**Anal and urinary incontinence in nulliparous women – prevalence and associated risk factors**

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**Abstract**

**Objective:** To establish the prevalence and risk factors of urinary (UI) and anal incontinence (AI) in nulliparous women.

**Study design:** Thirty-one catholic convents were sent a validated questionnaire to determine the prevalence and severity of UI, and a similarly structured questionnaire to assess AI. Multivariable regression models were used to determine independent risk factors associated with the likelihood of UI or AI.

**Main outcome measures:** Urine/faecal/flatal incontinence and symptom severity

**Results:** Of 202 nuns, 167 (83%) returned the questionnaire. Twenty-two women were excluded due to history of childbirth. Of 145 nulliparous women, 56.2% reported UI and 53.8% reported AI. Women aged 66-76 had significantly increased odds of experiencing UI in comparison to women 40-65: OR 2.35 [95% CI 1.02-5.45] (p=0.04). The risk of UI was increased in women with a BMI ≥30 in comparison to those with a BMI <19: OR 6.25 [95% CI 1.03-38.08] p=0.04). With regards to AI, although none of the differences with age and BMI groups reached statistical significance, there was a trend towards women in higher BMI groups having an increased incidence of AI. Current/previous HRT was also associated with significantly increased odds of experiencing UI:OR 2.53 [95%CI 1.01-6.36], (p=0.04). However, when adjusting for age and BMI, there was no significant association with UI.

**Conclusions:** This study highlights that while childbirth is an important risk factor, UI and AI also occur in over 50% of nulliparous women. Additional studies are required to identify other risk factors that may be associated with incontinence in this population.

**Introduction**

Urinary incontinence (UI) is defined as “the involuntary loss (leakage) of urine” 1, and anal incontinence (AI): ‘the involuntary loss of faeces or flatus” . 2 Both are a physical and psychological distressing problem for women, which can negatively affect their quality of life. 3,4 Globally, the reported prevalence of UI is between 16.2- 81.9% 5 and it increases with age. 6 Whilst the reported prevalence of AI ranges between 14.7-21.6%, the rates also significantly increase with age. 7 A large population based study of 100,000 women identified risk factors associated with UI including increasing age, body mass index (BMI), smoking, diabetes mellitus and parity. 8 Whilst, the reported risk factors associated with the development of AI include UI, advanced age, menopause, pelvic surgery including hysterectomy and pelvic floor repair, faecal urgency, irritable bowel syndrome and parity. 7

Obstetric risk factors are well defined in the literature, with parity being shown to increase the risk of UI by 67% 8, and AI by 10%. 7 Moreover, vaginal birth in comparison to caesarean section increases the risk of UI by 75% 9 and AI by 65%.10 Proposed attributing factors include the resulting injury to the pelvic floor including the levator ani, anal sphincter complex, connective tissue and adjacent neurovascular structures. 11 In addition, it is hypothesised that the hormonal changes experienced during pregnancy affect collagen and so the tensile strength of the pelvic floor muscles and bladder neck. 11 A systematic review evaluated the prevalence of UI in nulliparous females aged 14-45 years, adjusting for the risk factors of advanced age and pregnancy. 12 The average prevalence of UI was found to be 20.1% (range 1-42.2%) and BMI was identified was a risk factor. Other potential risk factors included sexual activity, anxiety, depression, constipation, childhood enuresis and high impact exercising. 12 With regards to AI, after adjusting for relevant medical comorbidities such as previous bowel or pelvic floor surgery, the prevalence of AI has been reported to be similar in nulliparous and parous women. 13 However, the parous women in the study by van Meegdenburg et al were older and had an increased BMI. 13

Yet there is paucity of data regarding associated risk factors and prevalence of UI and AI in older nulliparous women. In a postmenopausal and nulliparous population in the United States of America (USA), UI prevalence was estimated to be 50% with BMI, recurrent urinary tract infections and depression, being independent risk factors but not age. 14 However, no studies investigating AI in older nulliparous women alone have been undertaken to date. The aim of this study was to establish the prevalence and risk factors for both UI and AI in women, excluding the major risk factors of pregnancy and childbirth, by using a cross sectional survey of nulliparous nuns based in the United Kingdom (UK).

**Methods**

All catholic convents in mainland UK were identified and invited by letter to take part in the study. An anonymous self-administered postal questionnaire was sent to all nuns, living in the convents that agreed to participate. Nuns who were nulliparous were eligible for inclusion. We collected demographic data, previous gynaecology history including menopausal status, hormonal replacement therapy use (HRT- local or systemic), gynaecology surgery, incontinence surgery, and information on UI and AI. Information on UI was collected by using a validated questionnaire as previously described by Hannestad et al in the EPICONT Study.15 Urinary incontinence was defined as any leakage of urine. We assessed UI severity using a validated score developed by Sandvik et al. 16 This was calculated by multiplying the reported amount and frequency of urine loss. The calculated severity index ranged from 1 to 8 and is further categorised into slight (1-2), moderate (3-4), and severe (6-8) UI. A similarly structured questionnaire was created to assess AI. Faecal incontinence was defined as any involuntary leakage of stool, and flatal incontinence as any involuntary loss of wind. Anal incontinence was defined by all women who either answered yes to both leaking faeces and wind and to those that only leaked one or the other. Women who reported that they leaked faeces/flatus were asked the frequency of leakage, with response categories of: < once a month, ≥ once per month, ≥ once per week and every day and/or night. In addition, women were also asked “How do you experience your leakage problem?”, with response categories of: no problem, a small nuisance, some bother, much bother, a major problem”. The South East Multi-Centre Research Ethics Committee reviewed the study protocol and agreed ethical approval by a research ethics committee was not required. However, permission was obtained from the Mother Superiors of all respected convents.

Data was analysed using SPSS version 26.0.0.0. Descriptive analysis was used to describe variables. Nominal data is presented as number (N) and percent. For continuous data, the mean and standard deviation (SD) was calculated. For analysis, three body mass index (BMI) groups were defined: low BMI values (< 19), normal BMI values (19 - 29), and high BMI values (≥ 30). Age was also categorized into three groups: 40 – 65 years, 66 – 76 years, and 77 years and older. Incontinence of faeces and flatus were analysed together as AI. Univariate analysis was carried out to compare factors including age, BMI, menopausal status, HRT use and previous pelvic/vaginal surgery between women with or without incontinence. Chi-square test was used to analyse categorical data and the independent samples t-test was used for continuous data. A *p*-value <0.05 was considered statistically significant. Multivariate analysis was carried out through binominal logistic regression and ordinal logistic regression, including all variable at a significance level p <0.05, calculating the odds ratios (ORs) and the corresponding 95% confidence intervals (CIs). With ordinal logistic regression, the calculated coefficients were exponentiated to obtain adjusted odds ratios (aOR) and the corresponding 95% CI. In all multivariate models we adjusted for the confounding effect of age and BMI.

**Results**

Of the 177 convents, 87 replied and 31 (17.5%) agreed to take part in the survey. Two hundred and two questionnaires were sent out, of which 167 (83%) were returned. Twenty-two women reported to previously bearing children and therefore were excluded from the analysis. Data of 145 nulliparous nuns were used for analysis. The mean age was 71 (SD ±12) years (range 41-100) and the mean BMI was 25 (SD ±5.2). Data for age and BMI were missing in 7.6 % (n=11) and 20.0% (n=29) respectively. None of the participants were smokers. Ninety five percent were postmenopausal and 21% had previously or were currently using HRT. Thirty-eight women (26%) had undergone pelvic surgery and of these 23 (16%) included hysterectomy. Only 6 (4%) had undergone urinary incontinence surgery, four of these were specified as ‘bladder stretch’ (Table 1).

The overall prevalence of UI was 56.2% (95% CI 48.1-64.2). Of the 88 women with a history of UI, the most frequently reported type of incontinence was SUI (42.0%) Incontinence type was not specified in four (4.5%) women. In 10.2% of women (n=9), UI severity was classified as severe and the impact of UI (the extent the woman thought of her leakage as a problem) was reported as more than “a small nuisance” in 32.2% (n=28) (Table 1). With AI, the overall prevalence was 53.8% (95% CI 42.7-64.9) with the most common sub-type being reported flatal incontinence alone (71.8%). The impact of AI was reported as more than “a small nuisance” in 35.1% (n=27) of women.

Table 3 describes the prevalence of UI and AI based on three age group categories 40 – 65 years, 66 – 76 years, and ≥ 77 years. With respect to UI, this was greatest in women aged 66-77: 71.6% (95 % CI 58.6-84.7). However, although the prevalence of AI was similar across all age groups, the prevalence of faecal incontinence specifically was greatest in women ≥77 (22.7% [95%CI 10.3-35.1]). Univariate analyses are shown in Table 4, comparing factors including age, BMI, menopausal status, HRT use and previous pelvic/vaginal surgery between women with or without incontinence. Those with UI had a significantly higher BMI (26.3 vs 24.4 kg/m2, p=0.04). Also, significantly more women with a history of UI had a history of previous/current HRT use in comparison to those without UI (76.7% vs 23.3%, p=0.04). No differences were found when analysing AI.

Of the 88 women with UI, 56 (63.6%) also had AI. Of the 78 women with AI, 22 (28.2%) did not report UI and 32 (36.4%) of women with UI did not report AI. Overall, the odds of experiencing both urinary and anal incontinence was 2.78 (95% CI 1.4-5.54) (p=0.01). The factors which were independently associated with the risk of UI or AI after binary logistic regression are shown in Table 5. After categorising age into three groups, women who were 66-76 had significantly increased odds of experiencing UI in comparison to women aged 40-65: OR 2.35 (95% CI 1.02-5.45) (p=0.04). However, there was no significant difference in UI rates between women ≥77 and those 40-65 years old. In addition, after categorising BMI into three groups; the risk of UI was increased by 6-fold in women with a BMI ≥30 in comparison to those with a BMI <19 (OR 6.25 [95% CI 1.03-38.08] p=0.04). With regards to AI, although none of the differences with age and BMI groups reached statistical significance, women in higher BMI groups (19-29: OR 1.26 [95%CI 0.21-5.3≥30: OR 1.86 [95%CI 0.30-11.50]) had an increased incidence of AI.

The association between age, BMI and the reported severity of UI was evaluated using logistic regression (Table 6). Age was not found to be an independent risk factor associated with the severity of UI. However, BMI was found to be an independent risk factor with the odds of increased UI severity being significantly lower in women with a BMI of 19-29 (aOR 0.03 (95 %CI 0.00-0.43)) (p= 0.01) and ≥30 (aOR 0.03 (95 %CI 0.00-0.41)) (p= 0.01) in comparison to those with a BMI <19. In addition, the odds of reporting a greater impact of bowel symptoms was significantly lower in women with a BMI ≥ 30 (aOR 0.13 (95 %CI 0.02-0.96)) (p= 0.04).

With respect to previous gynaecological history, factors associated with of UI or AI after binary logistic regression are shown in Table 7. Women with a history of current/previous HRT was associated with a 3- fold increase in the odds of experiencing UI (OR 2.53 (95%CI 1.01-6.36) (p=0.04). However, when adjusting for confounding factors including age and BMI, there was no significant association with prior/current HRT use and UI. In addition, there were no significant associations found with other aspects of the gynaecology history and the odds of UI or AI.

**Discussion**

This survey has shown that over 50% of our predominantly postmenopausal, nulliparous population experienced UI or AI. In over 30% of women, these symptoms were bothersome. Although pregnancy and childbirth are established risk factors, this study has highlighted that UI and AI also occur frequently in nulliparous, non-pregnant women. To our knowledge, this is the first study to specifically investigate the prevalence of AI in nulliparous women over the age of 40.

The strength of this study is the use of a validated questionnaire and severity score index to assess UI. 15,16 In addition, the questionnaire response rate for convents that agreed to participate was 83%. However, as this was a self-reported survey, further information surrounding relevant medical history could not be obtained. With respect to anal incontinence, we used similar questions to that used for urinary incontinence by Hannestad et al in the EPICONT Study 15 but it was not a validated questionnaire. In addition, due to missing age and BMI values, data had to excluded from corresponding multivariate analysis.

In our study we used the EPICONT questionnaire. 15 This was validated against a population of 28,000 community dwelling women in Norway with a mean age of 53 years. In this study the prevalence of UI was lower in comparison to our study: 24% in women aged 40 to 44 years, increasing with age to a 40% prevalence in women over 90 years. However, it is important to note that, unlike our study, all women over the age of 20, irrespective of parity were eligible for inclusion. Therefore, the results cannot be directly compared. Gyhagen et al 9 used the EPICONT questionnaire in their matched cohorts of nulliparous and primiparous women delivered vaginally or by caesarean section aged between 40-64. Although the prevalence of UI in their cohort was 20%, in comparison to our study the average age of their study participants was lower (53 vs 71). Pregnancy increased the prevalence of UI to 30%; by contrast, compared to vaginal delivery, caesarean section was associate with a risk reduction of30%. Our data with regards to UI shows similarities with a previously published survey amongst 190 nulliparous nuns in the USA.14 The mean age of this population was 68 years with 97% being postmenopausal. In keeping with our study, 50% of the nulliparous, postmenopausal women were incontinent of urine. However, their cohort had a higher mean BMI (27.3 k/m2 vs 25.0 k/m2) and more reported previous/current HRT use (40% vs 21%). 14

Furthermore, in our study the prevalence of AI was 54% with over 70% admitting to flatal incontinence alone. Pretlove et al completed a systematic review of prospective observational studies, investigating the prevalence of AI according to age and gender.17 Twenty-nine studies were included in their review, of which 20 either reported data for solid and liquid faecal incontinence alone or did not clearly state the inclusion of flatal incontinence.17 The prevalence of faecal incontinence in women over the age of 60 in their systematic review was 6.2%, however, parity was not taken into account. 17 This is much lower than the prevalence of faecal incontinence in our cohort of nulliparous women: 28.2% (2 women reported faecal incontinence in isolation and 20 reported both faecal and flatal incontinence). Although symptom severity with faecal incontinence may be worse than flatal incontinence, the reported prevalence of flatal incontinence is important, as the negative impact on their quality of life experiencing each symptom in isolation has been shown to be similar. 4

With regards to independent risk factors, we identified that when participants were grouped into age categories, being in a higher age group increased the risk of UI.. In addition, increased BMI was associated with UI. It is known that with increasing age, both the ratio of connective tissue to muscle and innervation to the pelvic floor muscles reduces.18,19 Moreover, BMI correlates with intra-abdominal pressure, and a prolonged increase in BMI is hypothesised to lead to neuropathy and weakening of the pelvic floor muscles 20, although there are no neurophysiological studies to support this. UI and AI had been described to often occur concurrently, as they share similar aetiology.11 This may explain why in our study women with UI were three times more likely to experience AI, emphasising the global effect pelvic floor dysfunction can have. In our study, we also found that women who currently or had previously used HRT were almost three times more likely to report UI. However, after controlling for confounding factors including age and BMI this increase was no longer significant. The association between HRT use and UI has been previously reported in the literature. The Nurses’ Health Study (NHS) II 21 found that after adjusting for age, the odds of UI increased by approximately 40% in those currently using HRT in comparison to those who have never used HRT. Overall, the risk factors identified in our study possess some similarities to those published by Buchsbaum et al.14 The authors showed that significantly more nulliparous nuns currently using HRT were incontinent of urine, but after controlling for potential confounding variables, HRT no longer remained a significant risk factor. In addition, although BMI was shown to be an independent risk factor for UI, age was not. It is important to note that that unlike in our study, the prevalence of UI was not compared between different age groups.14

With AI, apart from reported UI, we did not identify any additional independent risk factors. This may be due to the fact that the aetiology of AI is multifactorial and our questionnaire constructed for evaluation of AI did not include questions on potential risk factors described in the literature, such as diabetes, previous anorectal surgery or cholecystectomy.11,22

UI severity can be measured by combining the subjective reported amount and frequency of urine loss: a score validated by Sandvik et al against a 48 hour pad-test.16 In the EPICONT study 15, the severity of UI was shown to increase with age, but the association with BMI was not analysed. Unexpectedly, we found in our cohort that underweight women (BMI <19) were more likely to experience severe UI in comparison to other BMI groups. In addition, that underweight women were more likely to report increased impact of AI symptoms in comparison to those with a BMI ≥30.

In our study the average BMI of women in the underweight category was 17 kg/m2 (range 13-19). A study evaluating UI in women aged 17-40 years with an average BMI of 14 kg/m2(range 13-16) showed that that frequency and severity of UI was associated with longer duration of being underweight.23 Underweight women are often persistently hypo-oestrogenic due to low levels of body fat, 24 and Boos et al 23 hypothesised that their findings may be secondary to this. However, the evidence surrounding the role of oestrogen deficiency in UI and AI is unclear.11

In conclusion, UI and AI are both highly prevalent in postmenopausal, nulliparous women over the age of 40.This study could form the basis for larger cross-sectional studies to identify other risk factors, besides childbirth that may be associated with incontinence in this population.

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None

**Declarations of conflicting interests:**

The Author’s) declare that there is no conflict of interest

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**Table 1:** Questionnaire answers of respondents with urinary incontinence:

|  |  |
| --- | --- |
|  | **Mean (SD)/n (%)** |
| **Age (years)** | 71.3 (12.0) |
| **BMI (kg/m2)** | 25.6 (5.2) |
| **Postmenopausal** | 137 (94.5) |
| **HRT use** | 30 (20.7) |
| **Gynaecology Surgery** | 38 (26.2) |
| **Incontinence Surgery** | 6 (4.1) |
| **Urinary Incontinence (UI)** | 88 (56.2) |
| ***SUI*** | 37 (42.0) |
| ***MUI*** | 14 (15.9) |
| ***UUI*** | 33 (37.5) |
| **Frequency of urine loss** |  |
| ***Less than once a month*** | 33 (37.5) |
| ***Once or more per month*** | 11 (12.5) |
| ***Once or more per week*** | 20 (22.7) |
| ***Every day and/or night*** | 24 (27.3) |
| **Amount of urine lost** |  |
| ***Drops or little*** | 76 (86.4) |
| ***More*** | 12 (13.6) |
| **Severity of UI** |  |
| ***Mild (1-2)*** | 43 (48.9) |
| ***Moderate (3-4)*** | 36 (40.9) |
| ***Severe (6-8)*** | 9 (10.2) |
| **Impact of incontinence\*** |  |
| ***No problem*** | 11 (12.6) |
| ***A small nuisance*** | 48 (55.2) |
| ***Some bother*** | 11 (12.6) |
| ***Much bother*** | 8 (9.2) |
| ***A great problem*** | 9 (10.4) |

\*\* One woman did not complete the question on the impact of urinary incontinence

n=number

SD= standard deviation

SUI- Stress urinary incontinence

UUI- Urge urinary incontinence

**Table 2: Questionnaire answers of respondents with anal incontinence:**

|  |  |
| --- | --- |
|  | **Mean (SD)/n (%)** |
| **Anal Incontinence (AI)** | 78 (53.8) |
| ***Faecal*** | 2 (2.6) |
| ***Flatal*** | 56 (71.8) |
| ***Faecal and Flatal*** | 20 (25.6) |
| **Frequency of faecal loss** |  |
| ***Less than once a month*** | 8 (36.4) |
| ***Once or more per month*** | 1 (4.5) |
| ***Once or more per week*** | 8 (36.4) |
| ***Every day and/or night*** | 4 (22.7) |
| **Frequency of flatal loss\*** |  |
| ***Less than once a month*** | 12 (16.0) |
| ***Once or more per month*** | 15 (20.0) |
| ***Once or more per week*** | 30 (40.0) |
| ***Every day and/or night*** | 18 (24.0) |
| **Impact of AI \*** |  |
| ***No problem*** | 23 (29.9) |
| ***A small nuisance*** | 27 (35.0) |
| ***Some bother*** | 16 (20.8) |
| ***Much bother*** | 5 (6.5) |
| ***A great problem*** | 6 (7.8) |

\*\* One woman with flatal incontinence did not complete the question on the frequency or impact

symptoms

n=number

SD= standard deviation

**Table 3:** Prevalence of urinary and anal incontinence and distribution of sub-types

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Age (years)†** | **Respondents**  **n (%)** | **Prevalence of UI** | | **SUI** | | **UUI** | | **Mixed UI** | | **Prevalence of AI** | | **Faecal incontinence** | | **Flatal incontinence** | |
| % | (95% CI) | % | (95% CI) | % | (95% CI) | % | (95%CI) | % | (95% CI) | % | (95% CI) | % | (95% CI) |
| **40-65**  **(n=52)** | 52 (36.6) | 51.9 | 38.3-65.5 | 25.0 | 13.2-36.8 | 3.8 | -1.4-9.0 | 15.4 | 5.6-25.2 | 53.8 | 40.2-67.4 | 13.4 | 4.1-22.7 | 51.9 | 38.3-65.5 |
| **66-76**  **(n=46)** | 46 (32.4) | 71.7 | 58.6-84.7 | 32.7 | 19.1-46.3 | 10.9 | 1.8-19.9 | 21.7 | 9.8-33.6 | 54.3 | 39.9-68.7 | 10.9 | 1.9-19.9 | 54.3 | 39.9-68.7 |
| **≥77**  **(n=44)** | 44 (31.0) | 59.1 | 44.6-73.6 | 15.9 | 5.1-26.7 | 15.9 | 5.1-26.7 | 31.8 | 18.0-45.6 | 54.5 | 39.8-69.2 | 22.7 | 10.3-35.1 | 52.3 | 37.5-67.1 |

**†**missing data=3

UI- Urinary incontinence

SUI- Stress urinary incontinence

UUI- Urge urinary incontinence

AI- Anal incontinence

**Table 4:** Comparison of women reporting urinary or anal incontinence with those who did not

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **UI**  **(n=88)** | **No UI**  **(n=57)** | p- value | **AI**  **(n=78)** | **No AI**  **(n=67)** | p-value |
| Mean (SD)/ n (%) | Mean (SD)/ n (%) | Mean (SD)/ n (%) | Mean (SD)/ n (%) |
| **Age (years) (n=142) †** | 72.2 (11.6) | 70.0 (13.1) | 0.30 | 71.6 (12.4) | 70.9 (11.5) | 0.74 |
| **BMI (kg/m2) (n=124) †** | 26.3 (5.7) | 24.4 (4.1) | ***0.04*** | 25.3 (4.7) | 25.8 (5.6) | 0.57 |
| ***HRT*** |  | | | | | |
| **Yes (n=30)** | 23 (76.7) | 7 (23.3) | ***0.04*** | 17 (56.7) | 13 (43.3) | 0.84 |
| **No (n=115)** | 65 (56.5) | 50 (43.5) | 61 (53.0) | 54 (47.0) |
| ***Post-menopausal*** |  | | | | | |
| **Yes (n=137)** | 85 (62.0) | 52 (38.0) | 0.17 | 73 (53.3) | 64 (46.7) | 0.73 |
| **No (n=8)** | 3 (37.5) | 5 (62.5) | 5 (62.5) | 3 (37.5) |
| ***Gynaecology Surgery*** |  | | | | | |
| **Yes (n=38)** | 12 (31.6) | 26 (68.4) | 0.26 | 25 (65.8) | 13 (34.2) | 0.08 |
| **No (n=107)** | 45 (42.1) | 62 (57.9) | 53 (49.5) | 54 (50.5) |
| ***Hysterectomy*** |  | | | | | |
| **Yes (n=23)** | 14 (60.1) | 9 (39.1) | 0.99 | 16 (69.6) | 7 (30.4) | 0.10 |
| **No (n=122)** | 74 (60.7) | 48 (39.3) | 62 (50.8) | 60 (49.2) |
| ***UI surgery*** |  | | | | | |
| **Yes (n=6)** | 5 (83.3) | 1 (16.7) | 0.25 | 4 (66.7) | 2 (33.3) | 0.52 |
| **No (n=139)** | 83 (59.7) | 56 (40.3) | 74 (53.2) | 65 (46.7) |

**†** Missing data- Age group (n=3), BMI (n=21)

n=Number

SD= Standard deviation

UI- Urinary incontinence

AI- Anal incontinence

**Table 5:** Association between age and BMI with urinary and anal incontinence using binary logistic regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **UI n=88\*** | | | **AI=78** | | |
| **Age (years)†** | OR | 95% CI | p-value | OR | 95% CI | p-value |
| **40-65**  **(n=52)** | - | - | - | - | - | - |
| **66-76**  **(n=46)** | **2.35** | **1.02-5.45** | ***0.04*** | 0.63 | 0.26-1.49 | 0.29 |
| **≥77**  **(n=44)** | 1.34 | 0.60-3.01 | 0.48 | 0.76 | 0.29-1.99 | 0.58 |
| **BMI (kg/m2) †** |  | | | | | |
| **<19**  **(n=9)** | - | - | - | - | - | - |
| **19-29**  **(n=97)** | 1.85 | 0.47-7.36 | 0.38 | 1.26 | 0.21-5.85 | 0.77 |
| **≥30**  **(n=18)** | **6.25** | **1.03-38.08** | ***0.04*** | 1.86 | 0.30-11.50 | 0.51 |

\*Incontinence type was not specified in 4 women

**†-**Missing data- Age group (n=3), BMI (n=21)

**Table 6:** Association between age and BMI with reported severity and impact of incontinence using ordinal logistic regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Severity of urine loss (n=88)** | | | **Impact of bowel symptoms (n=77) \*** | | |
| **Age (years) †** | aOR | 95% CI | p-value | aOR | 95% CI | p-value |
| **40-65** | - | - | - | - | - | - |
| **66-76** | 2.67 | 0.84-8.39 | 0.09 | 0.70 | 0.21-2.30 | 0.56 |
| **≥77** | 1.48 | 0.56-3.94 | 0.43 | 1.47 | 0.52-4.13 | 0.46 |
| **BMI (kg/m2) †** |  | | |  | | |
| **<19** | - | - | - | - | - | - |
| **19-29** | **0.03** | **0.00-0.43** | ***0.01*** | 0.21 | 0.02-1.98 | 0.18 |
| **≥30** | **0.03** | **0.00-0.41** | ***0.01*** | **0.13** | ***0.02-0.96*** | ***0.04*** |

\* 1 woman did not complete the question on the impact of bowel symptoms

† Missing data: Age (n=1), BMI (n=7)

aOR- Adjusted odds ratio

95% CI- 95% Confidence Interval

**Table 7:** Association of gynaecology history with urinary and anal incontinence using binary logistic regression

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **UI n=88** | | | | | | **AI=78** | | | | | |
| OR | 95% CI | p-value | aOR | 95% CI | p-value | OR | 95% CI | p-value | aOR | 95% CI | p-value |
| **Menopause**  **n= 137** | 1.76 | 0.21-14.91 | 0.60 | 1.76 | 0.21-14.91 | 0.60 | 0.34 | 0.03-3.83 | 0.38 | 1.21 | 0.19-7.55 | 0.84 |
| **HRT**  **n= 30** | **2.53** | **1.01-6.36** | ***0.04*** | 2.37 | 0.71-10.19 | 0.15 | 0.96 | 0.38-2.41 | 0.93 | 1.16 | 0.52-2.60 | 0.72 |
| **Gynaecology Surgery**  **n= 38** | 1.57 | 0.72-3.44 | 0.26 | 1.43 | 0.61-3.34 | 0.41 | 1.71 | 0.76-3.87 | 0.20 | 1.96 | 0.91-4.23 | 0.09 |
| **Hysterectomy**  **n= 23** | 1.01 | 0.41-2.51 | 0.99 | 0.94 | 0.35-2.55 | 0.90 | 2.09 | 0.74-5.90 | 0.17 | 2.21 | 0.85-5.76 | 0.10 |
| **UI surgery**  **n=6** | 3.37 | 0.38-29.65 | 0.27 | 2.60 | 0.28-24.41 | 0.40 | 1.21 | 0.19-7.55 | 0.84 | 1.21 | 0.19-7.55 | 0.84 |

aOR- Adjusted odds ratio

95% CI- 95% Confidence Interval

UI- Urinary incontinence

AI- Anal incontinence