ORIGINAL RESEARCH

Impact of E2 and FSH levels on the severity of Stress Urinary Incontinence (SUI) in menopausal women

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ABSTRACT

Objectives: This study aimed to analyze the relationship between E2 and FSH levels in menopausal women with the severity of Stress Urinary Incontinence (SUI) at Ulin Hospital, Banjarmasin, Indonesia.

Materials and Methods: This study used an analytic observational method with cross-sectional design in menopausal women diagnosed with Urinary Incontinence (UI) from October 2020 - March 2021. The independent variables were E2 and FSH levels. The dependent variable was the severity of SUI in menopausal women. The severity of SUI was determined by the Incontinence Severity Index (ISI) scoring. Data were analyzed by Spearman correlation.

Results: The subjects who met the criteria were 25 women. The results showed the prevalence rate of SUI was 5.8% with E2 and FSH levels of mild SUI (14.25 pg/mL and 49.70 mIU/mL), moderate (7.91 pg/mL and 54.13 mIU/mL), and severe (9.14 pg/mL) and 70.97 mIU/mL). The number of severity levels of mild SUI was 44%, moderate SUI was 48%, and severe SUI was 8%. Most patients with SUI aged >60 years, multipara, normal body mass index (BMI), duration of menopause <10 years, menarche <15 years, Intrauterine Device (IUD) contraception, and delivered with spontaneous vaginal delivery. There was no significant relationship between E2 levels and the severity of SUI with a p-value of 0.084 and a correlation coefficient of -0.353. There was no significant relationship between FSH level and severity of SUI with a p-value of 0.367 and a correlation coefficient of 0.189.

Conclusion: There was no significant relationship between E2 and FSH levels and the severity of SUI in menopausal women. It is necessary to do research on other factors that influence the high severity of SUI in menopausal women.

Keywords: E2; FSH; severity; SUI; menopause; maternal health

ABSTRAK

Tujuan: Penelitian ini bertujuan untuk menganalisis hubungan kadar E2 dan FSH pada wanita menopause dengan tingkat keparahan Inkontinensia Urin Tipe Stres (IUS) di RSUD Ulin Banjarmasin, Indonesia.

Bahan dan Metode: Penelitian ini merupakan observasional analitik dengan pendekatan cross-sectional dengan populasi pada wanita menopause yang terdiagnosis Inkontinensia Urin (IU) periode bulan Oktober 2020 - Maret 2021. Variabel bebas adalah kadar E2 dan kadar FSH. Variabel tergantung adalah tingkat keparahan IUS pada wanita menopause. Tingkat keparahan IUS ditentukan dengan skoring Incontinence Severity Index (ISI). Data dianalisis dengan korelasi Spearman.

Hasil: Total yang memenuhi kriteria 25 subjek. Hasil penelitian menunjukkan angka prevalensi IUS sebanyak 5,8% dengan kadar rerata E2 dan FSH tingkat keparahan IUS ringan (14,25 pg/mL dan 49,70 mIU/mL), sedang (7,91 pg/mL dan 54,13 mIU/mL), berat (9,14 pg/mL dan 70,97 mIU/mL). Jumlah tingkat keparahan IUS ringan sebesar 44%, IUS sedang 48%, IUS berat 8%. IUS terbanyak pada usia >60 tahun, paritas multipara, Indeks Masa tubuh (IMT) normal, lama menopause <10 tahun, menarche <15 tahun, kontrasepsi IUD, metode persalinan spontan per vaginam. Tidak ada hubungan signifikan kadar E2 dengan tingkat keparahan IUS dengan p-value 0,084 dan koefisien korelasi sebesar -0,353. Hasil penelitian juga menunjukkan FSH tidak ada hubungan signifikan dengan tingkat keparahan IUS dengan p-value 0,367 dan koefisien korelasi sebesar 0,189.

Simpulan: Tidak terdapat hubungan signifikan antara kadar E2 dan FSH dengan tingkat keparahan IUS pada wanita menopause. Perlu dilakukan penelitian mengenai faktor-faktor lain yang mempengaruhi tingginya tingkat keparahan IUS pada wanita menopause.

Kata kunci: E2; FSH; tingkat keparahan; IUS; menopause; kesehatan ibu

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INTRODUCTION

The increase in life expectancy has an impact on the number of menopausal women. Along within increasing age, health problems are also increasing, one of the organ problems related to menopause is urinary problems. Stress Urinary Incontinence accounts for about 56% of the major urinary problems in menopausal women.[1-3]

Stress urinary incontinence (SUI) is defined by the International Continence Society (ICS) as a condition characterized by the involuntary loss of urine as a result of increased intra-abdominal pressure due to exertion or sneezing or coughing. Symptoms include urination when coughing, straining, laughing, sneezing, running or other things that increase pressure in the abdominal cavity, hence it is related to quality of life.[4] In menopause (defined as the cessation of menstruation for 12 consecutive months), estrogen levels decrease and FSH (Follicle Stimulating Hormone) levels increase significantly, resulting in hormonal fluctuations and physiological changes in the genitalia. The decrease in estrogen that occurs due to menopause causes thinning of the epithelium, weakened tissue and decreased blood flow and elasticity of the vaginal walls.[5] Barbara et al. (2017) reported that women with SUI had significantly lower E2 levels than the control group, and also reported a positive association between hypermobility of bladder neck with SUI.[6]

Symptoms of urine leakage experienced by patients due to changes in urethral closing pressure affect the severity of incontinence, some are mild, moderate and severe, so the symptoms suffered by each patient vary. One way to measure the severity of IUS is by using the Incontinence Severity Index (ISI). Murphy et al. (2000) found the validity of the ISI associated with the Urogenital Distress Inventory (UDI-6) to determine the severity of IU.[7,8] Assessment of the severity of IUS is important when it is associated with E2 and FSH levels in menopausal women for diagnostic and therapeutic purposes.

EPIC study conducted in 2008 globally found that around 348 million people in the world had experienced IU, showing an increase of 10.8% to 286 million in 2013, and is estimated to increase by 21.6% to 423 million in 2013. In 2018, the global prevalence of IU is anticipated to increase from 8.2% in 2008 to 8.5%. The last epidemiological study in Indonesia was published in 2014 and involved six teaching hospitals, namely: Jakarta, Bandung, Semarang, Surabaya, Makassar, and Medan. From a total of 2,765 respondents who met the inclusion criteria, the total prevalence of IU was 13%, increasing with age.[7] Many are too shy to discuss this condition with a healthcare provider and some believe it is a normal part of aging that they have to deal with. The result can be isolation and limited social activities and interactions. In fact, IUS is a health problem at the age of menopause that can be resolved. Prolonged IUS if not treated immediately will affect a person's quality of life and can cause life problems both in terms of medical, social, economic and psychological. A survey conducted at the Geriatric Polyclinic of Cipto Mangunkusumo Hospital, Jakarta, in 2006, of all patients who experienced IU, the pressure type occurred in 17.3% of patients.[9,10]

Sandvik et al. (2000) also reported that the prevalence of IU increases with age, and half of IU is mostly in the stress type with a prevalence of 15% aged 45-59 and an increase of 33% aged 60.[7] Currently in Banjarmasin there are no data on IUS or studies that measure E2 and FSH levels were associated with the severity of IUS. On this basis, researchers are interested in examining whether there is a relationship between E2 and FSH levels in menopausal women with the severity of IUS at Ulin Hospital Banjarmasin.

MATERIALS AND METHODS

The research design used was analytic observational with a cross-sectional approach. The study was conducted at the Geriatrics Polyclinic and Gynecological Polyclinic of Ulin Hospital Banjarmasin from October 2020 to March 2021 with the target population being all menopausal women diagnosed with IU. All target populations were interviewed using the QUID questionnaire followed by selection. Inclusion criteria were menopausal women aged more than 45 years, IUS was established by QUID, did not suffer from other gynecological diseases, except patients with POP grade < 2, not diagnosed with DM as evidenced by blood sugar examination fasting and while peripheral, there was no diagnosis of UTI from the urinalysis examination and the patient was willing to be the subject of the study in writing. Exclusion criteria were a history of hysterectomy surgery, oophorectomy, BMI > 30 (obese) with measurements of height and weight, neurological disease, chronic cough, having disease, abnormality or tumor in the pelvic area, having a history of undergoing radiotherapy, estrogen hormonal therapy, smoking, and alcoholic. Respondents who met the inclusion and exclusion criteria were continued with the examination of blood E2 and FSH levels as well as filling in the ISI scoring to determine the severity of IUS. All members of the population who met the inclusion and exclusion criteria were taken as research subjects. The independent variables in this study were blood E2 and FSH levels with the dependent variable

being the severity of IUS./ After classifying the severity, the researchers looked for the relationship between E2 levels and blood FSH levels with the severity of IUS in postmenopausal women, processed by the SPSS program and analyzed by Spearman's test with a 95% Confidence Interval; it is said to be significant if the p value < 0.05 then it is said to be related, whereas if the p value > 0.05 it is said to be unrelated. This study met the ethical clearance of the ethics commission of Ulin Hospital Banjarmasin with number 113/IX-Reg Riset/RSUDU/20.

RESULTS AND DISCUSSION

The total number of menopausal women who came to the Gynecology Outpatient Clinic and Geriatric Outpatient Clinic was 527. Of these 527 patients, the incidence of IU was 10.6% (56 per 527) and SUIwas 5.8% (31 per 527). Of the 31 patients, five patients with UTI and one patient with DM were found, so in this study only 25 participants met the inclusion and exclusion criteria. The prevalence of SUI in this study is lower than the study in India conducted by Aathira et al. using QUID where the prevalence of IU was 26.47%, and IUS was 13.9%.[9] A survey conducted at the Geriatric Outpatient Clinic of Cipto Mangunkusumo Hospital, Jakarta in in 2006 reported 17.3% of all patients experiencing SUI.[10] In China in 2009, the prevalence rate of IUS was 18.9%.[11] The latest research in India in 2018 from 418 cases, found 77 cases (18.4%) having SUI.[12]

The prevalence rate of SUI in this study was lower because IU was considered a taboo and embarrassing thing to talk about and to tell doctors, so it is often not reported by patients or their families. Because there is an assumption that the problem is a shameful thing, so there is no good record made. Vito et al. (2013) evaluated the impact of IU including depression, anxiety, shame and withdrawal. This impact makes patients reluctant to report to their families or to go to the doctor.[13] The low prevalence rate in this study was also due to the time, the research was conducted during the Covid-19 pandemic, especially Banjarmasin city was included in the red zone areal therefore, the number of patients visited to the hospital was decreased. Besides the age factor makes patients not dare to visit the hospital.[14]

Menopausal women who experienced SUI in this study were mostly aged > 60 years compared to those aged <60 years (Table 1). This result is the same as the study at India in 2018 by Gita et al. which reported an increase in the number of SUI at age > 60 by 83.3% and age 40-60 by 51.81%.[12] IGPSuka Aryana et al. in the 2018 Geriatric Opinion also reported that SUI was 22% suffered by women aged between45-64 years.[15] In general, women of menopausal age will experience hormonal, physical and psychological changes. One of the physical changes in the menopausal period is urogenital changes in the form of atrophy in the genitals and urinary tract, resulting in SUI.[3]

Parity is one of the risks of SUI. The results of this study showed that the highest number of SUI was in the group of menopausal women with multiparity, namely 88.0%. The results of this study are supported by research by Gabriela et al. (2019) who reported that those who had never given birth had a 1 in 10 chance, while those who had given birth had an increased SUI probability of 1 in 3 deliveries. According to research by Fred et al. (2013) vaginal delivery can result in injury to the structures in the pelvic floor. These pathophysiological changes in the muscle structure and fascia of the pelvic floor result in a pelvic support defect and pelvic floor dysfunction.[16]

In addition to labor factors, obesity is also a risk factor for SUI. A systematic review by Bray (2015) said there was strong association between overweight and SUI. When a person gains weight, the size of fat cells will increase and then the number will increase. The increased BMI will be followed by an increase in intra-abdominal pressure which is higher so that it will suppress the pelvic floor thereby reducing the ability to control the urethra and bladder.[17] In this study, respondents who had a normal BMI had a small risk factor for SUI.

In this study (Table 1), there was one respondent with severe SUI in multipara and one respondent with nullipara. In the study of Gabriela et al, it is said that the level of SUI is influenced by parity. This is in contrast to the Norwegian EPINCONT study in 2001 which said the effect of parity was dependent on age, the severity of clinical SUI was not significantly associated with parity.[18] It is known that the decrease in estrogen secretion from the ovaries that occurs in menopausal women causes important urogenital changes. In this study, it was reported that mostly the respondents who experienced SUI were respondents with menopause > 10 years. These results are the same as the results of a study by Fidel (2016) which reported that the length of menopause was strongly negatively correlated with serum E2 levels with a value of r = -0.880, which indicates that the longer menopause will lower the E2 levels.[19]

Table 1 Characteristics of respondents to the severity of SUI

Characteristics	Total (%)	Light n (%)	Currently n (%)	Heavy n (%)
Age (Years)				
<60	10(40)	6 (60.0)	4(40.0)	0(0.0)
≥60	15 (60)	5 (33.3)	8(53.3)	2 (13.3)
Parity				
Pimipara	1(4.0)	1 (100.0)	0 (0.0)	0 (0.0)
Multipara	22 (88.0)	10 (45.5)	11 (50.0)	1 (4.5)
Grandemultipara	1 (4.0)	0 (0.0)	1 (100)	0 (0.0)
Nullipara	1 (4.0)	0 (0)	0 (0)	1 (100)
Body Mass Index				
18.5 - 24.9 (Normal)	14 (56.0)	7 (50.0)	5 (35.7)	2 (14.3)
25.0-29.9 (Overweight)	11 (44.0)	4 (36.4)	7 (63.6)	0(0.0)
Duration of menopause (Year)				
<10	13 (52.0)	8 (61.5)	5 (38.5)	0 (0.0)
≥10	12 (48)	3 (25.0)	7 (58.3)	2 (16.7)
Menarche (Year)				
<15	23 (92.0)	9 (39.1)	12 (52.2)	2 (8.7)
≥15	2 (8.0)	2 (100))	0 (0.0)	0 (0.0)
Contraception				
Pill	6 (24.0)	1 (16.7)	5 (83.3)	0(0.0)
Inject 3 months	4 (16.0)	1 (25.0)	3 (75.0)	0(0.0)
IUD	12 (48.0)	7 (58.3)	4(33.3)	1 (8.3)
No family planning	2 (8.0)	1 (50.0)	0 (0.0)	1(50.0)
MOW	1 (4.0)	1 (100)	0(0.0)	0(0.0)
Delivery Method				
Spontaneous-vaginal	20(80.0)	8 (40.0)	11 (55.0)	1 (5.0)
Caesarean section	3 (12.0)	2 (66.7)	1 (33.3)	0 (0)
Spontaneous and caesarean section	1 (4.0)	1 (100)	0 (0)	0 (0)
Nullipara	1 (4.0)	0 (0.0)	0 (0.0)	1 (100)
Educational background				
Primary school	2 (8.0)	0 (0.0)	2 (10.00)	0 (0.0)
Junior High School	3(12.0)	1 (33.3)	2(66.7)	0 (0.0)
Senior High School	6 (24.0)	2 (33.3)	2 (33.3)	2 (33.3)
Associate degree	6 (24.0)	4 (66.7)	2 (33.3)	0 (0)
Bachelor degree	8 (32.0)	4 (50.0)	4(50.0)	0 (0)
Employment history				
Non-Housewife	10(40.0)	5 (50.0)	5 (50.0)	0 (0.0)
Housewife	15 (60.0)	6 (40.0)	7(46.7)	2 (13.3)
Ethnic group				
Banjar	17(68.0)	6 (35.3)	10 (58.8)	1 (5.9)
Java	6 (24.0)	4 (66.7)	2 (33.3)	0 (0.0)
Dayak	1 (4.0)	0 (0.0)	0 (0.0)	1 (100)
Batak	1 (4.0)	1 (100)	0 (0.0)	0 (0.0)
Total	25 (100)	11 (44.0)	12(48.0)	2 (8.0)

Note: Primipara (female who gave birth to a baby weighing more than 500 grams or a gestational age of 20 weeks total 1 time), Multipara (amount 2-4), grande multipara (amount >4), Nullipara (never gave birth), housewife who only takes care of various domestic work, not working in the office.

Bjelland et al. (2018) reported that the sooner the age of menarche, the slower the age of menopause, and vice versa, the slower the age of menarche, the sooner the menopause. From the research, it can be seen that almost all of them experienced menarche at age 15 years. This is influenced by several factors, one of which is nutrition. Someone who has good nutrition will experience menarche more quickly because nutrition affects the formation of body fat which will indirectly metabolize fat by several hormones, namely the hormone estrogen. In this study, the younger the age of menarche, the longer the menopause.[20]

In this study, spontaneous vaginal delivery had a higher severity than delivery by cesarean section. This is similar to research conducted by Gyhagenetal (2013). Severity of moderate to severe SUI was more common after vaginal delivery (21.3%) compared to cesarean section (13.5%) with 95% CI (1.40–2.03).[21]

Based on the distribution of SUI severity, it was found that the severity level of 8.0% occurred at age > 60 years, mild and moderate levels occurred at the age <60 years (44.0%, 48.0%) (Table 1). This result is similar to the Hannestad study which reported that the higher the age of the respondent, the higher the severity of SUI. In women who had SUI under 45 years, 57% had mild

SUI, 31% moderate SUI, and 12% severe SUI while for women between 45 and 59 years (46%, 33%, 21%). In the age group 60 years, 24% mild SUI and 31% moderate SUI, and 44% severe SUI.[7]

In the results of this study (Table 2) the mean level of E2 showed lower result in the moderate SUI than in the severe SUI. The E2 level should be lower in the severe SUI than in the moderate level, by analysis the lower the value of the E2 level indicates the more severe the severity of SUI. The discrepancy in the value of this level was due to the small sample population of 25 respondents so that only two respondents were found with severe SUI severity. To know the value of the lowest E2 level read by our tool is only limited to a value of <9; however, the overall value of E2 levels in this study is in accordance with the menopause criteria, namely E2 <30 pg/ml. The low level of E2 in SUI was supported by Areti et al.'s (2017) study that women with SUI had significantly lower serum E2 levels compared to the control group (17.30 + 8.16 vs 24.22 + 8.99, P < 0.001).[22] This study is also supported by research by Bai et al. (2004) who examined the estrogen receptor in SUI women; the results obtained lower estrogen levels in SUI women compared to controls.[23]

The mean value of FSH levels in the results of this study (Table 2) showed a value of 70.97 mIU/ml in severe SUI, moderate SUI 54.13 mIU/ml and mild SUI 49.70 mIU/ml. This is consistent with the theory that menopausal women have FSH levels > 40 mIU/ml. Analysis of this data shows that the higher the FSH value, the more severe the severity of SUI. As in the study of Iris et al. who conducted a study of FSH levels in post-oovorectomy dogs, the plasma FSH-concentration greatly determines the occurrence of IU. Changes in the anatomy of the ovary due to the aging process that causes sclerosis and a reduced number of primordial follicles, as well as a decreased in the activity of steroid hormone synthesis. The decline in estrogen levels will mark the beginning of the climacteric and continue to decline during menopause, reaching its lowest level during the menopausal period. This causes negative feedback on the hypothalamus, which in turn causes an increase in gonadotropin production, resulting in hypergonadotropin-hypo-gonadism conditions.[3]

Based on Table 3 in this study, the highest mean E2 levels were at age > 60 years and the lowest was at age <60 years. The results of this study are in contrast to the research of Fidel et al. in 2016 who stated that age, parity and duration of menopause were strongly negatively correlated with E2 levels.[24] Likewise, Randolph et al.'s (2004) study reported that E2 levels decreased significantly with age, with a sharper decline at higher age. Similarly, FSH levels increase significantly with age.[25]

In this study (Table 3) menopause duration >10 years had a higher average E2 level compared to menopause duration <10 years, while FSH levels were higher in menopause < 10 years compared to menopause >10 years (Table 3) This study result is in contrast to the study by Fidel et al. (2016) who reported that the duration of menopause was strongly negatively correlated with serum E2 levels, with an r value of -0.880, which indicates that the longer menopause the lower the E2 levels.[19]

Table 2. Mean levels of E2, FSH with severity of SUI

No	SUI Severity	n (%)	Average E2 (pg/mL)	Standard Deviation	Mean FSH (mIU/mL)	Standard Deviation
1	Mild	11(44)	14.25	5.78	49.70	17.61
2	Moderate	12 (48)	7.91	9.64	54.13	19.53
3	Severe	2 (8)	9.14	12.92	70.97	16.96

Table 3. Mean levels of E2 and FSH with age

Characteristics	n (%)	E2 (pg/mL)		FSH (mIU/mL)	
		mean	Standard Deviation	mean	Standard Deviation
Age (Years)					
< 60	10 (40)	10.17	9.05	55.92	21.59
≥ 60	15 (60)	11.21	8.52	51.93	17.04
Duration of menopause (Year)					
< 10	13 (52.0)	11.47	7.32	59.15	19.08
≥10	12(48.0)	13.08	8.12	47.44	16.88

Table 4. The results of the analysis of E2, FSH levels with the severity of SUI

Spearman's Correlation	*P values*	Correlation coefficient
E2 levels with SUI severity	0.084	-0.353
FSH levels with severity of SUI	0.367	0.189

In this study (Table 3), the highest mean E2 levels were found at age > 60 years and the lowest at age <60 years. The results of this study contradict the research of Fidel et al. that said that parity age and duration of menopause had a strong negative correlation with E2 levels.[24] Likewise, a study by Randolph et al. (2004) reported that E2 levels decreased significantly with age, with a sharper decline at higher age. Similarly, FSH levels increase significantly with age.[25]

In this study (Table 3) menopausal duration > 10 years had a higher average E2 level compared to menopause duration < 10 years, while FSH levels were higher in menopause < 10 years compared to menopause > 10 years (Table 3). This study results contrast with research by Fidel et al. (2016) which reported that the length of menopauseduration was strongly negatively correlated with serum E2 levels, with a value of r = -0.880, which indicates that the longer menopause duration the lower the E2 level.[19]

Based on Table 4, the significance value or Sig (2-tailed) was 0.084, meaning that there was no significant relationship between E2 levels and the severity of SUI (p > 0.05). The results of this study are supported by research by Waetjen et al. (2011) who found that changes in endogenous E2 levels from year to year had no effect on the development or worsening of IU in women undergoing the menopausal transition. It is reported that the distribution and density of estrogen receptors can vary in different tissues depending on estrogen exposure and menopausal status. Genotypic variations in the estrogen receptor and estrogen metabolism may lead to different effects of estrogen on IU.[26] The results of this analysis contradict the study by Khanjani (2017) that the decrease of estrogen causes atrophy of the urogenital mucosa, lining of the urethra and bladder so that it can affect the severity of IU.[2] This study is also in contrast to Gopal et al.'s (2008) which reported a sharp decrease in E2 levels over time had significantly lower IU scores. It was reported that women between the ages of 45 and 49 years had significantly higher IU scores than women older than 55 years.[27]

The relationship between the variable levels of E2 and the severity of SUI in this study, obtained a correlation coefficient of -0.353, meaning that the level of strength of the relationship between the variables of severity and levels of E2 (weak relationship).

The direction (type) of the relationship between the E2 level variable and the severity of SUI with the correlation coefficient number in the above results is negative, namely -0.353 so that the strength of the relationship between the two variables is not unidirectional (type of relationship is not unidirectional). Thus, it can be interpreted that the lower the level of E2, the severity of SUI also increases.

Based on the results of the significant relationship between FSH levels and the severity of SUI (Table 4), it is known that the significance value or Sig (2-tailed) of 0.367 means that there is no significant relationship between the FSH level variable and the severity of SUI. The results of this study are similar to those of Elaine et al. who reported that FSH levels changed significantly during the menopausal transition, not differing between those with IU and those without IU.[26]

The relationship between the FSH level variable and the severity of SUI in this study obtained a correlation coefficient of 0.189, meaning that the level of strength of the correlation between the severity variable and FSH levels (very weak relationship).

The direction (type) of the relationship between the FSH level variable and the severity of SUI with the correlation coefficient number in the above results is positive, namely 0.189 so that the strength of the relationship between the two variables is unidirectional (type of unidirectional relationship). Thus, it can be interpreted that the higher the level of FSH, the severity of SUI also increases.

High FSH at menopause due to the gradual loss of ovarian function will reduce its ability to respond to stimulation by pituitary hormones to produce steroid hormones. The pituitary gland will stimulate the ovaries to secrete FSH so that FSH levels will increase due to the loss of the negative feedback mechanism of ovarian steroids and inhibit the gonadotropin release.[24]

In this study, E2 levels and FSH levels did not completely cause the severity of SUI, but were also influenced by parity factors and delivery methods. In a

study conducted by Rami et al. (2020) it was reported that older women, obesity, a history of gynecological surgery, and a history of vaginal delivery and parity had major correlations with the occurrence of SUI.[6,28]

According to research by Jianping et al. (2021) oxidative stress causes apoptosis in granulosis cells from follicles in the ovaries. Apoptosis will cause follicles to become atresia, degenerative and decrease in number. Disorders of folliculogenesis which is described by the small number of follicles and the small diameter of the follicles will interfere with steroidogenesis which results in the formation of sex steroid hormones being disrupted. Low estrogen levels will form fewer FSH receptors in the follicle so that it cannot form a dominant follicle, thus folliculogenesis will also be inhibited. Oxidative stress in the initiation of apoptosis in granulosa cells of primordial follicles and growing follicles can be caused by various stimuli, such as alcohol, radiation and smoking, malnutrition, obesity and overactivity.[29]

The advantage of this study is that there are still not many studies that have raised the topic of the relationship between E2 levels and FSH levels with the severity of SUI using the ISI scoring system in menopausal women. Researchers can also find out the prevalence of SUI in menopausal women at Ulin Hospital Banjarmasin and determine the relationship between E2 and FSH levels with the severity of SUI in menopausal women. The limitation of this study is that the E2 level measurement instrument cannot read E2 levels at levels below 9 (pg/mL) so E2 levels <9 pg/mL, cannot be read on laboratory examination equipment at Ulin Hospital Banjarmasin.

CONCLUSION

There was no significant relationship between E2 and FSH levels with the severity of SUI in menopausal women. It is necessary to do research on other factors that influence the high severity of SUI in menopausal women.

DISCLOSURES

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Conflict of Interest

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Author Contribution

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