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Review article

# The prevalence of urinary incontinence in nulliparous adolescent and middle-aged women and the associated risk factors: A systematic review

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ABSTRACT

Urinary incontinence (UI) has been defined as the complaint of involuntary loss of urine. There is a general belief that UI is experienced almost exclusively by the elderly and women who have given birth. However, epidemiological studies report that young women who are nulliparous also experience UI. The aim of this study was to systematically review studies investigating the prevalence of UI in nulliparous adolescent and middle-aged women and to provide an overview of risk factors associated with UI. The electronic databases PubMed, EMBASE, CINAHL, and Cochrane Library were systematically searched for eligible studies. Inclusion and exclusion criteria were defined a priori. The selected studies were reviewed and data extraction was carried out by the reviewers. Two independent researchers assessed the quality of the included studies. Eighteen studies were included in this systematic review. UI prevalence estimates varied from 1% to 42.2%. Among the women with UI of any type, 12.5% to 79% had stress urinary incontinence. BMI, childhood enuresis, and high-impact exercising were found to be the main associated risk factors. Understanding the effect of the risk factors on the pelvic floor will enable us to implement preventive strategies and advise appropriately on the prevention of UI.

## 1. Introduction

Urinary incontinence (UI) has been defined as the complaint of involuntary loss of urine and is a worldwide entity with a prevalence of 13.9% in males and 51.1% in females [1,2].

It is a general belief that UI is associated almost exclusively with the elderly and women who have given birth. However, epidemiological studies report that younger women who are nulliparous, also experience UI episodes, with the risk factors unknown.

UI negatively affects the quality of life due to feelings of embarrassment, fear of odour and distress leading women to distance themselves from social and recreational activities [3,4].

Despite the high prevalence and its life impact, UI remains a taboo issue and few affected women seek help [5,6]. The economic cost of UI is also substantial. In the United States each patient pays on average over $900 per year on resources used for “routine care”, such as absorbent pads, diapers, protection and laundry [7].

The prevalence of UI has previously been reported by many studies, however, these referred to both parous and nulliparous women. An accurate estimation of UI prevalence in nulliparous women as well as the identification of the associated risk factors will help to further raise awareness of the problem, and could ultimately lead to the prevention of UI in young women. Furthermore, valid UI prevalence measures may improve the accuracy of sample size calculation in future studies.

This is the first systematic review which investigated the prevalence of UI only in nulliparous women, excluding the main risk factors of pregnancy, delivery, and advanced age.

The aim of this study was to systematically review studies investigating the prevalence of UI in nulliparous adolescent and middle-aged women, and to provide an overview of risk factors associated with UI.

## 2. Methods

### 2.1. Study design

This systematic review was carried out in accordance to the 27-item PRISMA statement for Reporting Systematic Reviews and Meta-Analyses [8].

### 2.2. Literature search

A search of the literature was performed for the identification of eligible studies using the following electronic databases: MEDLINE (via

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PUDMED), CINAHL (via EBSCO), EMBASE (via OVID), and Cochrane Library. The following databases were utilised to search for relevant articles from their inception to January 2016. A variety of keywords were used to search for relevant articles. The following search terms were used: urinary incontinence; leakage; pelvic floor; urine dysfunction; prevalence; epidemiology; nulliparous; nulligravid; female; and women. Filters were used only to report studies with human subjects. Logic Boolean functions were used to establish the search algorithm. In addition; truncation was used to capture the variations. The electronic search was then supplemented by manual searches of the reference lists of these articles to avoid missing any relevant publication. Also; a search of Google Scholar was conducted for the identification of further relevant papers.

### 2.3. Eligibility criteria

Specific criteria were applied to the articles to ensure the studies used were relevant and of a high quality. Studies were included if: (1) the study reported the UI prevalence on the observed sample as an outcome measure; (2) the study sample included nulliparous women younger than 45 years old; (3) the study was an original primary study; any other form was excluded. No restrictions on the language were applied. Non-English language publications were translated.

In the case of a mixed study population, the study authors were contacted and asked for split results, and only the findings of the nulliparous were recorded and included. In the instance of incomplete information in potentially relevant studies, the authors were also contacted. When an author did not respond, or presented an inability to provide the relevant data, the study was excluded.

Studies that have included women who were older than 45 but premenopausal, were also included.Studies that included participants with neurological diseases or nulliparous pregnant women were excluded. Any review type study, case report, or current concepts were excluded. The studies had to evaluate and present the prevalence of UI (of any UI type). Studies focusing on female athletes or soldiers were excluded, as our focus group was the general female population; and also a previous systematic review had already been conducted focused on female athletes.

As the general female population are defined all those women without reference to any specific characteristic.

Abstracts from conferences were not reviewed for inclusion because of their limited availability in the electronic databases.

### 2.4. Study selection

Initially, the titles and abstracts were screened by the two reviewers (**SA**) (**AB**) independently. The papers were identified based on the relevance of the study in relation to the type of population (nulliparous women), the study aim, and findings in the title and abstract. Full text copies were obtained for the selected studies to assess for eligibility and the reference lists were scanned for further relevant articles. Duplicate articles were excluded. Any disagreements that arose between the reviewers were resolved through discussion.

### 2.5. Data extraction and synthesis

Data extraction was carried out by the two reviewers (**SA**) (**AB**) independently, using a predesigned and standardised form to record information, and the findings of each study.

### 2.6. Quality assessment

The methodological quality assessment of the included prevalence studies conducted by using the “Guidelines for critical appraisal for the health research literature: prevalence or incidence of a health problem” as proposed by Loney et al. [9].

This tool includes eight items and each item received 1 point. The available answers for this tool are “Yes” (1 point) and “No” (0 points). When there was insufficient information in the article to permit a judgment for an item, then the item was scored with “No” (0 points). Further details are given for each item to help guide assessment.

Each article was evaluated and scored according to eight criteria: (i) the study design and sampling method − this item was considered adequate if the study design was an observational type of study; (ii) sampling frame − considered adequate if the sampling frame was unbiased; (iii) sample size was n > 100; (iv) appropriate tool used for measurement of the prevalence of UI (valid questionnaire); (v) outcomes measure – considered adequate when the prevalence outcome was measured objectively in an unbiased fashion; (vi) response rate – the item received 1 point only if the response rate was greater than 70%; (vii) results accepted if the estimates prevalence were given with confidence intervals; (viii) study subjects – accepted if the study subjects and setting described in detail are similar to those of interest to this review.

The quality scores ranged from 0 to 8 points. Studies were classified as having as low quality when the score was less than 4 points, moderate quality when the score was 4–6, and high quality when the score was 7–8.

## 3. Results

The included articles were selected independently by the two authors (**SA** and **AB),** based on the inclusion and exclusion criteria.

The databases identified 746 results. After removing the duplicates and irrelevant studies to the research topic based on their titles and abstracts, the results were limited to 20. Two potential studies were excluded because the authors did not respond with further information regarding the parity status (nulliparous or parous) of their participants.

A total of eighteen studies were included in this review as presented in Table 1. Fig. 1 shows the selection process of articles.

### 3.1. Characteristics of the included studies

Eighteen studies were included and analysed in this systematic review. Fourteen studies were comprised of only nulliparous women [10,13–15,17–22,24–27], and four studies were composed of a mixed sample with nulliparous and parous women [11,12,16,23]. In all these studies the prevalence was reported separately. The number of the nulliparous women in the included studies ranged from 19 to 1936 participants.

The studies were conducted in the following countries: Portugal, Italy, China, Malaysia, France, Netherlands, Sweden (2), Norway, Australia (2), Canada, Brazil (2), Denmark, Iceland, and USA (2). The age of the participants ranged from 14 to 50 years old.

All studies used questionnaires as outcome measures to record the UI prevalence (Table 1).

With the exception of one study in French and one in Icelandic, the included studies were in English. The female participants were collected from high schools, universities, town communities’ areas, family clinics, maternity clinics, hospitals, residential buildings, banks, beauty centers and gyms.

### 3.2. Methodological quality

All the studies were assessed using the Loney et al. quality assessment [9]. The studies had scoring that ranged between 3 and 7. The quality of the studies considered 3 studies as low quality, 13 as moderate, and 2 high (Table 2). Disagreements were resolved by discussion between the two reviewers.