is more common among female than males (9.4% vs. 7.3%) subjects.[4] FI is also associated with a strong negative impact on health-related quality of life (HRQoL). However, the impact on quality of life (QoL) depends partly on the frequency and severity of FI, which varies from daily loss of all stools to infrequent staining of underwear. An estimated 2.7% of adults report leakage of solid or liquid stool at least weekly. The impact of FI may include embarrassment, social isolation, job loss, and depression.[5]

The Pan American Health Organization (PHO) and World Health Organization (WHO) coordinated the multi-center Health, Wellbeing, and Ageing Study, denominated the SABE Study to assess the living condition of elderly individuals in seven countries in Latin America and the Caribbean (Argentina, Barbados, Brazil, Chile, Cuba, Mexico, and Uruguay). In Brazil, the population studied was made up of community-dwelling older people in the city of Sao Paulo in the year 2000, which were reevaluated in 2006 and 2010.[6]

There is a shortage of epidemiological data regarding FI in Brazil. In this scenario, the goal of this research study is to provide prevalence estimates and identify associated factors of symptomatic FI by examining sociodemographic and clinical characteristics in adults aged 60 years or older in 2010.

## MATERIALS AND METHODS

Based on the results of the SABE study we investigated the prevalence and factors associated with FI in older adults.

The SABE study was submitted to and approved by the Ethics Committee of the School of Public Health at the University of São Paulo and by the National Research Ethics Commission (CONEP). Participation was voluntary, and all participants signed an informed consent form.

The reference sample (cohort A) was obtained by stratified, two-stage sampling according to the censitary sectors of the

The present study was performed at the Section of Urogynecology and Pelvic Surgery, Department of Gynecology of the Federal University of São Paulo, SP, Brazil.
Prof. Roger Dmochowski led the peer-review process as the Associate Editor responsible for the paper.
Potential conflicts of interest: Nothing to disclose.
*Correspondence to: José Tadeu Nunes Tamanini, Department of Medicine / Federal University of São Carlos - UFSCar, Rodovia Washington Luís, km 235 - SP-310, São Carlos - SP – Brasil, 13.565-905. E-mail: tadeutamanini@ufscar.br
Received 4 April 2015; Accepted 1 July 2015
Published online in Wiley Online Library (wileyonlinelibrary.com).
DOI 10.1002/nau.22836

city. Subjects aged ≥ 75 years were oversampled because of the higher mortality rate in this age group.

Overall, inclusion criteria were participants aged 60 years or older, living at home in the community. Details regarding the sampling design of the initial study are described in a previous publication.[6]

In 2006, the second round of interviews was performed. A new sample (cohort B) of adults aged 60–64 years was obtained following the same method used in the first visit because this age group was not represented in the first cohort.

The third follow-up visit took place between 2010 and 2011. A third sample of adults aged 60–64 years was included (cohort C).

Almost half of the individuals from the initial cohort that were not represented in the period between the beginning of the study and the third follow-up visit died within this period (44.2%). A small percentage of individuals (20.9%) were lost to follow-up because of other reasons, such as moving to another city, refusal to respond, or inability to locate. Sampling weights were recalculated in 2010 according to the 2010 census in order to maintain a representative sample. Weights derived from the posteriori stratification were incorporated with the weights related to the sample design.

The 2010 final sample included 1,345 adults (≥ 60 years old) who represented the 1,338,138 older adults living in Sao Paulo whose data were available on the third visit (Fig. 1).

The study involved home interviews for all follow-up visits. Each interview was performed by a single interviewer using a standard questionnaire that addressed the living and health conditions of older adults. Details regarding the third follow-up visit of the SABE study can be found in the report from Corona et al.[7]

Fecal incontinence was identified on the basis of a specific question (12.c.8) from the standardized questionnaire "In the last 12 months, have you ever lost control of bowel movements or stools?" The possible answers categories were "Yes", "No", "No response", and "Does not know". To study the possible influence of these variables on FI, the categories "Does not know" and "No response" were disregarded and were then considered to be missing values.

The mean and standard deviation were calculated for continuous variables, and proportions were calculated for categorical variables. Differences between groups were estimated using the Wald test of mean equality and the Rao-Scott test. Both tests consider sampling weights for the estimate of the population with population weights.

Poisson regression was performed to analyze the factors associated with FI, with the option Incidence Rate Ratio (IRR), which provides comparisons through the incidence rate ratios. IRR for cross sectional studies is equivalent to prevalence ratios.[8,9]

The variables obtained from univariate analysis and associated with the outcome at $p \leq 0.2$ were considered for modeling. The variables considered for the multivariate model were not only those related to potential risk factors. As this is a cross-sectional study, variables were included as falls and depression, which can be factors resulting from incontinence.

The groups were separated as follows:

a. Demographic characteristics: gender and age groups;
b. Clinical characteristics: presence of self-reported chronic diseases (diabetes, heart disease), self-reported health status, self-reported nutrition status by questioning to the participant: "In relation to your nutritional status, you consider yourself well nourished? The possible answers were: no, yes, not know and not answered.
c. Participants with chronic pain were considered those who reported pain lasting less than six months. Chronic pain that most bothered the elderly was characterized as general and articular, as well as its location, duration, intensity and frequency. In general, pain intensity was evaluated through verbal descriptors: weak pain, moderate, severe and very intense.
d. Further clinical characteristics were falls during the last year, polypharmacy (which was defined as the use of multiple medications or the administration of more medications than clinically indicated), and the presence of urinary incontinence by means of the final score from the International Consultation on Incontinence Questionnaire—Short Form (ICIQ-SF). The ICIQ-SF is a questionnaire that can be self-administered. It evaluates the impact of urinary incontinence on QoL and classifies the urinary losses of the analyzed patients. It is made up of four questions that evaluate the frequency, severity, and impact of urinary incontinence, plus a set of eight self-diagnosis items related to the causes of urinary

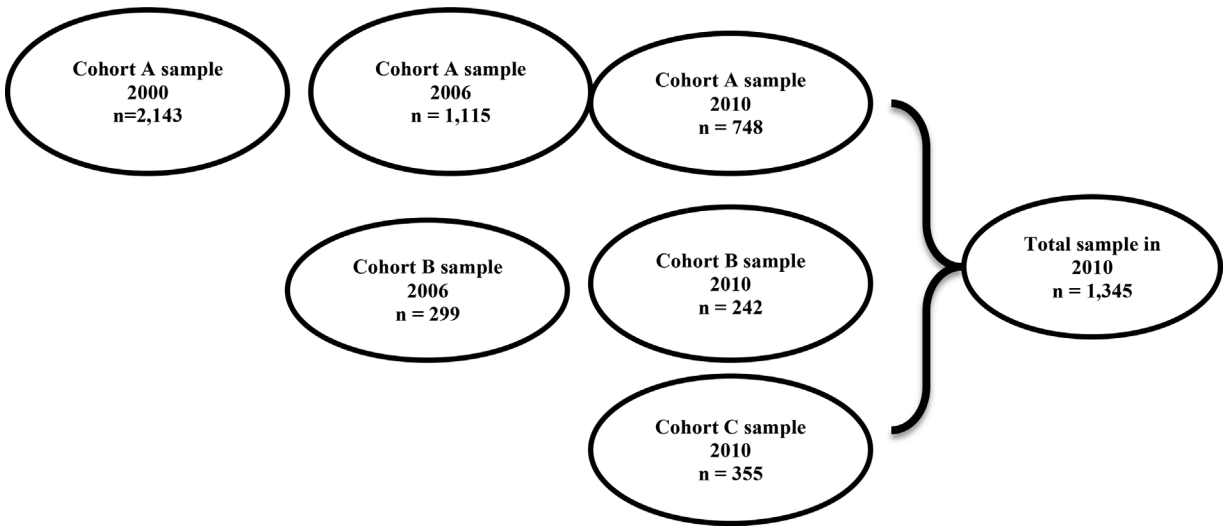


**Fig. 1.** Composition of the study population at third follow-up visit of the SABE study. Sao Paulo, SP, Brazil, 2010.

incontinence or situations relating to urinary incontinence experienced by the patients. The final score is the sum of the subscores of questions 3, 4, and 5. Participants with ICIQ-SF final score $\geq$3 were considered incontinent. The higher the final score, the greater the negative impact on QoL.[10] Functional status was assessed by the variable "doing basic activities of daily living (BADL)" and "instrumental activities of daily living (IADL)". The occurrence of depression symptoms was evaluated considering the Brazilian version of the Geriatric Depression Scale, with a score of $\geq$ 6 indicating positive results.[11]

It was considered that identification of a statistically significant association ($P < 0.05$) between a given variable under study and the outcome in question, after adjustment for the potential variables of the same group and of the superior hierarchical groups, would indicate the existence of an independent effect, inherent to the given variable. Data analysis was performed using Stata® Version 11. The sampling weights were applied in all analyses.

## RESULTS

At the end of the third follow-up visit, 1,345 individuals were interviewed, which included 864 (64.3%) female and 481 (35.7%) male participants. Most of the participants (598 [44.46%]) were in the age group 60–69 years old. In regards to education completed among participants, 205 individuals (15.2%) were illiterate and 722 (53.7%) had 4 to 11 years of study. For the FI study, data from 986 individuals were available. In total, 113 individuals (11.7%) had experienced FI in the past year, including 29 male and 84 female subjects. The weighted FI prevalence for male and female was 8.3% and 13.2%, respectively.

Table I shows the distribution of older adults and bivariate analysis for the presence of FI according to sociodemographics, symptoms and clinical characteristics. The following parameters were higher and reached significant differences in the prevalence of FI: increasing age, being female, those with poor self-reported health status (bad/very bad), those who reported pain or falls within the last year, polypharmacy, urinary tract infection or urinary incontinence, those with depression symptoms, and those with self-reported malnutrition and weight loss. With regard to functional capability, such as BADL and IADL, the greater the dependence that the elderly people presented, the greater the prevalence of FI.

Although the rate of FI was higher in those with diabetes or heart disease, the figures were not significantly different. In addition, the prevalence of FI was similar among those aged 65–79 years, whereas the prevalence of FI among those aged $\geq$ 80 years was higher.

In general, when the relative frequency data were put into a multivariate logistic regression model (Poisson regression), the analysis showed different associated factors when separating genders. Among females, variables such as age group (70–74 years) and some self-reported diseases or conditions such as mild depression, heart disease, urinary incontinence, and polypharmacy were strongly associated with FI. Among males, the presence of self-reported conditions such as malnutrition was significantly associated with FI and thus presented a high relative risk index for its occurrence. Self-reported falls in the last 12 months was considered as a tendency to be an associated factor, since this variable did not reach statistical significant difference ($P = 0.059$) (Table II).

**TABLE I. Distribution of Older Adults (%) and Bivariate Analysis (95% Confidence interval - CI) for the Presence of Fecal Incontinence According to Sociodemographics, Symptoms and Clinical Characteristics. SABE Study, São Pau) lo, SP, Brazil, 2010.**

| | | Fecal incontinence | | | | |
|---|---|---|---|---|---|---|
| **Variables** | | **No** | **95%CI** | **Yes** | **95%CI** | ***P*-value** |
| Age groups (years) | | | | | | |
| (n = 986) | 60–69 | 90.3 | 84.5– 94.1 | 9.7 | 5.9–15.5 | 0.0365 |
| | 70–74 | 90.9 | 85.4– 94.5 | 9.1 | 5.5–14.6 | |
| | 75–79 | 90.3 | 85.7–93.5 | 9.7 | 6.5–14.3 | |
| | 80–84 | 83.8 | 77.8–88.5 | 16.2 | 11.5–22.2 | |
| | $\geq$ 85 | 80.4 | 71.9–86.8 | 19.6 | 13.2–28.1 | |
| | Total | 88.7 | 85.9–90.9 | 11.3 | 9.1–14.1 | |
| Gender | | | | | | |
| | Female | 86.8 | 83.4–89.6 | 13.2 | 10.4–16.6 | 0.0133 |
| | Male | 91.7 | 88.1–94.2 | 8.3 | 5.8–11.9 | |
| Self-reported health status | | | | | | |
| (n = 943) | Very good/good | 92.1 | 88.8–94.5 | 7.9 | 5.5–11.2 | 0.0003 |
| | Fair | 88.8 | 85.2–91.5 | 11.2 | 8.5–14.8 | |
| | Bad/very bad | 76.7 | 64.8–85.5 | 23.3 | 14.5–35.2 | |
| | Total | 89.2 | 86.4–91.4 | 10.8 | 8.6–13.6 | |
| Diabetes mellitus | | | | | | |
| (n = 985) | No | 89.9 | 86.8– 92.4 | 10.1 | 7.6– 13.2 | 0.0693 |
| | Yes | 84.7 | 78.4– 89.4 | 15.3 | 10.6–21.6 | |
| | Total | 88.7 | 85.9–90.9 | 11.3 | 9.1–14.1 | |
| Anemia | | | | | | |
| (n = 981) | No | 90.2 | 87.4– 92.5 | 9.8 | 7.5–12.6 | 0.004 |
| | Yes | 81.7 | 74.4–87.3 | 18.3 | 12.7–25.6 | |
| Heart disease | | | | | | |
| (n = 985) | No | 89.5 | 86.3– 92.1 | 10.5 | 7.9–13.7 | 0.1341 |
| | Yes | 86.2 | 82.0–89.6 | 13.8 | 10.4–18.0 | |
| | Total | 88.6 | 85.9–90.9 | 11.4 | 9.1–14.1 | |
| Pain | | | | | | |
| (n = 983) | No | 91.2 | 88.5–93.3 | 8.8 | 6.7–11.5 | 0.0001 |
| | Yes | 84.1 | 79.4– 87.8 | 15.9 | 12.2–20.6 | |
| | Total | 88.9 | 86.1–91.2 | 11.1 | 8.8–13.9 | |
| Symptoms of Depression | | | | | | |
| (n = 845) | Normal | 91.2 | 88.6– 93.3 | 8.8 | 6.7–11.4 | 0.0000 |
| | Mild | 88.1 | 81.7– 92.5 | 11.9 | 7.5–18.3 | |
| | Severe | 55.6 | 33.9–75.3 | 44.4 | 24.7–66.1 | |
| | Total | 89.9 | 87.4–91.9 | 10.1 | 8.1– 12.6 | |
| Falls within last year | | | | | | |
| (n = 985) | No | 91.8 | 89.1– 93.9 | 8.2 | 6.1–10.9 | 0.0000 |
| | Yes | 81.4 | 75.9–85.8 | 18.6 | 14.2–24.1 | |
| | Total | 88.6 | 85.9–90.9 | 11.4 | 9.1– 14.1 | |
| Urinary Incontinence (ICIQ-SF# Final Score) | | | | | | |
| (n = 983) | 0 | 93.7 | 91.3–95.4 | 6.3 | 4.6–8.7 | 0.0000 |
| | 3–21 | 75.4 | 68.8–81.0 | 24.6 | 19.0–31.2 | |
| | Total | 88.8 | 86.1–91.0 | 11.2 | 9.0–13.9 | |
| Urinary tract infection | | | | | | |
| | No | 89.7 | 86.7– 92.1 | 10.3 | 7.9–13.3 | 0.0024 |
| | Yes | 80.5 | 73.1–86.1 | 19.5 | 13.9–26.9 | |
| | Total | 88.6 | 85.8–90.9 | 11.4 | 9.1–14.2 | |
| Weight loss within last year | | | | | | |
| | No | 91.1 | 88.0–93.4 | 8.9 | 6.6–12.0 | 0.0137 |
| | 1–3 kg | 85.1 | 76.0– 91.2 | 14.9 | 8.8–24.0 | |
| | >3 kg | 81.5 | 73.2–87.7 | 18.5 | 12.3–26.8 | |
| | Total | 89.0 | 86.3–91.3 | 11.0 | 8.7–13.7 | |
| Malnutrition | | | | | | |
| (n = 958) | Good/fair | 90.4 | 87.6–92.6 | 9.6 | 7.4–12.4 | 0.0000 |
| | Bad/not fair | 72.2 | 60.6–81.4 | 27.8 | 18.6–39.4 | |
| | Total | 89.0 | 86.3–91.3 | 11.0 | 8.7–13.7 | |
| Polypharmacy | | | | | | |
| (n = 986) | 0–4 drugs | 91.8 | 88.3–94.3 | 8.2 | 5.7–11.7 | 0.0019 |
| | $\geq$5 drugs | 85.0 | 81.5–88.0 | 15.0 | 12.0–18.5 | |
| | Total | 88.7 | 85.9–90.9 | 11.3 | 9.1–14.1 | |
| Functional status | | | | | | |
| (n = 986) | | | | | | |
| BADL* | 0 | 92.7 | 89.9– 94.8 | 7.3 | 5.2–10.1 | 0.0000 |

(*continued*)

**TABLE I. (*Continued*)**

| Variables | | Fecal incontinence | | | | |
|---|---|---|---|---|---|---|
| | | No | 95%CI | Yes | 95%CI | *P*-value |
| | 1 | 87.3 | 80.4–92.0 | 12.7 | 8.0–19.6 | |
| | ≥2 | 75.6 | 67.5–82.3 | 24.4 | 17.7–32.5 | |
| | Total | 88.7 | 85.9–90.9 | 11.3 | 9.1–14.1 | |
| IADL** | 0 | 93.9 | 91.3–95.7 | 6.1 | 4.3–8.7 | 0.0000 |
| | 1 | 88.7 | 82.5–92.9 | 11.3 | 7.1–17.5 | |
| | ≥2 | 77.7 | 71.9– 82.7 | 22.3 | 17.3–28.1 | |
| | Total | 88.7 | 85.9–90.9 | 11.3 | 9.1–14.1 | |

# ICIQ-SF Final Score: International Consultation on Incontinence Short Form Final Score.

* BADL, basic activities of daily living.

** IADL, instrumental activities of daily living.

## DISCUSSION

In this study, the prevalence of FI among the older population ranged from 8.3% for males to 13.2% for females and was reported by 11.3% of the population for both genders. These figures are in line with the prevalence of FI reported in developed countries, such as the USA. Community-based US prevalence data suggest that FI affects an estimated 8.3% of the population, or approximately 20 million adults.[3] In the US, the prevalence of FI ranges from 7 to 15% in community-dwelling men and women.[12,13] In contrast, a recent study by Gouveia Santos et al. on the prevalence of FI in Brazil reported a rate of 3.6% for both genders (4% for females and 3% for males). These rates are lower than those found in our study; however, this is probably due to the questionnaire characteristics employed and/or the differences in the age of the target population (mean age of 40.6 years) compared to the older population in the present study.[14]

Identifying associated factors for FI is challenging because most studies that attempt to delineate these factors are limited by their cross-sectional designs as well as the wide variation in the tools used to assess and diagnose the condition. Despite these challenges, several associated factors for FI have been identified across many multivariate analyses including being female, increasing age, higher body mass index (BMI), limited physical activity, smoking, presence of neuropsychiatric conditions, higher vaginal parity and history of obstetrical trauma, presence of chronic diarrhea and irritable bowel syndrome, and history of rectal surgery, prostatectomy, or pelvic radiation. Many of these determinants affect colonic motility and stool transit and are thought to contribute to the development of FI.[15]

**TABLE II. Poisson Regression for the Presence of Fecal Incontinence and Confidence Intervals (95%) for Both Genders, According to Sociodemographic, Clinical, and Functional Characteristics of the Elderly People in the Municipality of São Paulo, SP, Brazil. SABE Study, 2010.**

| Variables | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | IRR# | SD | 95%CI | IRR# | SD | 95%CI |
| Age group (years) | | | | | | |
| 60–69 (Reference) | | | | | | |
| 70–74 | 0.65 | 0.49 | 0.15–2.93 | 0.52* | 0.16 | 0.27– 0.99 |
| 75–79 | 0.28 | 0.41 | 0.02– 5.23 | 0.94 | 0.44 | 0.36– 2.40 |
| 80–84 | 0.52 | 0.49 | 0.08– 3.42 | 1.03 | 0.38 | 0.49–2.17 |
| ≥ 85 | 1.07 | 0.75 | 0.26– 4.35 | 0.83 | 0.48 | 0.26– 2.67 |
| Diabetes | 1.09 | 0.62 | 0.35– 3.36 | 1.36 | 0.44 | 0.71– 2.62 |
| Self-reported health | | | | | | |
| Fair | 0.71 | 0.45 | 0.20– 2.48 | 0.84 | 0.33 | 0.38– 1.85 |
| Bad/very bad | 0.98 | 0.93 | 0.15–6.47 | 0.66 | 0.66 | 0.23– 1.88 |
| Heart disease | 0.95 | 0.50 | 0.33–2.73 | 0.52* | 0.13 | 0.31– 0.86 |
| Anemia | 0.99 | 0.58 | 0.31–3.18 | 1.11 | 0.48 | 0.46– 2.66 |
| Pain | 0.76 | 0.55 | 0.18–3.19 | 1.44 | 0.41 | 0.81– 2.54 |
| Symptoms of Depression | | | | | | |
| Mild | 0.93 | 0.73 | 0.19– 4.49 | 0.31* | 0.15 | 0.11–0.84 |
| Severe | 0.58 | 0.83 | 0.03– 10.11 | 1.60 | 1.16 | 0.38– 6.76 |
| Falls within last year | 2.92 | 1.62 | 0.96– 8.85 | 1.57 | 0.46 | 0.88– 2.82 |
| Urinary Incontinence (ICIQ-SF Final Score) | 2.00 | 1.42 | 0.49– 8.23 | 3.64** | 1.40 | 1.68– 7.85 |
| Urinary Tract Infection | 1.64 | 1.31 | 0.34–8.03 | 1.00 | 0.39 | 0.46– 2.18 |
| Weight loss within last year | | | | | | |
| 1–3 kg | 2.51 | 1.76 | 0.62– 10.18 | 1.87 | 1.39 | 0.42– 8.20 |
| >3 kg | 1.33 | 1.31 | 0.19–9.45 | 1.10 | 0.50 | 0.44– 2.73 |
| Malnutrition | 6.64* | 5.41 | 1.31–33.74 | 1.27 | 0.55 | 0.53– 3.04 |
| Functional status | | | | | | |
| BADL* | | | | | | |
| 1 | 0.62 | 0.46 | 0.14–2.68 | 1.90 | 0.68 | 0.93–3.89 |
| ≥2 | 0.83 | 0.90 | 0.10–7.17 | 0.91 | 0.40 | 0.38–2.18 |
| IADL** | | | | | | |
| 1 | 1.41 | 0.95 | 0.37–5.41 | 2.17 | 0.97 | 0.88–5.29 |
| ≥2 | 0.56 | 0.33 | 0.17– 1.83 | 2.36 | 1.20 | 0.85–6.54 |
| Polypharmacy | | | | | | |
| ≥ 5 | 0.75 | 0.45 | 0.23–2.49 | 2.33* | 0.87 | 1.10–4.92 |

BADL, basic activities of daily living; IADL, instrumental activities of daily living; SD, Standard Deviation.

#Adjusted IRR (95% CI) = Incidence Rate Ratio (95% confidence interval) adjusted using the logistic regression (Poisson regression) final model, one by one for all variables.

*$P \leq 0.05$.**$P \leq 0.001$.

In a cross-sectional study in Korea, Kang et al. assessed a total of 1,149 subjects and reported an overall prevalence of FI of 6.4% without gender differences. From the total of subjects with FI, most of them (78.4%) had mild FI. In a multivariate analysis, old age, watery stool, and functional diarrhea were found to be independent predictors for FI.[16]

Through lifetime, men and women are exposed to different risk factors for pelvic floor dysfunction. Childbirth-related pelvic floor injury for women and prostate cancer treatment for men are known risk factors and therefore different genders may experience different rates of UI and FI. With aging, decompensating medical conditions such as diabetes mellitus, stroke, and cognitive and mobility impairment, appear to influence incontinence more strongly than direct pelvic floor injury. This is most evident in the observation that older men and women experience similar rates of FI despite the unique potential in women for anal sphincter trauma with vaginal delivery.[17]

Indeed, our study revealed some factors associated with FI from final model of multivariate analysis for both male and female subjects.

In general, advancing age and decompensating medical condition such as mild depression and heart disease were consistently associated with the development of FI. Moreover, the strongest associations were malnutrition, urinary incontinence, and polypharmacy. All of associated factors found in our study but age are considered modifiable. So, primary healthcare provider or specialist doctor should consider controlling of such factors when managing FI in both genders.

The factor of ''experiencing a fall in the last 12 months'' nearly reached a significant difference; thus, this factor was considered a tendency to be associated with FI. However, experiencing a fall has been well described as an associated and/or risk factor for urinary incontinence.[18] This tendency association is probably due to the fact that both urinary and fecal incontinence share some risk factors, most of which are also associated with pelvic floor dysfunction.

For the male sample population in our study, the only associated factor was malnutrition. Our study is the first to report this associated factor for FI for non- institutionalized patients. Malnutrition was recognized as a factor associated with FI by Shahin et al. who assessed institutionalized patients. In their study, not only sociodemographic data were assessed but also questions regarding incontinence occurrence, duration, and nursing interventions, as well as nutritional status, level of care dependency, and the incidence of pressure ulcers.[19]

The female population in our study presented different factors associated with FI than what have typically been reported in similar studies. When designing the study, we ruled out well-established risk factors, such as obstetric trauma and parity, and instead looked for unreported factors. Multivariate analysis revealed the following associated factors: being 70–74 years old, self-reported heart disease, self-reported symptoms of mild depression, urinary incontinence, and polypharmacy.

Urinary incontinence has been shown to correlate with FI, as up to one-third of female subjects with urinary incontinence have concomitant FI.[2] This association may be stronger for stress urinary incontinence than for urgency urinary incontinence.[19] In our study, urinary incontinence was found to be the strongest associated factor with FI among female individuals.

Displaying symptoms of depression is also a well-known associated and/or risk factor for FI. Halland et al. found independent factors for FI among community-dwelling Australian women that included diabetes mellitus, depression, urinary incontinence, and osteoarthritis.[20]

Although heart disease was found to be an associated factor for FI in our study, Nelson et al. described heart disease as a non-associated factor with FI in nursing home patients.[21] However, the explanation of this association is not clear and requires more research to confirm this finding.

Polypharmacy is a common practice among older people, but this practice can lead to additional problems. Among older adults, 30% of hospital admissions and many preventable problems, such as falls and confusion, are believed to be related to adverse drug effects.The occurrence or aggravation of lower urinary tract symptoms in geriatric patients may be caused by medication, especially in cases where the symptom is newly diagnosed. Furthermore, geriatric patients, in particular, are at an increased risk for adverse effects of medications commonly used for treatment of urinary incontinence itself. For instance, anti-muscarinic drugs can lead to several complex anticholinergic adverse effects, such as delirium. Therefore, the discovery of inappropriate medication use and the knowledge of possible related adverse events to this drug use are important in diagnostic evaluation and therapeutic considerations to prevent a cascade of symptom-related medication use.[22] Here, we are the first to report that polypharmacy is strongly associated with FI. Polypharmacy and certain medications contribute to falls in many patients and can be a modifiable factor.[23]

Therefore, the information presented in this study highlights the importance of understanding the complexity of the factors associated with FI.

Strengths of our study include that it was not restricted to specific subgroups of elderly people, of a specific gender, or of specific conditions, such as defined age groups, diabetics, or nursing home patients. The sampling had enough power to make a strong statistical analysis. Furthermore, the information was collected with a pre-tested and validated questionnaire by trained collaborators. Our data are generalizable because of the stringent epidemiologic methodology applied. On the other hand, the SABE Study assessed only non-institutionalized adults, which may limit the generalizability of these results to other groups. Potential limitations include the design of a cross-sectional study, where the causal relation is not clear. Furthermore, the original SABE Study has used some measures that were not validated in Portuguese so far, and mixing risk factors with associated factors in the same model.

## CONCLUSION

In our study, we found that FI affects approximately 11% of the elderly population in Sao Paulo, and its occurrence is related to both age and gender. FI was more prevalent in female (13.2%) than in male (8.3%) and increased in prevalence with advancing age. Among the female population surveyed, heart disease and polypharmacy were two associated factors for FI discovered in our study, which have not been previously described. The shame and embarrassment associated with FI often results in patients not reporting this condition spontaneously. Therefore, it is important for physicians to be aware of the symptoms and factors associated with FI to provide their patients with counseling and treatment options. In addition, it is important understand the associate factors with FI to implement prevention strategies to combat this condition.

## ACKNOWLEDGMENTS

We acknowledge the academic team composed by Letícia A. Pallone, Juliana Milhomem Tamanini and Patrícia Pelegrina Rosseto for their technical assistance and support.

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