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Prevalence of urinary incontinence and its associated predictor and Self-care behavior among the elderly females in Chaiyaphum Province, Thailand: Cross-sectional study

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Abstract:

BACKGROUND: Urinary incontinence (UI) has been overlooked by elderly females because it is considered an embarrassment and physical dysfunction that occurs naturally in older women. However, UI is problematic if symptoms are ignored, and the condition becomes chronic.

MATERIALS AND METHODS: This cross-sectional descriptive research was conducted in a community context using semi-structured interviews as data collection methods. The interviews involved 1475 elderly females who live in Muang district, Chaiyaphum province and were analyzed by Chi-square, Pearson Product Moment Correlation Coefficient, Stepwise multiple regression, Bivariate and Multivariate at 0.05 statistical significance.

RESULTS: The study found a 30.37% prevalence of UI. Nine factors are related to the cause: Pelvic muscle exercise, water intake, caffeine and alcohol intake, diabetes, environmental obstacles, activities, constipation, urination frequency, and exercise. Elderly females who had their highest education at primary school to high school also had the possibility to experience 64% and a diploma had the possibility to experience 68% less UI than illiterate ones. The elderly females who had more than 23 kilograms per square meter (kg/m^2) for body mass index (BMI) tend to have 2.64 times more than those who had 18.5–22.9 kg/m^2 at 0.05 statistical significance. UI self-care behavior on overall prediction was moderate, whereas behavioral change and self-care performance were high.

CONCLUSION: Nine factors are related to this cause. The possibility is also related to educational level and BMI. The overall UI self-care behavior showed a moderate level of prediction, but a high level of behavioral change and self-care performance.

Keywords:

Prevalence, self-care behavior, urinary incontinence

Introduction

Urinary incontinence (UI) is a condition in which people lose control of their own urination.[1] Mostly found in females[2,3] and is also known as "Giant geriatric syndrome."[4] The prevalence of UI increases with age.[2,3,5] From the foreign literature reviews, it was found that 45–75% of American elderly females,[2] 15–30% of South Korean elderly in the community and 60–70% in nursing homes,[3] 30–40% of British and Japanese elderly females,[6] 25–45% among females and is increasing worldwide,[7] 26.9% of Brazilian females,[8] 19% of elderly in nursing homes,[9,10] 20.9% of South Korean elderly females in community,[10] 3–53% of community dwelling elderly females,[11] 49% in physically active females and up to 15% in advance age,[12] 38% of elderly females.[13-16]

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The factors that are related to the cause of UI in the elderly such as physical exertion or effort, coughing, or sneezing,[7] diabetes, hypertension, stroke, overweight, more than three times normal delivery, dependent condition, the surrounding environment that causing difficult circumstance to urinate, alcohol and caffeine intake, smoking,[13,15] activity limitation, urinary tract infection,[14–16] and weak pelvic floor muscle.[16-18]

The solution to UI in elderly females is 99% to avoid smoking and smoke, 96.6% to give genital parts a proper clean, and 93% to urinate before long rides or traveling outside.[13]

The magnitude of UI prevalence in elderly females was not reported to their providers. In previous studies, few still were not clear about causes of UI in elderly females, but all studies agree that there are many factors associated with UI.

However, UI prevalence in elderly females is totally different based on the context of population, geography, environment, society, culture, and personal traits. There are many factors related to UI that also affect the daily routines of the elderly and have more intense effects in elderly females especially urinary tract infections and bone fractures. The proper treatment of UI in elderly females helps prevent complications from UI and improves the quality of life for elderly females. Moreover, the ultimate outcomes will create intervention programs for Thai elderly females and policymakers may decide to modify UI in Thai elderly females' preventive recommendations after identifying challenges.

This study aimed to determine the prevalence and factors related to the cause, possibility, and self-care behavior of UI in elderly females.

This study employed the adaptation of the definition concept of UI by the World Health Organization (WHO)[1] and International Continence Society (ICS)[18] as the research tool concept and adapted Orem's self-care deficit theory,[19] which uses patients' ability to care for themselves as a research concept because the Orem self-care deficit theory is commonly known in the nursing field. Orem also explained the vision of caring as "self-care is the activity that a person initiates and performs in order to benefit themselves to maintain living, health and livelihood."

Adapting Orem's self-care deficit theory to investigate how self-care agency and self-care deficit, a key component of Orem's theory, influence the management of UI in elderly females. This can involve exploring how individuals' perceptions of their ability to perform self-care behavior impact their management strategies, and treatment adherence and developing tailored interventions for individuals experiencing UI. This approach may involve designing programs that enhance self-care capabilities or address specific self-care deficits or how interventions guided by this theory impact individuals' management strategies and outcomes.

Objectives

In the existing literature, studies on UI in elderly females were found to be limited. Therefore, the primary objective of this study was to assess its prevalence. The secondary objective was to assess factors related to the cause. The third objective was to assess the self-care behavior of UI among elderly females in the Muang district, Chaiyaphum province.

Materials and Methods

Study design and setting

This study was a cross-sectional descriptive study that collected data from elderly females aged ≥60 years with Thai nationality and registered in Muang district, Chaiyaphum province. The data collection procedure was carried out for a period of four months: February–May 2023.

Study participants and sampling

The sample consisted of 1475 elderly females in Muang district, Chaiyaphum province, who were invited to participate in the study and selected by qualification specifically by Daniel.[20] In this study, the population size was known and calculated as 1341 people and 10% of the population was added to prevent the disappearance of data or incomplete questionnaires. Therefore, the population was 1475 as per the formula.

$$n = \frac{Np\,(1-p)\,Z^2_{\alpha/2}}{d^2\,(N-1) + p\,(1-p)\,Z^2_{\alpha/2}}$$

The sampling was randomized in several steps. First, cluster three groups by grouping them according to the size of the population in the health service centers. Next, representatives from each size of health service center were selected at a ratio of 4:1 using cluster random sampling and randomizing six health service centers. Thus, there was one small health service center, Cokesoong sanitariums with 119 samplings; the four medium sizes were Ban Lao sanitariums, with 304 samplings; Na Seow sanitariums, with 295 samplings; Huay Torn sanitariums, with 193 samplings; Lat Yai sanitariums, with 230 samplings; and a large health service center, Na Fai sanitariums, with 334 samplings (1475 samplings in total).

Inclusion criteria

More than or equal 60-year-old females with Thai nationality who had lived and registered themselves under the responsibility of each size of health service center in Muang district, Chaiyaphum province, and who were able to verbally communicate and understand, were willing and consenting to this study.

Exclusion criteria

The person who was sick or examined with neurological disorders or experienced brain surgery such as stroke, Parkinson's, Alzheimer's, spinal cord injury, acute confusional state, or depression, be able to attend less than 80% of research activities.

Variables

The variables were captured by using a semi-structured questionnaire and included population-related data such as age, educational level, body mass index (BMI), number of normal deliveries, past career, urinate leakage, activities, obstacle environment, caffeine and alcohol intake, constipation, daily water intake, urination frequency from day to night, underlying disease, pelvic muscle exercise, the amount of urine and the frequency in UI conditions, self-care behavior: Prediction, behavioral change and self-care performance by using the definition "UI" of WHO[1] and ICS[18] along with Orem self-care theory[19] as the concept of research tool.

Data collection and techniques

An interviewer-administered questionnaire comprising 67 questions was designed for this study. Before developing the questionnaire, existing literature on UI was reviewed. The literature search was conducted using five databases, such as PubMed, SciELO, Web of Science, Embase and OATD, using the keywords "UI" "underreported" and "elderly females." Using the definition "UI" of WHO[1] and ICS[18] along with Orem self-care theory[19] as the concept of research tool.

The questionnaire was distributed across the four domains. The first domain comprised demographic characteristics interviewed using a population-based form to collect information about the general data of elderly females with UI. There were eight questions including age, education level, past career, disease, BMI, and number of normal deliveries. The second domain was conducting an initial screening for elderly females with UI, in which the elderly female responded "yes" to the preliminary screening questions, indicating the presence of UI. Interviews were conducted using demographic, factors-related related and self-care behavior domains in sequence. There were three questions employed in the adaptation of the definition concept of UI by WHO[1] and ICS[18]: "Do you have urine leakage?" "Do you have a fever, cloudy or burning urine?" and "Do you have experienced urine leakage on the day of the interview?" The third domain was factors related to UI questions, which focused on the factors related to the occurrence and severity of UI in elderly females. There were 29 questions from the literature review that, comprehensively covered factors associated with the causes of UI, including activities, environmental obstacles, caffeine and alcohol intake, water intake, pelvic muscle exercise, diabetes, constipation, urination frequency, and exercise. Questions regarding the severity and frequency of UI were also included. The fourth domain was the self-care behavior question, which focused on caregiving behavior regarding UI in elderly females over the past 6 months and/or up to today. A total of 27 questions employed the adapted Orem's self-care deficit theory[19]: Six questions on prediction, four questions on behavioral change, and 17 questions on self-care performance. Respondents were asked to answer "highest" to "lowest" on a 5-point Likert scale.

The first step for data collection was to prepare four healthcare providers who attended a 1-day training as an interviewer, which included training for standard procedures for conducting interviews, questionnaire contents, and interview-related skills for experimenting with interviewing elderly females until the interviewers were confident. There was a summary assessment for the interviewers, who qualified to conduct field interviews. Within 4 months of selection, the elderly females selected were interviewed face-to-face at their homes by a researcher or well-trained interviewers. All participants consented to participate in this study. In cases where the sample cannot read or write, the fingerprints of the sample are stamped on the consent form. During the interviews, the interviewers explained the purpose of the study and the questionnaire to elderly females. In addition, elderly females had to fully understand the aims of the study because they had to answer the questionnaire themselves. Respondents were included in this study only when they answered "Yes" to the preliminary screening questionnaire, "Do you have urine leakage?" If the interviewee did not answer "yes" this question was excluded from the study. Upon answering "yes" to the aforementioned question, the respondents had to answer the form about UI three forms of UI: demographic characteristics, factors related to UI and self-care behavior questionnaires.

For content consistency, this study used five experts' interviews to recheck the consistency of contents, analyze the consistency index and select questions that were equal to or more than 0.6 of the consistency indexes to be in use of questioning. Regarding the conviction rate, this study found the conviction rate by using questionnaires with 30 elderly females who had the same conditions as the samplings in Khon Kaen province. The

Kuder-Richardson20 (K-R20) obtained a 0.89 conviction rate from screening and finding that Cronbach's alpha coefficient of the conviction of questionnaires on factors related to UI and the intensity of the conditions of elderly females at 0.90 and elderly females' UI self-care behavior questionnaires was 0.87. Moreover, this study used an instant tool: IBM SPSS Software trial version 22 for data analysis by distributing frequency, percentage, standard deviation, measures of association for categorical variables using Chi-square (Z^2), measures of association for continuous variables using Pearson product-moment correlation coefficient, prediction test using stepwise multiple regression analysis, possibility analysis using Bivariate and Multivariate at 0.05 statistical significance.

Ethical considerations

This study was certified by the National Ethics Committee Accreditation System of Thailand (NECAST) of Mahasarakham University on January 30, 2023, No. 014-415 / 2566. Moreover, this study worked according to Helsinki's ethical principles only when the samplings verbally volunteered and signed the study contract before participating in the research.

Results

The population-related data of the samplings in the community in Table 1 shows the data of 448 elderly females who had UI which found the average age at 71.59 years (standard deviation (SD) =6.93, Min. =60, Max. =99): 52.9% of elderly females aged between 60 and 69 years old, 33.5% of elderly females aged 70–79 years old. These elderly females mostly had the highest education at 85.7% of primary school and 81.5% of the former farmers who did a lot of heavy lifting, more than half of the samplings had underlying disease (59.4%) such as hypertension (26.6%), diabetes (23.7%), and more than one-third of the sampling having between 25.0 kg/m2 and 29.9 kg/m2 of BMI, 3.67 times in average of elderly females who experienced more than three times of normal delivery (SD =1.01, Min. =0, Max. =10) and almost a half of the samplings had experienced 4 times of normal delivery (48.8%).

The elderly females' UI prevalence

Table 2 shows the UI prevalence in elderly females. There were 448 elderly females experiencing UI (30.37%), which was 25.67% elderly females from the Naseow sub-district, followed by Nafai elderly females at 17.86%, Banlao elderly females at 17.41%, Latyai elderly females at 16.07%, Huayton elderly females at 13.39% and Cokesoong elderly females at 9.60%.

Factors related to the cause of elderly females' UI

Table 3 shows factors related to the cause of UI in elderly females as follows: Pelvic muscle exercise (r = 0.567,

Table 1: Demographic profile of the respondents (*n*=448) (Source: Original Research Data)

Demographic profile of the respondents	
Age	
60–69 Years	236 (52.7%)
70–79 Years	150 (33.5%)
(Mean=71.59, SD=6.93, Min.=60, Max.=99)	
Education level	
Primary school	384 (85.7%)
High school	29 (6.5%)
Diploma	6 (1.3%)
Bachelor	14 (3.1%)
Past career	
Unemployed	29 (6.5%)
Employee	31 (6.9%)
Farmer	365 (81.5%)
Underlying disease	
No	182 (40.6%)
Hypertension	119 (26.6%)
Diabetes	106 (23.7%)
Body mass index	
18.5–22.9 kg/m^2 (Normal weight)	94 (21.0%)
23–24.9 kg/m^2 (overweight)	157 (35.0%)
25–29.9 kg/m^2 (obesity class 1)	168 (37.5%)
More than 30 kg/m^2 (obesity class 2)	17 (3.8%)
Number of normal deliveries	
3	90 (20.1%)
4	218 (48.8%)
(Mean=3.67, SD=1.01, Min.=0, Max.=10)	

Table 2: The UI prevalence in elderly females (Source: Original Research Data)

Sub-district	Number of sampling	Number of elderly females' UI	Prevalence (%)
Naseow	295	115	25.67
Nafai	334	80	17.86
Banlao	304	78	17.41
Latyai	230	72	16.07
Huayton	193	60	13.39
Cokesoong	119	43	9.60
Total	1475	448	100.00

Table 3: Factors related to the cause of UI in elderly females (*n*=448) (Source: Original Research Data)

Variable	b	SE	β	*t*	*P*
Pelvic muscle exercise	0.186	0.014	0.530	13.734	<0.001*
Water intake	0.197	0.021	0.414	9.510	<0.001*
Caffeine and alcohol intake	0.139	0.027	0.179	5.148	<0.001*
	0.089	0.037	0.082	2.373	0.018*
Diabetes	−0.137	0.028	−0.321	−4.853	<0.001*
Environmental obstacle	0.127	0.035	0.182	3.576	<0.001*
Activities	0.062	0.018	0.159	3.364	0.001*
Constipation	0.057	0.025	0.086	2.301	0.022*
Urination frequency	−0.040	0.018	−0.096	−2.252	0.025*
Exercise					

Constant=1.250, R=0.726, R^2=0.526, SEE=0.31791, F=5.071*, Sig. of F=0.025. *P<0.05. SE= Standaed Error, SEE= Standard Error of the Estimate

$P < 0.001$), water intake ($r = 0.514$, $P < 0.001$), caffeine and alcohol intake ($r = 0.320$, $P < 0.001$), endocrine disease as an underlying disease ($Z^2 = 4.657$, $P = 0.018$), environmental obstacles ($r = 0.288$, $P < 0.001$), activities ($r = 0.119$, $P < 0.001$), constipation ($r = -0.026$, $P = 0.001$), urination frequency ($r = 0.212$, $P = 0.022$) and exercise ($r = -0.020$, $P = 0.025$) at 0.05 statistical significance. The model explained the 25.0% Nagelkerke *R* square value of the variance of a UI and the prediction success was overall 52.6% of the case.

The possibility of elderly females' UI

Bivariate and multivariate analysis of the possibility of UI in elderly females' UI found three variables that were at 0.05 statistical significance. Table 4 shows the population-related factors and possibility of UI in elderly females' by multivariate analysis method such as highest educational level between primary school to high school (Adj. Odds Ratio (OR) =0.36, 95% Confidence Interval (CI): 0.16–0.80, $P = 0.01$), diploma to bachelor degree (Adj. OR =0.32, 95% CI: 0.14–0.74, $P = 0.01$) and BMI >23 kg/square meter (Adj. OR =2.64, 95% CI: 1.07–6.49, $P = 0.03$) at 0.05 statistical significance.

UI elderly females' self-care behavior

Table 5 shows the self-care behavior of elderly females with UI as follows: 4.1 Overall prediction was at a moderate level (mean =3.30, SD =0.82). In more detail, this study found the top three of UI elderly females' self-care behavior on average was as follows: The highest (no caffeine and alcohol intake) was at 91.1% (mean =4.88, SD =0.38) followed by (no water intake for 2 hours before a bed) 90.2% (mean =4.88, SD =0.36), and (avoided constipation) 90.2% (mean =4.87, SD =0.44).

Table 5 also shows that overall behavioral change was high (mean =4.49, SD =0.60) when considered in detail. This study found the top three highest averages of elderly females' UI behavioral changes as follows: Trying to stay close to the restroom at 72.3% (mean =4.64, SD = 0.65), checking the nearest route to the restroom at 65.2% (mean =4.54, SD =0.70), and checking the location of the nearest restroom before going out at 67.2% (mean =4.52, SD =0.79).

Furthermore, Table 5 demonstrates that overall UI self-care performance fell to a high level (mean =3.57, SD =0.44). More in detail, the study also found the top three highest averages of elderly females' UI self-care behavior were as follows: Clean their body right after the leak at 62.9% (mean = 4.51, SD = 0.71), 6–8 glasses of water intake a day at 72.1% (mean =4.49, SD =0.89), and wear comfortable and easy to take off clothes at 53.6% (mean =4.39, SD =0.75).

Table 4: The population-related factors and possibility of UI in elderly females by bivariate and multivariate analysis (Source: Original Research Data)

Variables in the Model	OR	*P*	AOR	95.0% CI for AOR Lower Upper
Education (ref: Illiterate)				
Primary to high school	0.35	0.01	0.36	0.80
Diploma to bachelor	0.31	0.01	0.32	0.14 0.74
BMI (ref: Normal weight)	2.60	0.03	2.64	1.07 6.49
More than 23 kg/m^2				

Discussion

The study on the prevalence of UI and its associated predictors and caring behaviors among elderly females discussed the results according to the proposal of the study as follows:

1. This study found the prevalence of elderly females' UI at 30.37%, which is related to 45% of the prevalence of UI of menopause and middle-aged females in the USA and 75% of elderly females,[2] 15–30% prevalence of UI of Korean elderly females in the community,[3] 30–40% prevalence of elderly females in England

Table 5: The UI self-care behavior of elderly females on prediction, behavioral change and self-care performance (*n*=448) (Source: Original Research Data)

Self-care behavior	Behavior score level Number (Percentage)					Mean	SD
	Lowest	Low	Moderate	High	Highest		
Prediction (Mean=3.30, SD=0.82)							
1. No caffeine and alcohol intake	0	0	10 (2.2)	30 (6.7)	408 (91.1)	4.88	0.38
2. No water intake 2 hours before bed	0	0	6 (1.3)	38 (8.5)	404 (90.2)	4.88	0.36
3. Avoiding constipation	1 (0.2)	0	12 (2.7)	31 (6.9)	404 (90.2)	4.87	0.44
Behavioral change (Mean=4.49, SD=0.60)							
1. Trying to stay close to the restroom	0	3 (0.7)	33 (7.4)	88 (19.6)	324 (72.3)	4.64	0.65
2. Checking the nearest route to the restroom	0	4 (0.9)	43 (9.6)	109 (24.3)	292 (65.2)	4.54	0.70
3. Checking the location of the nearest restroom before going outside	2 (0.4)	8 (1.8)	47 (10.5)	90 (20.1)	301 (67.2)	4.52	0.79
Self-care performance (Mean=3.57, SD=0.44)							
1. Clean their body right after the leak	0	0	56 (12.5)	110 (24.6)	282 (62.9)	4.51	0.71
2. 6–8 glasses of water intake a day	0	14 (3.1)	76 (17.0)	35 (7.8)	323 (72.1)	4.49	0.89
3. Wear comfortable and easy to take off clothes	0	6 (1.3)	55 (12.3)	147 (32.8)	240 (53.6)	4.39	0.75

and Japan's UI,[6] 25–45% among females and is increasing worldwide,[7] 26.9% in Brazil,[8] 20.9% in South Korea,[10] 3–53% of community dwelling elderly females,[11] 49% in physically active females, and up to 15% in advance age,[12] 38% of elderly females[16] and which related to previous domestic and international studies.[21]

2. Factors related to the cause of elderly females' UI are pelvic muscle exercise,[16,17,22] activities,[7,14–16] water intake, caffeine and alcohol intake, diabetes, environmental obstacle, constipation, urination frequency, exercise,[13,14–16] osteoarthritis, hypertension, overweight, weak and severely ill elderly, females who delivered normally more than three times,[17] which contains medicine-affected sphincter muscle and it was also found that UI in the elderly who did not receive proper treatment was related to fall, bone fracture, abnormal sleeping, isolation, depression, urinary tract infection, limitation of some activities that obstruct the elderly from walking to the restroom and urinating on their clothes unintentionally, inappropriate environment such as insufficient light on the way to the restroom, no rail for disability and elderly in the restroom, slippery floor and insufficient facilities for the elderly.[6] Moreover, these factors have affected the prevalence of UI in the elderly by up to 50% because the following environment may obstruct the elderly's access to the restroom or make them dislike going to the restroom because they might think it is too dangerous with limited activity and depression.[15] Additionally, weakened pelvic floor muscles are a significant risk factor for UI in elderly females.
3. The study found factors related to the possibility of UI in elderly females as follows: The educational level of elderly females between primary school to high school has a 64% lower possibility of UI compared to illiterate elderly females. The educational level of elderly females between diploma degree to bachelor degree has less possibility of UI at 68% compared to the illiterate elderly women, followed by the elderly females who have more than 23 kg/m^2 on BMI or obese have more possibility of UI up to 2.64 times compared to ones who have 18.5–22.9 kg/m^2 on BMI or normal weight, which is related to study that elderly should control their weight not to be higher than normal range because those who have more than 30 kg/m^2 on BMI or level 2 obese tend to have abdominal pressure increased causing easier urination than usual.[21]
4. UI self-care behavior of elderly females on prediction found the top three highest average of UI self-care behavior of elderly females as follows: No caffeine and alcohol intake, no water intake for 2 hours before bed and avoidance of constipation. They found that the prevention of UI is not related to the change in daily routine but is related to avoiding smoking, avoiding constipation, and drinking less water when traveling outside.[13]

Regarding behavioral change, it was found that the top three highest averages of UI self-care behavior of elderly females were as follows: Trying to stay close to the restroom, checking the nearest route to the restroom and checking the location of the nearest restroom before going out, who stated that the elderly should prepare the nearest route to the restroom.[13]

Found lifestyle changes can improve with individual, women-centered and supervised pelvic floor muscle exercise programs, thereby reducing UI symptoms.[22]

Regarding UI self-care performance, the top three highest averages of elderly females' UI self-care behavior were as follows: Getting the body clean and wearing new clean clothes right after the leak, 6–8 glasses of water intake and wearing comfortable and easy-to-take off clothes, which is related to the study that found the most common way to palliate UI patients are having their genital parts always clean and wearing loose pants or easy to take off ones.[13]

Limitations and Recommendations

This study only studied the UI in elderly females who live in the Muang district, Chaiyaphum province. There are some limitations to this study that are worth mentioning. First, the study was cross-sectional in nature and conducted in the elderly, with the majority of the sample being young to middle-aged. This aging process can cause blurred vision, unclear vision, decreased reading ability, deafness, decreased hearing, and most have the highest education in primary school. This caused some sort of information bias in data collection. However, the elderly females selected were interviewed face-to-face and researchers or well-trained interviewers read slowly and clearly to the elderly before they had to answer the questionnaire themselves. Second, we only included participants residing in the elderly females in the Muang district, Chaiyaphum province; therefore, we cannot generalize our results to all of Thailand and other countries. However, identifying the challenges of prevention and early detection policies for UI in elderly females may help apply these outcomes to other contexts with comparable dynamics.

Therefore, health services and future studies are warranted. First, the solutions can be used by health policymakers and decision-makers to effectively administer health services. It seems that implementing more effective evidence-based decision-making is facilitated by conducting systematic review studies

based on nations where comparable economic income and education levels help to implement more efficient programs. Second, the researcher should study prevalence, factors that are related to the cause, and UI self-care behaviors in both males and females in hospitals, healthcare centers, and communities in order to gather primary data for knowledge development of UI in the elderly. Third, researchers should study the care system of the UI in the elderly that specifically occurs in Thailand in the super-aging society.

Conclusion

The prevalence of UI in elderly females in Muang district, Chaiyaphum province, was 30.37%. Important factors related to UI in elderly females are pelvic muscle exercise, water intake, caffeine and alcohol intake, and diabetes as an underlying disease. The possibility of UI is related to educational level and BMI. Moreover, UI self-care behavior on overall prediction was moderate, while behavioral change and self-care performance were at a high level. These findings pose great challenges to investigators who are striving to elucidate the causal pathways of UI and inform policymakers who are charged with planning early screening for the risk factors of UI among elderly females, in order to facilitate early prevention and intervention for the health care needs of a super-aging society.

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List of abbreviations
BMI: Body mass index; Kg/m^2: Kilograms per square meter; UI: Urinary incontinence, WHO: World Health Organization; ICS: International Continence Society; K-R20: Kuder-Richardson20; SPSS: Statistical package for the social sciences, Z^2: Chi-square; r: Pearson product-moment correlation coefficient; NECAST: National Ethics Committee Accreditation System of Thailand; SD: Standard deviation; Min.: Minimum; Max.: Maximum, AOR: Adjusted odds ratio; OR: Odds ratio; CI: Confidence interval

Authors' contributors' statement
Concept, design, the definition of intellectual content, literature search, data acquisition of the study, performed literature review, tool development, data cleaning, statistical analyzing, manuscript preparation was done by Mrs. Patchareepon Chompoowisate and Dr. Chaloemporn Namyota. The final manuscript review and editing was done by Dr. Sumattana Glangkarn.

Declaration of patient consent
The authors certify that all appropriate patient consent forms were obtained before study enrollment. The participants were appraised that their names and initials would not be published, and due efforts would be made to conceal their identity.

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Conflicts of interest
There are no conflicts of interest

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