

Impact of supplementation of drumstick (*Moringa oleifera*) and amaranth (*Amaranthus tricolor*) leaves powder on menopausal symptoms of postmenopausal women

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Abstract- Physiological and psychological changes occurring during the menopause influence both symptomatology and sexuality. Drumstick (*Moringa oleifera*) and amaranth (*Amaranthus tricolor*) leafy vegetables which are rich in micronutrients are helpful. So, the study was designed to see the effect of supplementation of dried drumstick and amaranth leaves powder on menopausal symptoms in postmenopausal women. Ninety postmenopausal women aged 45-60 years were selected and divided into three groups viz. Group I, II and III having thirty subjects in each group. The subjects of group II and III were supplemented daily with 7g drumstick leaves powder (DLP) and 9g amaranth leaves powder (ALP), respectively for a period of three months in their diet. The subjects of group I was not given supplementation. Information regarding menopause were collected. Menopause Rating Scale was used for various assessment and observation of postmenopausal symptoms among subjects. The mean standard error, analysis of variance and their statistical significance was ascertained using a computer programme package. The data revealed that 100, 83.3 and 70.0 per cent subjects in group I (control), group II (DLP supplementation) and group III (ALP supplementation) had gradual cessation of periods, whereas 16.7 and 30.0 per cent of subjects had experienced abrupt cessation of periods in group II and group III respectively. Irregularity of periods (2-3 months) was observed in gradual cessation of periods. Supplementation of DLP and ALP significantly decreased the severity of postmenopausal symptoms with decrease in total menopause rating score by 17.0 and 11.7 per cent in group II and III respectively. The results indicated that these plants possess antioxidant property and have therapeutic potential for the prevention of complications during postmenopause.

Index Terms- Amaranth leaves powder, Drumstick leaves powder, Menopausal symptoms

I. INTRODUCTION

Menopause is a unique stage of female reproductive life cycle. In present era with increased life expectancy, women are likely to face long periods of menopause accounting to approximately one third of her life. The average age of menopause in the western world is 51 years while according to Indian Menopause Society (IMS) research, the average age of Indian menopausal women is 47.5 years. Average age of

menopause is around 45- 55 years. So menopausal health demands even higher priority in Indian Scenario (Pal *et al* 2013). Physiological and psychological changes occurring during the menopause influence both symptomatology and sexuality, with a complex interplay of individual factors affecting wellbeing. Following the menopause, the effects of urogenital ageing are commonly apparent, with declining levels of estrogen producing atrophic changes (Nappi and Kierepa 2010). The antioxidant enzyme system seems to be affected in postmenopause due to deficiency of estrogen, which has got antioxidant properties. The beneficial effects of estrogen might be attributable to their free radical scavenging structures. (Shrivastava *et al* 2005). In such condition green leafy vegetables which are rich in micronutrients are helpful. There are many varieties of green leafy vegetables, which are rich in antioxidants and other essential micronutrients, but they are discarded and are not used for human consumption. Drumstick (*Moringa oleifera*) and amaranth (*Amaranthus tricolor*) leaves are one of them, which are available at no cost and are very rich in all the micronutrients (Sreelatha and Padma 2009, Anilakumar *et al* 2006). Hence, the present study was designed to see the effect of supplementation of dried drumstick and amaranth leaves powder on menopausal symptoms in postmenopausal women.

II. METHODOLOGY

Procurement of antioxidant powders: Fresh leaves of Drumstick (*Moringa oleifera*) and amaranth (*Amaranthus tricolor*) were procured from Department of Vegetable Crops, Punjab Agricultural University, Ludhiana. Fresh leaves were sorted and washed. Washed leaves were spread and dried in oven at 40°C for 4-6 hours and then powdered. Powdered drumstick leaves were named as Antioxidant powder I (DLP) and amaranth leaves as antioxidant powder II (ALP). All other ingredients were purchased from the local market.

Selection of subjects and supplementation: Ninety healthy postmenopausal women aged between 45-60 years, who were not having their menstrual period from last 1-3 years were selected for the study. Women who had undergone hysterectomy or taken hormone replacement therapy were excluded from the study. The selected subjects were equally divided into three groups viz. group I, group II and group III i.e. 30 in each group. Subjects of group II and group III were supplemented with antioxidant powder I (Drumstick leaves powder: 7g) and antioxidant powder

II (Amaranth leaves powder: 9g) in the recipes in daily diet for three months, whereas group I was not given any supplementation.

Analysis of menopausal symptoms: Menopause Rating Scale (Heinemann *et al* 2003) was used for various assessment and observation of postmenopausal symptoms among subjects.

Statistical analysis: The data on all the menopausal symptoms was analyzed statistically. The mean standard error, analysis of variance and their statistical significance was ascertained using a computer programme package (Cheema and Singh 1990).

III. RESULTS AND DISCUSSION

Ninety postmenopausal subjects were identified and divided into three groups. Information regarding menopause revealed that 100, 83.3 and 70.0 per cent subjects in group I (control), group II (DLP supplementation) and group III (ALP supplementation) had gradual cessation of periods, whereas 16.7 and 30.0 per cent of subjects had experienced abrupt cessation of periods in group II and group III respectively. Irregularity of periods (2-3 months) was observed in gradual cessation of periods. As menopause is natural process which occurs as a part of woman's normal aging process. It results in atresia of almost all oocytes in ovaries, causing increase in FSH and LH levels and thus decrease in oestrogen levels. This decrease in production of oestrogen leads to postmenopausal symptoms of hot flushes, insomnia, mood changes, generalized physical and mental exhaustion as well as vaginal atrophy, bladder problems and osteoporosis (Pal *et al* 2013).

Severity of menopausal symptoms before and after supplementation

Somato-vegetative subscale

Table 1 represents severity of somato-vegetative subscale symptoms of the subjects which includes hot flushes, heart discomfort, sleep problems and joint and muscular discomfort. The finding of the present study revealed that the main problem of menopausal women was hot flushes. Majority of subjects i.e. 50 and 40 per cent in experimental group II (DLP supplementation) and group III (ALP supplementation) experienced very severe hot flushes before supplementation which decreased to 30 and 26.7 per cent respectively. Malacara *et al* (2002) also reported hot flushes as one of the severe problem among postmenopausal women. Heart discomfort was severe in 16.7 per cent subjects of group II before supplementation which decreased to 6.7 per cent. No change was observed for group II. It was observed that 56.7 per cent subjects in group II and group III had very severe sleep problems which decreased to 36.7 and 33.3 per cent respectively after supplementation. Only 3.3 per cent subjects in each group did not have sleep problems before and after supplementation. Supplementation of DLP and ALP decreased severe joint and muscular discomfort by 73.3 and 83.3 per cent to 66.7, 73.3 per cent in group II and group III respectively. Rahman *et al* (2010) reported the three most prevalent menopausal symptoms among middle age women were joint and muscular discomfort (80.1%), physical and mental exhaustion (67.1%) and sleeping problems (52.2%).

Psychological subscale

Table 2 represents severity of psychological subscale symptoms of the subjects which includes depressive mood, irritability, anxiety and physical and mental exhaustion. It was observed that 20 per cent subjects of group III had very severe depressive mood before supplementation which decreased to 13.3 per cent whereas no change was observed for group II. Irritability was found to be severe in subjects of group II (23.3 per cent) which decreased to 16.7 per cent after supplementation whereas no change was observed for group III. Anxiety was observed to be very severe in 36.7 per cent subjects of group II and group III before supplementation which decreased to 26.7 and 23.3 per cent after supplementation. Supplementation of DLP and ALP improved physical and mental exhaustion by 50 and 60 per cent to 60 and 66.7 per cent in subjects of group II and group III respectively. Minuzzi *et al* (2013) reported a heightened risk for depression during early postmenopausal years (up to 2 years postmenopause).

Urogenital subscale

Table 3 represents severity of urogenital subscale symptoms of the subjects which includes sexual problems, bladder problems and dryness of vagina. Data revealed that before supplementation 73.3 per cent subjects of group II had very severe sexual problem which decreased to 66.7 per cent after supplementation. It was observed that 23.3 per cent subjects of group II had very severe bladder problems which decreased to 16.7 per cent after supplementation. Results concluded that 50 and 60 per cent subjects of group II and group III did not have dryness of vagina which increased to 60 and 66.7 per cent respectively after supplementation. Milsom and Molander (1998) documented that vaginal atrophy and urogenital complaints such as vaginal discomfort, dysuria and recurrent lower urinary tract infections are more common in women after menopause and more than 50% of postmenopausal women suffer from at least one of these symptoms.

Menopause Rating Scale (MRS) scores obtained by the subjects

MRS scores obtained by the subjects before and after supplementation of antioxidant powder I and II is given in the Table 4.

Somato-vegetative symptoms score

The mean scores for somato-vegetative symptoms of subjects ranged from 8.36 to 9.36 before supplementation of antioxidant rich powders. The mean initial scores before supplementation were 9.36 ± 0.34 and 8.73 ± 0.27 for group II and group III, respectively while change in score after supplementation were 7.76 ± 0.34 and 7.43 ± 0.27 for group II (17.1 per cent) and group III (14.9 per cent) respectively. Decrease in scores were significant ($p \leq 0.01$) for group II and group III. Kilaf and Kirchengast (2008) reported that with an increasing number of births the total menopausal score as well as the score of the somato-vegetative domain increased significantly.

Psychological symptoms score

The mean scores for psychological symptoms of subjects ranged from 10.16 to 11.30 before supplementation of antioxidant rich powders while 8.83 to 10.06 after supplementation of antioxidant rich powders. The mean initial scores before supplementation were 11.30 ± 0.41 and 10.16 ± 0.37 for group II and group III respectively while significant decrease in score after supplementation were 9.56 ± 0.32 and 8.83 ± 0.40 for group II and group III respectively. Kakkar *et al* (2007) stated that working women seem to suffer more from psychological symptoms. Kilaf and Kirchengast (2008) reported that Turkish postmenopausal women exhibited extremely high scores of all symptoms of the menopause rating scale.

Urogenital symptoms score

The mean scores for urogenital symptoms of subjects ranged from 6.20 to 7.90 before supplementation of antioxidant rich powders. The mean initial scores before supplementation were 7.50 ± 0.34 and 6.20 ± 0.43 for group II and group III respectively while significant decrease in score after supplementation were 6.03 ± 0.34 and 5.90 ± 0.44 for group II and group III respectively. Loh *et al* (2005) stated increased urogenital symptoms score among postmenopausal women compared to perimenopausal women. Kilaf and Kirchengast (2008) reported that with an increasing number of births the total menopausal rating scale score as well as the score of the urogenital domain increased significantly.

Total Menopause Rating Scale (MRS) Score

The mean total MRS scores ranged from 25.10 to 28.16 before supplementation of antioxidant rich powders. The mean initial total MRS scores before supplementation were 28.16 ± 0.52 and 25.10 ± 0.65 for group II and group III respectively while significant decrease in score after supplementation were 23.36 ± 0.51 and 22.16 ± 0.67 for group II and group III respectively. Song *et al* (2009) discussed the role of estrogen as an antioxidant in the damage of vascular endothelial cells. Supplementation of Klamin (algae extract) in postmenopausal women leads to significantly decrease in plasma lipid peroxidation with improvement in overall antioxidant system.

IV. CONCLUSION

It was concluded that consumption of drumstick leaves powder (7g) and amaranth leaves powder (9g) per day for three months significantly decreased the severity of postmenopausal symptoms. Decrease in total MRS score by 17.0 and 11.7 per cent was observed in groups supplemented with drumstick leaves powder and amaranth leaves powder respectively. The results indicated that these plants possess antioxidant property and have therapeutic potential for the prevention of complications during postmenopause. Hence, it is recommended to consume drumstick leaves and amaranth leaves as they can improve complications among postmenopausal women.

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Table 1. Severity of symptoms in postmenopausal women (Somato-vegetative Subscale)

Symptoms		Before						After					
		4	3	2	1	0	Mean	4	3	2	1	0	Mean
Hot flushes	Group I	12 (40)	9(30)	-	6(20)	3(10)	2.70	11(36.7)	8(26.7)	1(3.3)	6(20)	4(13.3)	2.53
	Group II	15(50)	5(16.7)	2(6.7)	4(13.3)	4(13.3)	2.77	9(30)	7(23.3)	2(6.7)	8(26.7)	4(13.3)	2.30
	Group III	12(40)	9(30)	-	6(20)	3(10)	2.70	8(26.7)	9(30)	2(6.7)	8(26.7)	3(10)	2.37
Heart discomfort	Group I	4(13.3)	7(23.3)	3(10)	10(33.4)	6(20)	1.77	4(13.3)	7(23.3)	3(10)	10(33.4)	6(20)	1.77
	Group II	2(6.7)	5(16.7)	7(23.3)	4(13.3)	12(40)	1.37	2(6.7)	2(6.7)	7(23.3)	7(23.3)	12(40)	1.27
	Group III	4(13.3)	7(23.3)	3(10)	10(33.3)	6(20)	1.77	4(13.3)	7(23.3)	3(10)	10(33.3)	6(20)	1.77
Sleep problems	Group I	21(70)	-	-	8(26.7)	1(3.3)	3.07	21(70)	-	-	8(26.7)	1(3.3)	3.07
	Group II	17(56.7)	4(13.3)	-	8(26.7)	1(3.3)	2.93	11(36.7)	5(16.7)	3(10)	10(33.3)	1(3.3)	2.50
	Group III	17(56.7)	5(16.7)	-	7(23.3)	1(3.3)	3.00	10(33.3)	7(23.3)	7(23.3)	5(16.7)	1(3.3)	2.67
Joint and muscular	Group I	22(73.3)	3(10)	3(10)	-	2(6.7)	3.43	22(73.3)	3(10)	3(10)	-	2(6.7)	3.43
	Group II	22(73.3)	-	-	8(26.7)	-	3.20	20(66.7)	-	2(6.7)	8(26.7)	-	3.07

discomfort	Group III	25(83.3)	-	-	5(16.7)	-	3.50	22(73.3)	-	3(10)	5(16.7)	-	3.30
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Figures in parenthesis are percentages

4=Very severe 3=Severe 2=Moderate 1= Mild 0=None
 Group I=Control Group II=DLP supplementation Group III= ALP supplementation

Table 2. Severity of symptoms in postmenopausal women (Psychological Subscale)

Symptoms		Before					After						
		4	3	2	1	0	Mean	4	3	2	1	0	Mean
Depressive mood	Group I	6(20)	-	9(30)	8(26.7)	7(23.3)	1.67	6(20)	-	9(30)	8(26.7)	7(23.3)	1.67
	Group II	2(6.7)	4(13.3)	9(30)	-	15(50)	1.27	2(6.7)	4(13.3)	5(16.7)	4(13.3)	15(50)	1.13
	Group III	6(20)	-	9(30)	8(26.7)	7(23.3)	1.67	4(13.3)	-	9(30)	8(26.7)	9(30)	1.40
Irritability	Group I	4(13.3)	7(23.3)	2(6.7)	8(26.7)	9(30)	1.63	4(13.3)	7(23.3)	2(6.7)	7(23.3)	10(33.3)	1.60
	Group II	4(13.3)	7(23.3)	2(6.7)	8(26.7)	9(30)	1.63	4(13.3)	5(16.7)	4(13.3)	8(26.7)	9(30)	1.57
	Group III	4(13.3)	7(23.3)	2(6.7)	8(26.7)	9(30)	1.63	4(13.3)	7(23.3)	2(6.7)	7(23.3)	10(33.3)	1.60
Anxiety	Group I	11(36.7)	2(6.7)	7(23.3)	8(26.7)	2(6.7)	2.40	11(36.7)	2(6.7)	7(23.3)	8(26.7)	2(6.7)	2.40
	Group II	11(36.7)	2(6.7)	7(23.3)	5(16.7)	5(16.7)	2.30	8(26.7)	4(13.3)	8(26.7)	5(16.7)	5(16.7)	2.17
	Group III	11(36.7)	2(6.7)	7(23.3)	8(26.7)	2(6.7)	2.40	7(23.3)	2(6.7)	11(36.7)	8(26.7)	2(6.7)	2.13
Physical and mental exhaustion	Group I	7(23.3)	-	-	3(10)	20(66.7)	1.03	7(23.3)	-	-	3(10)	20(66.7)	1.03
	Group II	8(26.7)	1(3.3)	2(6.7)	4(13.3)	15(50)	1.43	7(23.3)	-	2(6.7)	3(10)	18(60)	1.17
	Group III	7(23.3)	2(6.7)	-	3(10)	18(60)	1.23	7(23.3)	-	-	3(10)	20(66.7)	1.03

Figures in parenthesis are percentages

4=Very severe 3=Severe 2=Moderate 1= Mild 0=None
Group I=Control Group II=DLP supplementation Group III= ALP supplementation

Table 3. Severity of symptoms in postmenopausal women (Urogenital Subscale)

Symptoms		Before						After					
		4	3	2	1	0	Mean	4	3	2	1	0	Mean
Sexual problems	Group I	22(73.3)	3(10)	3(10)	-	2(6.7)	3.43	22(73.3)	3(10)	3(10)	-	2(6.7)	3.43
	Group II	22(73.3)	3(10)	3(10)	-	2(6.7)	3.43	20(66.7)	5(16.7)	3(10)	-	2(6.7)	3.37
	Group III	17(56.7)	3(10)	8(26.7)	-	2(6.7)	3.10	17(56.7)	3(10)	8(26.7)	-	2(6.7)	3.10
Bladder problems	Group I	7(23.3)	2(6.7)	4(13.3)	8(26.7)	9(30)	1.67	7(23.3)	2(6.7)	4(13.3)	8(26.7)	9(30)	1.67
	Group II	7(23.3)	2(6.7)	4(13.3)	8(26.7)	9(30)	1.67	5(16.7)	-	4(13.3)	12(40)	9(30)	1.33
	Group III	7(23.3)	-	4(13.3)	10(33.3)	9(30)	1.53	8(26.7)	1(3.3)	2(6.7)	4(13.3)	15(50)	1.43
Dryness of vagina	Group I	11(36.7)	2(6.7)	7(23.3)	8(26.7)	2(6.7)	2.40	11(36.7)	2(6.7)	7(23.3)	8(26.7)	2(6.7)	2.40
	Group II	8(26.7)	1(3.3)	2(6.7)	4(13.3)	15(50)	1.43	7(23.3)	2(6.7)	-	3(10)	18(60)	1.23
	Group III	7(23.3)	2(6.7)	-	3(10)	18(60)	1.23	7(23.3)	-	-	3(10)	20(66.7)	1.03

Figures in parenthesis are percentages

4=Very severe 3=Severe 2=Moderate 1= Mild 0=None

Group I=Control Group II=DLP supplementation Group III= ALP supplementation

Table 4 Menopause Rating Scale (MRS) scores obtained by the subjects before and after supplementation of antioxidant powder I and II

Parameters	Group I (Control)	Group II (DLP supplementation)	Group III (ALP supplementation)	C.D. at 5%
Somato-vegetative symptoms				
Baseline	8.36 ^a ±0.40	9.36±0.34	8.73±0.27	0.79
After Exp.	8.20±0.41 ^a	7.76±0.34	7.43±0.27 ^c	0.38
% change	1.9	17.1	14.9	
Paired t-value	1.54 ^{NS}	8.08**	5.45**	
Psychological symptoms				
Baseline	10.36±0.54	11.30±0.41	10.16±0.37	NS
After Exp.	10.06±0.54	9.56±0.32 ^b	8.83±0.40 ^c	0.70
% change	2.9	15.4	13.1	
Paired t-value	1.87 ^{NS}	6.98**	6.42**	
Urogenital symptoms				
Baseline	7.90±0.38	7.50±0.34	6.20±0.43	NS
After Exp.	7.76±0.37 ^a	6.03±0.34 ^b	5.9±0.44 ^c	0.11
% change	1.7	19.6	4.8	
Paired t-value	1.68 ^{NS}	6.06**	2.50*	
Total MRS score				
Baseline	26.63±0.99	28.16±0.52	25.10±0.65	NS
After Exp.	26.46±1.07 ^a	23.36±0.51 ^b	22.16±0.67 ^c	0.98
% change	0.6	17.0	11.7	
Paired t-value	1.05 ^{NS}	14.78*	7.26*	

Values represent Mean ±SE

**Significant at 1% level of significance

*Significant at 5% level of significance

NS-Non Significant

^a significant difference between group I and II

^b significant difference between group II and III

^c significant difference between group III and I