



# Studies on Some of the Serum Biomarkers in Postmenopausal women

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## Abstract

Menopause is the farewell to the reproductive period in the life cycle of a woman. A variety of causes are found to be associated with the shutdown of reproductive windows in a woman's life. The multiple causes include lifestyle, environment, reproductive hormones and so on. The decline of reproductive hormones are identified as the prime reason to the closure of fertile windows in women. The present study aims at the levels of various serum biomarkers and their role in postmenopausal women.

**Keywords:** anticardiolipin antibodies, biomarkers, hypo-prolactinemia, osteoporosis.

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## 1. Introduction

Menopause is a crucial event in every woman's life. It not only changes the physical, physiological, psychological and biological aspects of life but also changes every single aspect of her life. The hormone driven changes totally alter her perimenopausal, menopausal and postmenopausal life.

A complete arrest of ovarian follicular activity and the following permanent cessation of menstruation is termed as menopause (1). It is an age related loss of ovarian hormone production, promotes increased adiposity and associated metabolic pathway, but the molecular mechanisms remain unclear (2).

Biomarker is a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes or pharmacological responses to a therapeutic intervention (3). Menopausal transition is the cause for a wide variations in hormone levels and quantitative changes of other biochemical substances also.

Analysis of some of the prime menopause biomarkers in postmenopausal women is of having great significance in health intervention strategies in this group. Hence the present study is carried out to focus on the levels of certain reproductive hormones and other biomarkers which are providing vital clues about the health status in postmenopausal women.



## 2. Materials and methods

The present study entitled “Studies on some of the serum biomarkers in postmenopausal women” is carried out in Kanyakumari District, Tamil Nadu, the Southernmost part of India [4]. The study includes physically active, medically fit postmenopausal women of age ranging between 29-63 yrs.

The study population is grouped into 3 categories (viz) early (29-44yrs), normal (45-55yrs) and late (56-63 yrs) menopausal women. 10 blood samples are collected in each group (the experimental group) (i.e.) early, normal and late menopausal women and 6 blood samples are collected from the menstruating women of age between 30-50yrs, (two each in 30yrs, 40yrs and 50yrs) which are considered as control group. Blood samples are collected by a well trained staff nurse.

Standard methods are used for the estimation of serum estradiol [5], testosterone [6], progesterone [7], FSH[8], LH[9], prolactin [6], AMH[10], inhibin-B[11], lead [12], C-reactive protein [13], melatonin [14], serotonin [15], dopamine [16], calcium [17], magnesium [18], SGOT[19], SGPT [20], IgG[21] and IgM[22]. Statistical analyses are made with SPSS statistical package (version 11) [23]. Ethics Committee’s guidelines have been strictly adhered during the entire course of study.

## 3. Results

The mean serum estradiol concentration is measured as  $246.67 \pm 24.22$  pg/ml in the normal women (menstruating women), while it is around  $12.83 \pm 2.6$  pg/ml in the menopausal women. The amount of testosterone in the normal women is detected as  $0.33 \pm 0.05$  ng/ml, while it is  $0.75 \pm 0.1$  ng/ml in the menopausal subjects. Likely the progesterone level is found as  $6.88 \pm 3.52$  ng/ml in the menstruating women, but it is  $0.36 \pm 0.08$  ng/ml in menopausal women.

Around  $11.07 \pm 0.98$  mlu/ml FSH is found in the serum of control group, where as it is  $72.4 \pm 8.5$  mlu/ml in menopausal women.  $10.67 \pm 1.21$  mlu/ml LH is found in the serum samples of the menstruating women, but it is  $28 \pm 1.36$  mlu/ml in the menopausal subjects.  $16.67 \pm 1.75$  ng/ml prolactin is measured in the menopausal subjects.  $16.67 \pm 1.75$  ng/ml prolactin is measured in the control group, where as it is  $9.34 \pm 0.81$  ng/ml in the menopausal women (Table.1.)

The quantitative estimation of some of the serum biomarkers in the menstruating and menopausal women are shown in table.2. AMH is found as  $3.87 \pm 0.15$  ng/ml in the



menstruating mothers, while it is  $0.11 \pm 0.1$  ng/ml in the menopausal subjects. It is quite obvious that the amount of serum inhibin-B is around  $246.67 \pm 23.38$  pg/ml in the control and  $1.95 \pm 0.19$  pg/ml in the experimental group. In the normal subjects about  $8.83 \pm 0.15$  µg/dL lead is detected, where as it is around  $9.81 \pm 0.26$  µg/dL in the serum of menopausal women.  $0.43 \pm 0.05$  mg/dL C-reactive protein is found in the serum of normal women, while it is  $0.56 \pm 0.06$  mg/dL in the menopausal subjects.

The amount of day time serum melatonin is seen as  $24.33 \pm 0.04$  pg/ml in the control group but it is  $18.03 \pm 1.07$  pg/ml in the menopausal women. The serum serotonin level is found as  $181.67 \pm 24.01$  ng/ml in menstruating women, while it is around  $95.97 \pm 4.46$  ng/ml in menopausal women.  $85.33 \pm 3.72$  pg/ml dopamine is found out in the serum samples of normal women, where as it is  $77.27 \pm 4.5$  pg/ml in menopausal women. Serum calcium level is noticed as  $9.85 \pm 0.15$  mg/dL in normal women, while it is  $9.11 \pm 0.27$  mg/dL in menopausal women.  $2.46 \pm 0.04$  mg/dL magnesium is detected in the serum samples of menstruating women, where as it is  $2.36 \pm 0.07$  mg/dL in menopausal women.

Table.3. denotes the levels of some enzymes and anticardiolip in antibodies in serum of normal and menopausal women. Serum SGOT level is found as  $34.67 \pm 1.86$  Iu/l in the control and  $41.33 \pm 1.35$  Iu/l in the menopausal group. About  $37.67 \pm 1.63$  Iu/l serum SGPT is detected in menstruating women, but it is around  $61.9 \pm 2.68$  Iu/l in menopausal women. Serum IgG is found as  $1061.67 \pm 79.1$  mg/dL in the control group, but it is  $1272.33 \pm 44.66$  mg/dL in the menopausal group. Similarly serum IgM level is  $105.67 \pm 15.46$  mg/dL in the control subjects, while it is  $169.77 \pm 21.92$  mg/dL in the menopausal subjects.

**Table 1. Reveals the levels of reproductive hormones in serum of normal and menopausal women.(n=36 respondents; 30 menopausal + 6 normal women)  
(Values are ±SD)**

Hormones	Normal women	Menopausal women
Estradiol	$246.67 \pm 24.22$	$12.83 \pm 2.6$
Testosterone	$0.33 \pm 0.05$	$0.75 \pm 0.1$
Progesterone	$6.88 \pm 3.52$	$0.36 \pm 0.08$
FSH	$11.17 \pm 0.98$	$72.4 \pm 8.5$
LH	$10.67 \pm 1.21$	$28 \pm 1.36$
Prolactin	$16.67 \pm 1.75$	$9.34 \pm 0.81$

(t values : normal vs menopausal women,  $p < 0.05$ )

**Table 2. Indicates the levels of serum biomarkers in normal and menopausal women.(n=36 respondents; 30 menopausal + 6 normal women)**

(Values are  $\pm$ SD)

Biomarkers	Menstruating women	Menopausal women
Anti-Mullerian hormone	3.87 $\pm$ 0.15	0.11 $\pm$ 0.01
Inhibin-B	246.67 $\pm$ 23.38	1.95 $\pm$ 0.19
Lead	8.83 $\pm$ 0.15	9.81 $\pm$ 0.26
C-reactive protein	0.43 $\pm$ 0.05	0.56 $\pm$ 0.06
Melatonin	24.33 $\pm$ 1.37	18.03 $\pm$ 1.07
Serotonin	181.67 $\pm$ 24.01	95.97 $\pm$ 4.46
Dopamine	85.33 $\pm$ 3.72	77.27 $\pm$ 4.5
Calcium	9.85 $\pm$ 0.15	9.11 $\pm$ 0.27
Magnesium	2.46 $\pm$ 0.04	2.36 $\pm$ 0.07

(t values : menstruating vs menopausal women,  $p < 0.05$ )

**Table 3. Denotes the levels of some enzymes and anticardiolipin antibodies in serum of normal and menopausal women.(n=36 respondents; 30 menopausal + 6 normal women)**

(Values are  $\pm$ SD)

Biomarkers	Menstruating women	Menopausal women
SGOT	34.67 $\pm$ 1.86	41.33 $\pm$ 1.35
SGPT	37.67 $\pm$ 1.63	61.9 $\pm$ 2.68
IgG	1061.67 $\pm$ 79.1	1272.33 $\pm$ 44.66
IgM	105.67 $\pm$ 15.46	169.77 $\pm$ 21.92

(t values : menstruating vs menopausal women,  $p < 0.05$ )

#### 4. Discussion

Natural or spontaneous menopause occurs naturally without any medical intervention. It is a normal degenerative transition associated with ageing and loss of fertility [24]. The most important changes during menopause are a fall in the levels of most of the serum menopause biomarkers.



Natural menopause is associated with a rapid decline in circulating estrogen [25] and a high level of serum estradiol deficiency is reported by earlier researchers [26,27]. Studies revealed that an increase of FSH and LH are the markers of ovarian ageing [27] and low levels of inhibin-B and AMH [28,29] are hormonal instabilities associated with menopausal transition. It is reported that a decline of progesterone [30], an increase of testosterone [31, 32] which is responsible for stress, hypo-prolactinemia [33, 34] is associated with ovarian dysfunction and a decline of melatonin hormone [35,36] are noticed in menopausal women. Our study confirms a statistically significant level of increase of serum hormones such as FSH, LH and testosterone and a decrease of estradiol, progesterone, melatonin, prolactin, inhibin-B and AMH in menopausal women compared to the menstruating women which reveals their age specific roles in women ( $p < 0.05$ ).

Serotonin, a contributor to the feelings of well-being and happiness [37] is markedly low in menopausal women [38]. It is true in our study also ( $p < 0.05$ ). An earlier report says serotonin and dopamine play a key role in mood, which alters drastically with menopause, as these hormone levels decrease, as a result of estrogen decline [31] and the same trend is noticed in our subjects also ( $p < 0.05$ ).

An elevated level of CRP, a marker for inflammation in menopausal women is reported in an earlier study [39]. Our study coincides with this findings ( $p < 0.05$ ). A tremendous level of increase of blood lead level is noticed in postmenopausal women [40]. Similar findings are observed in our study also ( $p < 0.05$ ).

A decline of serum calcium level is reported by earlier researchers [41,42] and its deficiency during menopause causes osteoporosis [43]. Previous studies have shown that the decline of serum magnesium level is related to diminishing estrogen level in menopause [44, 45]. The role of magnesium in alleviation of hot flashes and help to maintain bone and cardiovascular health is reported in earlier findings [46,47]. A noticeable level of reduction of calcium and magnesium is seen in our menopausal women than the menstruating women ( $p < 0.05$ ).

Elevated levels of live enzymes ALT and AST are noticed in postmenopausal women [48, 49] and the same trend is noticed in our menopausal women also ( $p < 0.05$ ). An earlier report says increased level of anticardiolipin antibodies such as IgG and IgM are related to the development of heart diseases among postmenopausal women [50, 51]. It is true in our study also ( $p < 0.05$ ). Screening of anticardiolipin antibodies will provide vital clues about the risk of heart diseases in menopausal women.



## 5. Conclusion

The ovarian dysfunction and the following decline of ovarian hormones are thought to be the key controllers on the other serum biomarkers in postmenopausal women. The surge or decline of these biomarkers are capable of producing many health related issues and the monitoring of these serum biomarkers are inevitable for a happy life in this group. However, it should be confirmed only through large scale studies.

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