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Effective Factors on Urinary Incontinence in Natural Menopausal Women

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Background: Urinary tract infections and urinary incontinence are common urogenital problems affecting 7 - 10% of menopausal women.
Objectives: The primary objective of this study was to quantify effective factors on urinary incontinence in a cohort of menopausal women.
Patients and Methods: A sample of 150 menopausal women (natural menopause for at least 12 months) were recruited from 13 healthcare centers in Ilam, Iran. Data regarding diagnosis, medical history and clinical symptoms were collected using a structured questionnaire and screening patient medical records. Logistic regression models were used to examine associations between urinary incontinence and other variables.
Results: Multiple atrophic urogenital changes were identified including vaginal dryness (42%), decreased libido (41.3%), dyspareunia (16%), vaginal itching (11.3%) and vaginal discharge and burning (10.7%). The prevalence of urinary frequency, stress urinary incontinence, nocturia and urge urinary incontinence were 33.3%, 28.7%, 22.7% and 17.3%, respectively. A multivariate logistic model found that urinary infection (OR 5.6; 95% CI: 2.6 - 11.58), cystocele (OR 1.73; 95% CI: 1.29 - 2.33) and rectocele (OR 1.47; 95% CI: 1.20 - 1.80) were potential risk factors for incontinence. A significant association was observed between marital status and vaginal atrophy, body mass index and urinary incontinence and parity type and urinary incontinence ($P < 0.05$ for all).
Conclusions: Multiple associations existed between atrophic urogenital changes and urinary incontinence. The most significant interaction was between urinary tract infections and urinary incontinence in menopausal women, with urinary tract infections increasing the risk of incontinence by 5.6 fold. We recommend health professionals to focus on early screening of these issues and implement educational programs for women as part of standard practice.

Keywords: Menopause; Urinary Incontinence; Urinary Tract Infections; Women

1. Background

Menopause is a natural event normally occurs in women aged 45 - 55 (1) where her body undergoes transformations consequently leading to infertility (2). Menopause is defined as cessation of menstruation (amenorrhoea) for a period of 12 months due to loss of ovarian sensitivity to gonadotropin stimulation caused by follicular attrition (3, 4). This can be considered an important event for middle aged women, although attitudes toward menopause vary between different cultures (5). For some it is as a negative event bringing the end of fertility and lowering a woman's status compared with younger more fertile women, whilst in others it is celebrated as the end of monthly impurities and the beginning of the age of maturity, wisdom and freedom (6).

As life expectancy for women has increased over recent years, women would now spend one-third of their life in the menopausal and post-menopausal periods (2). In the menopausal period, a woman can experience several psychological and physiological changes, which can be attributed to reductions in levels of estrogen over prolonged periods of time (7-9). From a psychological perspective significant stress, sleep and mood dysfunctions, poor concentration and declining memory can be common (4) with some women even reported to have shame and feeling of seclusion (10), whilst urogenital changes are one of the important physiological occurrences during this period producing several symptoms.

The prevalence of bladder symptoms including urinary frequency, emergency discharge and urinary incontinence increases during this period (11) and are reported by 10 - 50% of women (12-14). Generally, 7 - 10% of menopausal women reported urethra syndromes, nocturia and urinary tract infections (2, 15). It has been suggested that estrogen deficiency may be an etiological factor contributing to urinary stress incontinence with

urogenital 'fullness' regulated by significant amounts of cycling estrogen (2, 9, 16). Importantly, the germinal epitheliums of the vagina, external genitalia, urethra and bladder all have large numbers of estrogen receptors with estrogen being the hormone responsible for producing collagen, which affects tissue elasticity (17). For emergency incontinence, the ageing process for the most part is believed to be responsible (11, 18). Previous researches showed that vaginal atrophy, uterine prolapse, cystocele, rectocele, cervical ectropion, cervical lesion and itching may be increased (19, 20). Bleeding due to vaginal trauma has been observed in 15% of menopausal women (2, 15), reduction in sexual activity was reported in 39% - 59% and reduced orgasm in 20% (20-22).

Early identification of these symptoms is important for clinical management as treatments are available including estrogen replacement therapy, which can have a positive impact on emergency discharge, urinary frequency and urinary incontinence and may also prevent urinary infections and urogenital atrophy from reoccurring (11, 16). Urinary incontinence and other symptoms of menopause can be a significant financial burden for some women as over $12 billion is spent annually on management with patients paying up to 70% of out-of-pocket expenses for conservative care (12). These potential costs to both healthcare system and patient could be mitigated if more patients were treated with intent to cure rather than symptom management (12). As such, the objective of this study was to determine the effective factors on urinary incontinence and urogenital changes in menopausal women, to allow a better understanding of this condition and subsequent symptom management.

2. Objectives

The primary objective of this study was to quantify effective factors on urinary incontinence in a cohort of menopausal women.

3. Patients and Methods

This was a cross-sectional study conducted to assess effective factors on urinary incontinence in menopausal women. A stratified sample of 150 menopausal women were recruited from the outpatient departments of 13 healthcare centers under the supervision of Ilam University of Medical Sciences, Iran, between August 2008 and December 2008. To determine the sample size in this study, the pilot study showed approximately 10% of postmenopausal women with no problem, therefore confidence level at 95%, and margin of error at 5%, the sample size was calculated as 150 according to the following equation:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} \times P_{1-P}}{d^2} \quad (1)$$

The number of subjects recruited from each center was determined by the population size under the coverage of that center. A cross-sectional survey was performed using a standardized questionnaire combined with medical record review and observation for collection of demographic characteristics, medical history and symptom scores for urinary and genital changes. Subject recruitment and interviews were conducted by one trained researcher, a Medical Sciences student of Tehran University of Medical Sciences. Inclusion criteria were women aged 40 to 65 years, those who attended one of the 13 healthcare centers as an outpatient, going through natural menopause (cessation of menstruation for a minimum of 12 months) and having no known mental or physiological illness. Inpatients and subjects admitted to hospital directly following the outpatient visit were excluded from the study. A prespecified research proposal was submitted to Tehran university of medical sciences as part of the Medical Sciences dissertation.

The present study was approved by the ethics committee of Tehran university of medical sciences, Iran. Verbal consent was obtained from each participant for voluntary participation in the study. Data stored on a password protected private computer at the researcher's office.

3.1. Statistical Analysis

Results were expressed as mean ± standard deviation or frequency as indicated. Kolmogorov-Smirnov test was used to determine normality for continuous variables. Chi-square test was used to find associations between 'marital status and vaginal atrophy', 'BMI (body mass index) and urinary incontinence', 'parity type and urinary incontinence' and 'type and number of parity with cystocele and rectocele'. Univariate and multivariate logistic regression models were used to examine associations between urinary incontinence and UTI (urinary tract infections), cystocele, age, parity type and number of parities. An alpha of < 0.05 was used to determine statistical significance.

4. Results

Demographic characteristics of 150 subjects are reported in Table 1. The average participant age was 54.9 years and average age at menopause was 48.7 years. Table 2 reports symptoms and clinical indications of urogenital and breast changes in the sample cohort. These findings indicated significant associations between 'marital status and vaginal atrophy', 'BMI and urinary incontinence', 'type of delivery and urinary incontinence', 'type and number of delivery with cystocele and rectocele' (all $P < 0.05$). However, no significant association was observed between marital status and vaginal infection.

Table 1. Demographics Characteristics [a]

Demographic Variable	Values
Age, y	
40 - 44	3 (2)
45 - 49	19 (12.7)
50 - 54	55 (36.7)
55 - 59	32 (21.3)
60 - 65	41 (27.3)
Age (mean years)	54.9 ()
Marital status	
Married	110 (73.3)
Widowed	40 (26.7)
Educational status	
Illiterate	133 (88.7)
Less than high school	15 (10)
High school diploma	2 (1.3)
Employment status	
Unemployed	143 (95.3)
Employed	7 (4.7)
BMI kg/m²	
< 20 (thin)	3 (2)
20 - 25 (normal range)	119 (73.3)
> 25 (obese)	37 (24)
Menopausal age, y	
40 - 44	39 (26)
45 - 59	48 (32)
50 - 54	55 (36.7)
55 - 59	8 (5.3)
Menopausal age (mean years)	48.7 ()
Menopausal duration, y	
1 - 5	78 (52)
6 - 10	32 (21.3)
> 11	40 (26.7)
Calcium intake (in 24 hours)	
Adequate	11 (7.3)
Inadequate	139 (92.7)
Tea consumption (glasses per day)	
< 3	57 (38.01)
3	53 (35.33)
> 3	40 (26.66)
Parity type	
Natural	140 (93.3)
Caesarean	10 (6.7)
Number of parities	
< 5	14 (9.33)
5 - 10	76 (76)
> 10	22 (14.7)

[a] Values are presented as No. (%).

Table 2. Frequency of Breast and Urogenital Symptoms [a]

Symptom variable	Values
Breast atrophy	
Reduction of breast size	34 (22.7)
Reduction of breast sensitivity	100 (66.7)
Reduction of nipple sensitivity	99 (66)
Vaginal atrophy	
Vaginal dryness	63 (42)
Vaginal itching	26 (17.3)
Libido	62 (41.3)
Dyspareunia	24 (16)
UTI	
Dysuria	19 (12.7)
Urinary urge	29 (19.3)
Urinary frequency	50 (33.3)
Urinary incontinence	12 (8)
Fever	4 (2.7)
Lowe abdominal pain	12 (8)
Vaginal infection	
Vaginal discharge	16 (10.7)
Vaginal burning	16 (10.7)
Vaginal itching	17 (11.3)
Cystocele	
Signs	
Sense of pressure and mass in vagina	49 (32.7)
Urinary incontinence	32 (21.3)
Incomplete bladder discharge	53 (35.3)
Signs of bladder infection	7 (4.7)
Symptoms	
Prominence in the anterior vagina	88 (58.7)
Thinning of anterior vaginal wall	87 (58)
Symptoms of bladder infection	4 (2.7)
Rectocele	
Signs	
Sense of pressure and mass in vagina	21 (14)
Sense of fullness in the rectum	24 (16)
Incomplete passing of faecal matter	12 (8)
Constipation	32 (21.3)
Symptoms	
Prominence in the posterior vagina	34 (22.7)
Thinning of the posterior vaginal wall	33 (22)
Uterus prolapse	
Signs	
Feel of mass in vagina	4 (2.7)
Feel of fullness and heaviness in vagina	7 (2.7)
Lower abdominal pain	13 (8.7)
Lower back pain	16 (10.7)
Constipation	13 (8.7)
Painful to pass stool	7 (4.7)
Signs of bladder infection	1 (0.7)
Symptoms	
Removal of the cervix	1 (0.7)
Vaginal discharge	1 (0.7)
Vaginal bleeding	0 (0)
Symptoms of bladder infection	1 (0.7)
Urinary incontinence	
Urination when coughing or laughing	43 (28.7)
Urge urination	26 (17.3)
Fullness of bladder after emptying	27 (18)
Nocturia	34 (22.7)

[a] Values are presented as No. (%).

A significant association was found between urinary incontinence and UTI ($P < 0.001$). To predict a relation between UTI and urinary incontinence, a logistic regression model indicated that UTI may increase the possibility of urinary incontinence by approximately 5.6 times. (Model 1) *Log p/1-p = -1.56 + 1.7 UTI; (OR = 5.6, 95 % CI 2.60 - 11.58; P = 0.001).*

Potential confounding variables incorporated into the model included age, type of delivery and number of deliveries, all of which produced no significant association. As such, UTI remained the most important variable attributed to urinary incontinence. With omission of the above mentioned variables, logistic regression found that UTI increases the possibility of urinary incontinence by 6.15 times (Model 2).

Log p/1-p = 0.8 + 1.8 UTI + 0.05 Number of delivery + 0.10 delivery type-0.05 age; (OR = 6.15, 95% CI 2.86 to 13.26; P = 0.000)

An analysis of the association between cystocele and urinary incontinence was performed in Model 3. This logistic regression model showed an association between cystocele and urinary incontinence when adjusted for age, type of delivery and number of deliveries, which increased the possibility of urinary incontinence by approximately 1.73 times.

Log p/1-p = -0.38 -0.032 Number of delivery, -0.012 delivery type -0.01 age + 0.55 cystocele; (OR = 1.73, 95% CI 1.29 - 2.34; P = 0.000)

In Model 4, cystocele and UTI were added as variables to determine if this would further increase the possibility of urinary incontinence. UTI variable produced a greater effect in comparison to cystocele, whilst the other variables did not produce a significant interaction.

Log p/1-P = 0.17 -0.006 number of delivery + 0.033 delivery types -0.035 ages + 0.38; cystocele + 1.52 UTI; (OR = 4.6, 95% CI 2.06 t- 10.27; P = 0.000)

The rectocele variable was added in regression Model 5, which indicated that age, type of delivery and number of deliveries as variables were not significant. Logistic regression showed that adjusting for the mentioned variables, rectocele increased the possibility of urinary incontinence by approximately 1.47 times.

Log p/1-P = 0.241- 0.005 number of delivery + 0.008 delivery type -0.025 age + 0.387 rectocele; (OR = 1.47, 95% CI 1.20 - 1.80; P = 0.000)

Finally, the variables of rectocele, cystocele and UTI were all added to regression Model 6, which indicated that urinary infection variable produced a significant effect on urinary incontinence. Once the analysis was adjusted for rectocele and cystocele as variables, the possibility of urinary incontinence increased by 3.81 times.

Log p/1-p = -1.86 + 0.226 rectocele + 1.34 urinary incontinence + 0.29 cystocele;

(OR = 3.81, 95% CI 1.73 - 8.41; P = 0.001)

5. Discussion

This study examined the association between urinary incontinence and other variables and found a significant association between type of delivery and intensity of urinary incontinence ($P = 0.025$). With respect to clinical statistics and determination of the absolute frequency, we found that women with normal vaginal delivery experienced a different intensity of urinary incontinence compared to other women, which is consistent with other studies (23-25). Observed urological disorders including urinary frequency, urinary incontinence, nocturia and dysuria were increased in this cohort ($P < 0.05$), which is consistent with the results of other studies (18, 23, 25-28). Urinary infection is the common problem in women in all ages groups and its prevalence in girl children reported as 6.3% (29). Urinary tract infections were found to have a significant impact on urinary incontinence according to the logistic regression models. Variables of age, urinary infection, cystocele, rectocele, number of deliveries and type of delivery were included as factors within various models. Findings indicated that urinary infection, cystocele and rectocele all influenced urinary incontinence, with urinary infection found to be the most important variable contributing to incontinence. Results of other studies reported that women with a medical history of UTI were more likely to experience urinary incontinence compared to those with no history (30-32). Another factor that can affect urinary incontinence is BMI with a greater BMI correlating with a greater risk of incontinence. Results in this study are consistent with other published findings, which confirm that women with urinary incontinence have higher BMI values in comparison to subjects without urinary incontinence (24, 25, 31-34).

This study also identified signs and symptoms of cystocele and rectocele within the cohort, with the number of parities and parity type affecting the intensity of signs and symptoms ($P < 0.05$). Women who had normal vaginal delivery and gave birth to more than five children reported different degrees of cystocele and rectocele signs and symptoms. Factors identified as causing cystocele were parturition injuries and tension, weakness or rupture of the pelvic fascia, whist for rectocele factors included multiple deliveries, parturition of a large newborn and foot-showing, which is usually revealed post menopause.

Hormone deficiency is known to cause significant urogenital changes resulting in physiological problems for menopausal women (16, 35-37), including vaginal dryness, reduced libido, dyspareunia and vaginal itching being the most common. However, similar to the results found in our study, reports of reduced libido and vaginal dryness for some studies are significantly lower than others (23, 38). One possible explanation for this result is the cultural aspect of conservative societies, with some women finding discussions about sexual issues difficult, whilst others recognize sexual changes as a natural part of the ageing process. Vaginal atrophy intensity was lower for married women ($P = 0.001$), which is similar to reports by Brown et.al. who found that women who are more sexually active would have less vaginal atrophy (39-41). The results of our study showed that marital status

had no statistically significant impact on vaginal infection (P = 0.356). These results show evidence of clinical significance with vaginal infections of 11.8% reported in married women and 5.1% for widowers, which is consistent with Hu et.al. study (42).

This study had several limitations including small sample size and recruitment location of participants, which limit generalizability of the findings to a broader population. However, this study can provide useful information regarding effective factors on urinary incontinence in menopausal women as the results can be transferred to other populations to varying degrees. Another limiting factor is the absence of economic data relating to direct and indirect costs of urinary incontinence in this cohort. This information should be collected as part of future evaluations and research to enhance the understanding of clinical management and improve patient quality of life. Finally, this study only focused on physiological implications of effective factors in menopause and we would suggest to consider psychological aspects relating to quality of life in further investigations.

Urinary incontinence is a common medical problem in women, which is exacerbated during menopause. This study showed that variables such as UTI, cystocele, rectocele and BMI have a significant impact on the severity of urinary incontinence, with UTI identified as the most important variable. With early detection of UTI, the prevalence and severity of urinary incontinence could be potentially reduced significantly.

This study examined important breast and urogenital changes neglected by previous researches for the most part. Knowing that women spend one-third of their life post-menopause, these problems would affect most women to varying degrees. Subsequently, these treatable health problems produce significant economic issues for the health system and patients. As such, effective factors identified in this study that contribute to urinary incontinence should be identified, discussed and addressed during clinical consultations for women approaching menopause as a means of prevention. In addition, clinical tools should be developed and trailed in further researches to improve patient education and knowledge about these health problems and act as a checklist for physicians. Considering the significance and prevalence of urinary incontinence found in this cohort, further research is required to improve our understanding of psychological and economic impact of this condition.

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Authors' Contributions

Study design: Masoumeh Shohani. Literature search: Masoumeh Shohani and Kristin V Carson. Data analysis: Kourosh Sayehmiri and Masoumeh Shohani. Manuscript writing: MasoumehShohani and Kristin V. Carson.

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