

**ORIGINAL RESEARCH**

# Comparison of antioxidant status in pre and postmenopausal women attending postgraduate medical institutions of North India

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## ABSTRACT

**Background:** Menopause is defined by W.H.O. as “thefinalmenstrualperiod.” This is itself a status of oxidative stress in women’s life which needs good care in this time period.

**Objective:** To estimate the levels of malondialdehyde (MDA), Vitamin C, Uric acid, Albumin and Estrogen in pre and postmenopausal women.

**Materials and Methods:** Total hundred female subjects including fifty healthy premenopausal women as controls and fifty healthy postmenopausal women as cases were enrolled for the study. Five ml of venous blood was drawn under aseptic precautions from antecubital vein in red capped evacuated blood collection tube. Samples were collected after overnight fast for 10–12 hours. Samples were processed within one hour of collection. Serum was separated by centrifugation at 2000 RPM for 10 minutes after clotting. Separated serum was stored at -20°C if not analysed on the same day. Inclusion criteria for cases and controls 1) Healthy premenopausal (twenty five to forty years) women without any menstrual irregularities. 2) Healthy postmenopausal women with history of natural menopause (three to five years of menopause).

**Results:** The levels of vitamin C were found to be significantly lower in cases than controls ( $p < 0.05$ ). Serum albumin levels were low in premenopausal women than postmenopausal women, values are within normal range and this difference was not statistically significant ( $p = 0.074$ ). Serum estrogen level was found to be significantly lower in postmenopausal women than premenopausal women. Serum uric acid levels in postmenopausal women were significantly higher in comparison to premenopausal women. Serum MDA levels in postmenopausal women were found to be significantly higher than premenopausal women ( $p < 0.05$ ).

**Conclusion:** This study suggests that there is enhanced oxidative stress and decreased antioxidant defence in postmenopausal women as compared to premenopausal women which can play an important role in the pathogenesis of the various diseases related to menopause. Therefore antioxidants in the form of micronutrients and vitamins can be given as supplements along with hormone replacement therapy to minimize the damage caused by oxidative stress in postmenopausal women.

**Key words:** MDA, Vitamin C, Estrogen, uric acid, albumin

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## Introduction

Menopause is defined by W.H.O. as “the final menstrual period.” Retrospectively it is defined as one year without the menstrual flow and postmenopause describes those years following this point.<sup>1</sup>Menopause” term is derived from the Greek word ‘men’ means ‘month’ and ‘pau’ means ‘to stop’ that is cessation of menstrual period. Menopause is a natural step in the process of ageing in a woman's life, when her menstruation stops and she is no longer fertile due to depletion of ovarian follicles and gradual decrease in ovarian production of estrogen and other hormones.<sup>2</sup>Every women undergoes menopause, which is an unavoidable physiological age dependent phenomenon, though age of entering in this phase of life and symptoms are different for every women. Free radicals have been proposed as an important causative agents of ageing.<sup>3</sup>It has been observed that there is increased production of free radicals after menopause which is due to sudden alterations in hormonal status, menopausal women develop oxidative stress (OS) because of estrogen deficiency and advancing age.<sup>4</sup> Oxidative stress is defined as the imbalance between oxidant molecular species and antioxidant mechanisms, where oxidants dominate and can lead to tissue damage and cellular dysfunction. Free radicals are potentially harmful to almost all the biomolecules including lipids, carbohydrates, nucleic acids and proteins.<sup>5</sup> Lipid peroxidation proceeds as a self-perpetuating chain reaction to form lipid peroxides and aldehydes like malondialdehyde (MDA).<sup>6</sup> Unfortunately, direct investigation of these free radicals *in vivo* is difficult because most of the free radical species have an extremely short half-life and cannot easily be trapped under physiological conditions. But indirect information on the impact of free radicals may be obtained by comparisons of the antioxidant concentrations. So we planned this study to find out is any relation between menopause and oxidative stress, as enhanced oxidative stress might be a reason for increased tissue damage and other physiological symptoms that women face after menopause.

The level of oxidative stress was measured as malondialdehyde, the end product of lipid peroxidation reaction that is produced as a result of damage to cell membrane lipids by free radicals. The extent of protection against oxidants was determined by the levels of estrogen, vitamin C, uric acid, and albumin in serum of premenopausal and postmenopausal healthy females.

**Aims and Objectives:** To estimate the levels of malondialdehyde (MDA), Vitamin C, Uric acid, Albumin and Estrogen in healthy premenopausal and healthy postmenopausal women.

## Material and Methods

**Study Type:** This was an institute based observational study conducted in department

of Medical Biochemistry of P.G.I.M.S. Rohtak during a time period of one and half year i.e. starting from January 2015 to June 2016.

**Sample size:** Total hundred female subjects including fifty healthy premenopausal women as controls and fifty healthy postmenopausal women as cases were enrolled for the study as per by using convenient method of sampling.

## Inclusion criteria for cases and controls

1. Healthy premenopausal (twenty five to forty years) women without any menstrual irregularities.
2. Healthy postmenopausal women with history of natural menopause (three to five years of menopause).

## Exclusion criteria for cases and controls

1. History of cardiovascular diseases.
2. History of rheumatoid arthritis.
3. History of radiotherapy.
4. History of liver and renal disease.
5. History of endocrinal disease.
6. Women on antioxidant and vitamin supplements.
7. Women on Hormone Replacement Therapy.
8. Family history of surgical menopause or early menopause.

## Estimation of Parameters

**Serum Preparation:** Five ml of venous blood sample were collected after overnight fast of 10–12 hours. Samples were processed within one hour of collection. Serum was separated by centrifugation and stored at -20°C if not analysed on the same day. Estimation of serum MDA<sup>7</sup>

**Principle:** Lipid peroxidation products reacts with thiobarbituric acid to give a red chromogen which is estimated at 535 nm.

## 2) Vitamin C Estimation<sup>8</sup>

**Principle:** Ascorbic acid in the presence of cuprous ion get oxidised to dehydroascorbic acid which react with 2,4-dinitrophenylhydrazine to form a red bishydrazone having absorbance maximum at 520 nm.

- 3) Estradiol estimation by Chemiluminescence.
- 4) Uric acid estimation by standard enzymatic method by autoanalyser.
- 5) Estimation of albumin by Dye-binding method by autoanalyser.

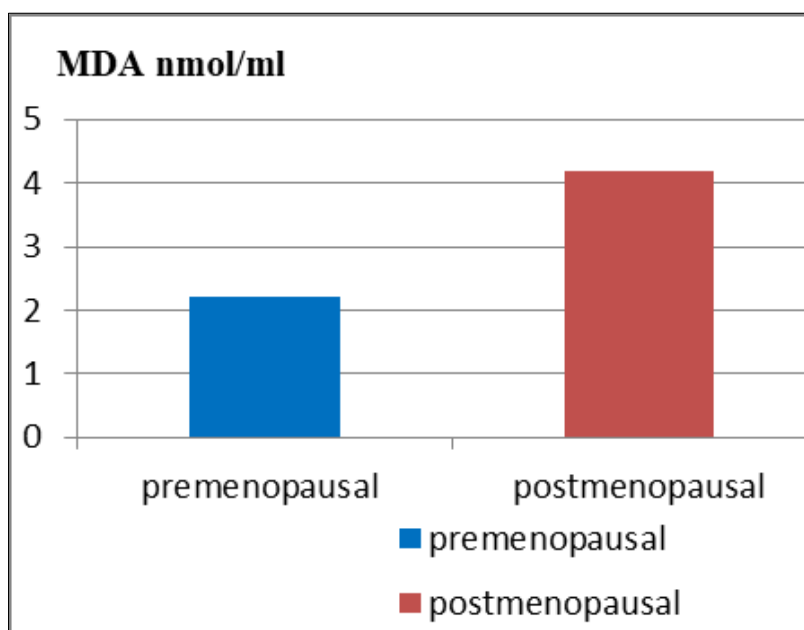
## Result and Observation

In the present study entitled as “Antioxidant status in premenopausal and postmenopausal women” it has been studied about the antioxidant status, lipid peroxidation status along with routine investigations among the participants and all these parameters had been compared among fifty postmenopausal healthy women selected as cases and fifty healthy

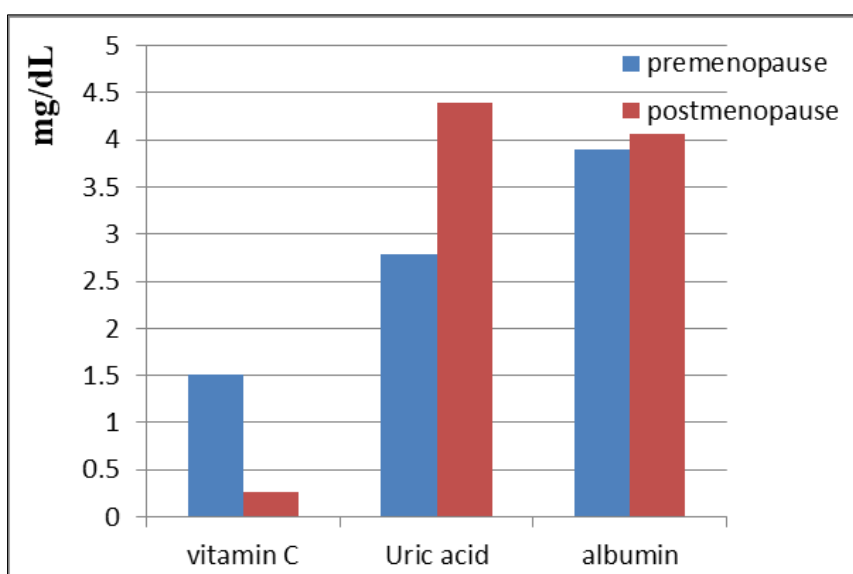
premenopausal women who were used as controls. The value  $<0.05$  was considered as significant. results were expressed in terms of mean  $\pm$  SD. The p

**Table 1: Different antioxidant parameters stratus among both of the groups**

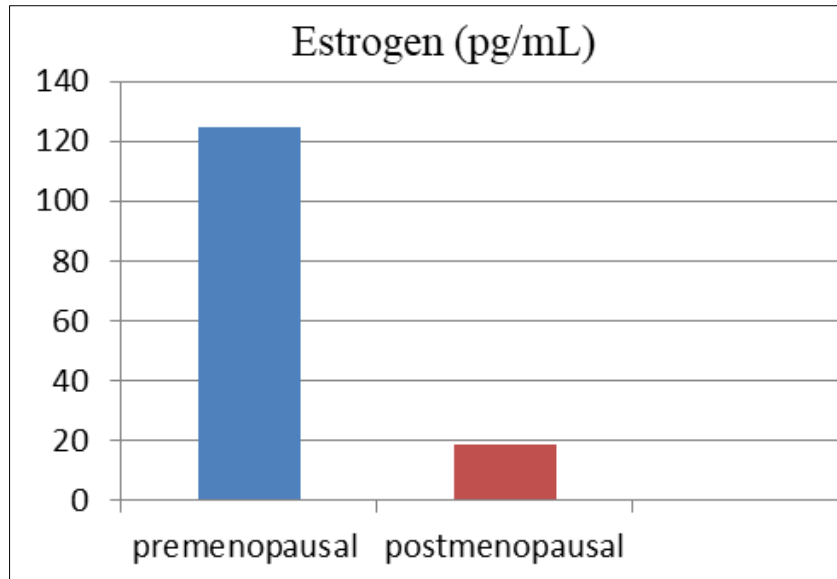
Parameter		Premenopausal	Postmenopausal	p-value
Estrogen (pg/ml)	Mean $\pm$ 2 SD	124.92 $\pm$ 18.67	33.94 $\pm$ 10.90	$<0.05$
	range	85.54 – 163	10.7- 55.48	
Vit C (mg/dl)	Mean $\pm$ 2SD	1.51 $\pm$ 0.35	0.26 $\pm$ 0.25	$<0.05$
	range	0.67 -2.4	0.11 – 1.4	
Uric acid (mg/dl)	Mean $\pm$ SD	2.79 $\pm$ 0.64	4.36 $\pm$ 0.68	$<0.05$
	range	2 – 4.9	3.1 -5.8	
Albumin (g/dl)	Mean $\pm$ SD	3.89 $\pm$ 0.494	4.07 $\pm$ 0.49	0.074
	range	3 – 4.9	3- 5	
MDA(nmol/ml)	Mean $\pm$ SD	2.21 $\pm$ 0.43	4.19 $\pm$ 0.65	$< 0.05$



**Fig1: Distribution of MDA in pre and postmenopausal women**



**Fig2: Distribution of vitamin-C, uric acid, albumin in pre and postmenopausal women**



**Fig3: Distribution of estrogen in premenopausal and postmenopausal women**

**Discussion**

In the present study, we have observed a significant increase in MDA levels in postmenopausal women in comparison to premenopausal women. The mean malondialdehyde level was found  $2.21 \pm 0.43$  nmol/mL in premenopausal group and  $4.19 \pm 0.65$  nmol/mL in postmenopausal group. The findings of our study were in accordance with the studies conducted by Sanchez *et al.*,<sup>9</sup> Arora *et al.*<sup>10</sup> Shrivastava *et al.*<sup>11</sup> and Bednarek *et al.*<sup>12</sup> In the present study increased MDA level due to increased lipid peroxidation in postmenopausal women is probably due to marked reduction in antioxidants, it suggests that aging along with deficiency of antioxidant may be responsible for the increase in MDA level. Victorino *et al.*<sup>13</sup> in their study concluded that postmenopausal women have decreased level of MDA in comparison to premenopausal women, they showed that this may be due to catechol metabolites of endogenous estrogen generates reactive oxygen species in premenopausal women so that increased MDA, while estrogen is decreased in postmenopausal women causes decreased reactive oxygen species in them.

Higher estrogen level was found in premenopausal group as compared to postmenopausal group. The present study is comparable with the studies conducted by Unfer *et al.*<sup>14</sup>, Arora *et al.*<sup>10</sup>, In our study a significant decrease has been observed in the levels of serum vitamin C levels in postmenopausal females as compared to premenopausal females The decrease in the levels of vitamin C in postmenopausal females might be due to its increased consumption to counteract the increased oxidative stress and to inhibit membrane lipid peroxidation. Arora *et al.*<sup>11</sup> had also found the similar result

In the present study the level of serum albumin was found to be increased in postmenopausal women than in comparison of premenopausal women the increase in albumin may be due to its action as an antioxidant

to cope up the oxidative stress in postmenopausal women or it may be due to a relatively dehydrated condition developed in postmenopausal women in comparison to premenopausal women. This is probably due to loss of a positive effect of estrogen on renal tubular reabsorption of water.

Similarly, study conducted by Maruhashi *et al.*<sup>15</sup> also found increased serum uric acid level in postmenopausal women than premenopausal women; this may be due to uricosuric action of estrogen.<sup>16</sup> The above finding was also justified by Chen *et al.*<sup>17</sup> in their study. Study conducted by Chinanayere *et al.*<sup>18</sup> reported that serum albumin levels decreases continuously as the menopausal age increases while it is more in early postmenopausal duration than premenopausal women.

**Conclusion**

This study suggests that in postmenopausal women the antioxidant defense (i.e. estrogen, vitamin C) decreases and oxidative stress increases as compared to premenopausal women and serum albumin and uric acid is increased to counteract the oxidative stress developed during menopause. So it is concluded that menopause is a relatively more oxidative stressed condition compare to premenopausal women. This study also suggests that there is increase in atherogenic lipid profile in postmenopausal women as compared to premenopausal women i.e. postmenopausal women have more cardiovascular disease risk. The health problems cropping up during this period are now obvious and better understood. It is therefore important to address all these menopause related diseases and apply prophylactic measures so that these women can lead an enjoyable and healthy life.

## References

1. Reddish S. Menopausal transition- assessment in general practice. *Aust Fam Physician*. 2011;40:266-72.
2. Burger HG, Dudley EC, Hopper JL. The endocrinology of the menopausal transition: a cross-sectional study of a population-based sample. *J Clin Endocrinol Metab*. 1995;80:3537-45.
3. Miquel J, Ramirez BA, Ramirez JV, Alperi JD. Menopause: a review on the role of oxygen stress and favourable effects of dietary antioxidants. *Arch Gerontol Geriatr*. 2006;42:289-306.
4. InalME, Kanbak G, Sunal E. Antioxidant enzyme activities and malondialdehyde levels related to aging. *ClinChimActa*. 2001;305:75-80.
5. Halliwell B. Tell me about free radicals, doctor: a review. *J R Soc Med*. 1989;82:747-52.
6. Pryor WA, Stanley JP. A suggested mechanism for the production of MDA during autoxidation of PUFA. Nonenzymatic production of prostaglandin endoperoxides during autoxidation. *J Org Chem*. 1975; 40:3615-7.
7. Bednarek TG, Bohdanowicz PA, Bidzinska B, Milewicz A, Antonowicz JJ, Andrzejak R. Serum lipid peroxide levels and erythrocyte glutathione peroxidase and superoxide dismutase activity in premenopausal and postmenopausal women. *Gynecol Endocrinol*. 2001;15:298-303.
8. Prince RL, Dick I, Devine A, Roger IP, Guteridge DH, Kerr D, *et al*. The effects of menopause and age on calcitropic hormones: a cross-sectional study of 655 Healthy Women Aged 35 to 90. *J Bone Miner Res*. 1995;10:835-42.
9. Sanchez-Rodriguez MA, Zacarias-Flores M, Arronte-Rosales A, Correa-Munoz E, Mendoza-Nunez VM. Menopause as risk factor for oxidative stress. *Menopause*. 2012;19:361-7.
10. AroraKS, Gupta N, Singh RA, Nagpal S, Arora D. Role of free radicals in menopausal distress. *J ClinDiag Res*. 2009; 3:1900-2.
11. Shrivastava V, Singh S, Singh N, Sapre S. Status of antioxidant enzymes and trace metals in postmenopausal women. *J ObstetGynecol*2005; 55:64-6.
12. Bednarek TG, Bohdanowicz PA, Bidzinska B, Milewicz A, Antonowicz JJ, Andrzejak R. Serum lipid peroxide levels and erythrocyte glutathione peroxidase and superoxide dismutase activity in premenopausal and postmenopausal women. *GynecolEndocrinol*. 2001;15:298-303.
13. Victorino VJ, Panis C, Campus FC, Cayres RC, Colado-Simao AN, Oliveira SR, *et al*. Decreased oxidant profile and increased antioxidant capacity in naturally postmenopausal women. *Age*. 2013;35:1411-21.
14. Unfer TC, Figueiredo CG, Zanchi MM. Estrogen plus progestin increase superoxide dismutase and total antioxidant capacity in postmenopausal women. *Climacteric*. 2014;17:1-10.
15. Maruhashi T, Nakashima A, Soga J, Fujimura N, Idei N, Mikami S, *et al*. Hyperuricemia is independently associated with endothelial dysfunction in postmenopausal women but not in premenopausal women. *BMJ*. 2013;3:1-8.
16. Mumford SL, Dasharathy SS, Pollack AZ. Serum uric acid in relation to endogenous reproductive hormones during the menstrual cycle: findings from the Bio Cycle Study. *Hum Reprod*. 2013;28:1853-62.
17. LY Chen, WH Zhu, ZW Chen, Dai HL, Ren JJ, Chen JH, *et al*. Relationship between hyperuricemia and metabolic syndrome. *J Zhejiang Univ Sci B*. 2007;8:593-8.
18. Chinayere OUA, Oneyukwu CU, Nsonwu AC. Biochemical bone turnover marker in postmenopausal women. *Asian J Biochem*. 2007;2:130-5.