

Correlation between Estrogen Levels with Lipid Profile in Menopause Women in West Sumatera

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Abstract

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BACKGROUND: Menopause is a condition where women had not experienced menstruation for 12 consecutive cycles. At menopause period, there is alteration in women reproductive cycle where estrogen decreased and lipid status altered.

AIM: This study is aimed to understand the association of estrogen level and lipid status in menopause women.

METHODS: This study was an observational study with cross-sectional design underwent in Obstetrics and Gynecology Polyclinic Dr M. Djamil Hospital, Padang to examine estrogen level and lipid level in 107 menopause women aged between 40-60 years old. The study was conducted for 6 months. The relationship between estrogen level and lipid profile was done using correlation test and p-value < 0.05 is significant.

RESULTS: There was no significant correlation between estrogen and total cholesterol (p = 0.146), LDL (p = 0.496), HDL (p = 0.172) and triglyceride (p = 0.296) in menopause women. There was negative correlation between estrogen with total cholesterol (r = -0.141; p = 0.146), HDL (r = -0.133; p = 0.172) and triglyceride (r = -0.1; p = 0.296) and a little positive correlation with LDL (r = 0.06; p = 0.496). Estrogen levels are not related to total Cholesterol, LDL, HDL, and triglyceride in menopause women

CONCLUSION: Estrogen levels did not correlate with lipid status in menopause women in West Sumatera.

Introduction

Human survival rate recently has been increased, both in a developed country and developing country. In the year 2000, there was 35 million (about 12% of the total population) above 65 years old in America and the year 2030, it was estimated that elderly population in America would reach 70 million [1]. In Indonesia, it was estimated that in the year 2020, there would be 27.08 million population 60 years older [2]. There were decreased biological process in the increased elderly population, wherein women; this would significantly affect the reproductive system among other systems. One of them is menopause with all of its subsequent effect [1].

Menopause is a condition where women had not experienced menstruation for 12 consecutive cycles. Menopause onset is varied in each people, ranging between 45 to 55 years. Menopause could occur because at least one process in menstruation mechanism is impaired [1].

At menopause, there is alteration in women reproductive system. Ovary function decreased due to ageing. This is characterised by depleted total follicle, sclerosing blood vessel and decreased sex steroid synthesis (estrogen). Decreased ovary function would cause impaired ovary ability to answer gonadotropin stimulation, which in turn disrupting hypothalamus-hypophysis-ovary interaction. This situation would increase the Follicle Stimulating Hormone (FSH) dan Luteinizing Hormone (LH) levels. Besides, endometrium would be atrophied due to low estrogen

level [3]. This change caused symptoms in menopause women such as vasomotor problem, somatic complaints such as dyspareunia, hair loss, dry vagina, arthralgia, palpitation, and psychological such as sleep disturbance and insomnia, mood alteration, and cognitive problem [4], [5], [6], [7].

Decreased estrogen also could affect lipid profile in menopause women. Endogenous estrogen has a suppressive effect on lipase activity in the liver; low estrogen level before and after menopause is correlated with high lipase activity in the liver [8], [9]. Subsequently, high lipase activity would cause a decrease in HDL2 cholesterol level and a small increase of solid LDL particle, correlated to the increase of CVD risk [10]. Moreover, estrogen also contributed in the regulation of lipoprotein lipase, and lipoprotein lipase is responsible for hydrolysing TG to chylomicrons and VLDL; Therefore, estrogen decrease during menopause could cause dysregulation of lipoprotein lipase [11].

Several studies showed that lipid levels and body weight was correlated with age and total cholesterol level and low-density lipoprotein cholesterol (LDL-C), particularly in menopause status [12]. Stevenson John C and colleagues found that postmenopause women significantly had higher concentration of total cholesterol ($p < 0.001$), triglyceride ($p < 0.005$), LDL cholesterol ($p < 0.001$) and HDL 3 cholesterol subfraction ($p < 0.001$), while HDL cholesterol and HDL2 was significantly lower ($p < 0.001$) [13]. Studies about estrogen level and lipid status in menopause women are scarce, and this study was aimed to analyse the correlation of estrogen level with lipid profile of menopause women in West Sumatera.

Methods

This was an observational study with a cross-sectional study design. The study was conducted in Obstetrics and Gynecology Outpatient Clinic Dr M. Djamil Hospital, Padang to collect samples and Biomedicine laboratory to examine estrogen level and lipid profile. The study was conducted for 6 months. The study population were all menopause women aged between 40-60 years old who presenting herself to Obstetrics and Gynecology Outpatient Clinic Dr M. Djamil Hospital, Padang. The study sample was part of population satisfying inclusion and exclusion criteria. Inclusion criteria were patients willing to study sample by writing informed consent by the patient and had no hormone replacement therapy. Exclusion criteria were menopause due to ovary extraction, had severe infectious disease, alcoholic, smoker, and labour/ athlete. The minimum sample was set at 107 women. This study used consecutive sampling technique. The patient had their history taken and

explained about the examination, which is the clinical examination of obstetrics and gynaecology. Then blood sample was collected in the morning to examine for study variables, i.e. estrogen and lipid status. Blood collected from a cubital vein and preserved in the laboratory until the total sample had been fulfilled, then be examined collectively. Total cholesterol, triglyceride, HDL and LDL were determined using the ELISA method and estrogen using Elisa Kit (Biovision catalogue #K3829-100). Data were calculated using the statistic method, i.e. mean, standard deviation, normality test using Kolmogorov Smirnov Test and Linearity Test, and correlation test using Pearson's test and Spearman's test correlation. Univariate analysis was done to assess the mean value of study characteristics. Bivariate analysis was aimed to assess the correlation of estrogen level with lipid level. Data analysis was done using computer statistic program.

Results

Mean menopausal age was shown in Table 1 which was 48.89 ± 3.05 years and mean lipid profile consisted of total cholesterol, LDL, triglyceride and HDL were 247.98 ± 46.30 mg/dl, 146.64 ± 37.68 mg/dl, 128.25 ± 106.63 mg/dl and 62.32 ± 19.98 mg/dl, respectively. Whereas mean estrogen level in menopause women was 24.08 ± 16.71 pg/ml.

Table 1: Mean of Menopausal Age, Total Cholesterol, Triglyceride, LDL, HDL, and Estrogen in Menopause Women

| Variable | Variable | Mean \pm SD |
|-------------------|-----------|---------------------|
| Menopausal age | years old | 48.89 \pm 3.05 |
| Total cholesterol | mg/dl | 247.98 \pm 46.30 |
| LDL | mg/dl | 146.64 \pm 37.68 |
| HDL | mg/dl | 62.32 \pm 19.98 |
| Triglyceride | mg/dl | 128.25 \pm 106.63 |
| Estrogen | pg/ml | 24.08 \pm 16.71 |

Correlation of menopausal age with lipid plasma in menopause women was shown in Table 2. There was no significant relation between menopausal age with total cholesterol ($p = 0.893$), LDL ($p = 0.801$), HDL ($p = 0.414$) and triglyceride ($p = 0.740$) and there was negative correlation between menopausal age and total cholesterol levels ($r = -0.013$), LDL ($r = -0.025$) and triglyceride ($r = -0.032$) and little positive correlation with HDL level ($r = 0.08$).

Table 2: Relationship of Menopausal Age and Lipid Plasma Level

| Variable | Correlation Coefficient | p value |
|-------------------------------------|-------------------------|---------|
| Menopausal age vs Total Cholesterol | -0.013 | 0.893 |
| Menopausal age vs LDL | -0.025 | 0.801 |
| Menopausal age vs HDL | 0.08 | 0.414 |
| Menopausal age vs Triglyceride | -0.032 | 0.740 |

Correlation between estrogen level and lipid plasma level was shown in Table 3.

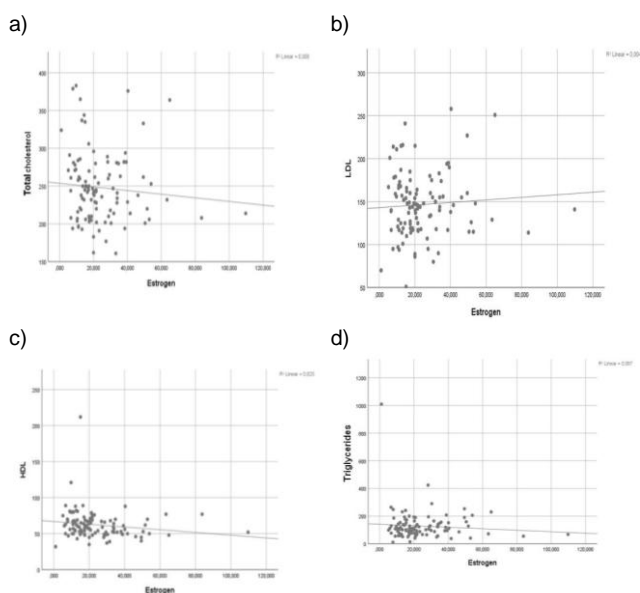


Figure 1: Correlation between estrogen and total cholesterol (a), LDL (b), HDL (c), and Triglycerides (d) concentration in menopause women

There was no significant correlation between estrogen and total cholesterol ($p = 0.146$), LDL ($p = 0.496$), HDL ($p = 0.172$) and triglyceride ($p = 0.296$) in menopause women ($p > 0.05$) and there was negative correlation between estrogen and total cholesterol level ($r = -0.141$), HDL ($r = -0.133$) and triglyceride ($r = -0.1$) and small positive correlation with LDL level ($r = 0.06$).

Table 3: Correlation of Estrogen and Plasma Lipid Level of Menopause Women

| Variable | Correlation Coefficient | p value |
|-------------------------------|-------------------------|---------|
| Estrogen vs Total Cholesterol | -0.141 | 0.146 |
| Estrogen vs LDL | 0.06 | 0.496 |
| Estrogen vs HDL | -0.133 | 0.172 |
| Estrogen vs Triglyceride | -0.1 | 0.296 |

Discussion

Lipid profile alteration was correlated with cardiovascular risk in menopause women. Increased cholesterol, triglyceride, LDL, apolipoprotein B levels and decreased HDL and apolipoprotein A levels are the characteristics of menopause women [14]. This study found that there was an increased mean total cholesterol level despite no mean increase of LDL and triglyceride levels and there was no decrease in mean HDL level in menopause women. Prisilia and colleague in 2016 studying 30 menopause women in Manado found that mean total cholesterol, LDL cholesterol was above reference range while mean triglyceride and HDL was according to a reference range.

In this study, there was no correlation between menopausal age with total cholesterol, LDL,

HDL and triglyceride ($p > 0.05$). There were various results for lipid profile study in menopause women. Study conducted by Domenico de Aloysio showed that there was significant increase in total cholesterol (6.9%, $P < 0.001$), LDL (7.5%, $P < 0.001$), and triglyceride (9%, $P < 0.002$) in post-menopause women compared with premenopause women [15]. Several studies showed that lipid level and weight was correlated with age while total cholesterol level and low-density lipoprotein cholesterol (LDL-C) was associated with menopause status [12]. Women in the transition period of menopause and post-menopause had LDL level ($p < 0.002$), total cholesterol level ($p < 0.0001$) and triglyceride ($p < 0.004$) higher than premenopausal women [9]. While HDL level had no significant difference between premenopausal women, a transitional period of menopause and post-menopause. In this study there was negative correlation between menopause age with total cholesterol level ($r = -0.013$), LDL ($r = -0.025$) and triglyceride ($r = -0.032$) and little positive correlation with HDL level ($r = 0.08$) [9]. This means that the older onset of menopause the smaller lipid level in the body between women who had early onset of menopause.

This study had no comparison like other studies, i.e. between premenopausal women, transitional period, and post-menopause. LDL and triglyceride levels, which were not increased and HDL level, which was not decreased, could be caused by estrogen levels in menopause women, which was not decreased.

Decreased estrogen level at menopause had affecting lipid profile in menopause women. Endogenous estrogen had a suppressive effect in lipase activity in the liver; low estrogen level before and after menopause was correlated with high lipase activity in the liver [8], [16]. Subsequently, high lipase activity in the liver caused a decrease in HDL2 cholesterol level and a small increase in solid LDL particle, which was correlated with increased CVD risk [8]. Moreover, estrogen also contributed to regulation of lipoprotein lipase, and lipoprotein lipase is responsible for hydrolysing TG to chylomicrons and VLDL [11]; Therefore, estrogen decrease in menopause period could cause dysregulation of lipoprotein lipase. Mean estrogen level in menopause women in this study was 24.08 ± 16.71 pg/ml. This was similar to the study by Ycui, where mean estrogen level was 20.84 ± 29.23 pg/ml [17]. In this study, there was no significant correlation between estrogen and total cholesterol, LDL, HDL and triglyceride ($p > 0.05$) in menopause women. There was negative correlation between estrogen and total cholesterol level ($r = -0.141$), HDL ($r = -0.133$) and triglyceride ($r = -0.1$) and little positive correlation with LDL level ($r = 0.06$) (Figure 1).

Swarnalatha PK showed that there was a significant correlation between estrogen level and decreased HDL cholesterol ($p < 0.01$) in post-menopause women compared with premenopausal

women ($p < 0.01$) [18]. Meslaic L found that estrogen level in menopause women had positive significant correlation with HDL ($p < 0.05$) and negative significant correlation with triglyceride ($p < 0.05$) [14]. G Berg also found negative significant correlation between estrogen and total cholesterol ($r = -0.332$ $p = 0.015$), LDL ($r = 0.301$, $P = 0.023$) [16]. Since this study had a different result with several studies, therefore the future study was needed about lipid profile in premenopausal women, in a transitional period and post menopause and their correlation with estrogen level and another associated hormone such as follicle-stimulating hormone (FSH) and luteinizing hormone (LH).

In conclusion, estrogen levels did not correlate with lipid status in menopause women in West Sumatera.

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