

Original Research Article

A Study on Handgrip Strength in Pre- and Post-Menopausal Women of Amritsar on the Basis of Their Food Habits

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ABSTRACT

Introduction: Menopause is the natural biological process in woman's life and indicates the end of women reproductive functions. During this phase, there is decline in production of estrogen and progesterone hormone, which are the most vital hormones in the female body. The main objective of the study was to compare the handgrip strength in pre- and post-menopausal women on the basis of their food habits.

Methods: The present study was conducted on a total of 802 middle aged women and was selected purposively as samples from Civil Hospital, Amritsar and Guru Nanak Dev Hospital, Amritsar, Punjab, India. Of those, 403 samples were the pre-menopausal and 399 post-menopausal women. Further, these women were divided into various groups on the basis of their food habits; these were vegetarian pre- and post-menopausal women, and non-vegetarian pre- and post- menopausal women. Apart from dominant and non-dominant handgrip strength, six anthropometric variables, viz., height vertex, body weight, BMI, upper arm, waist and hip circumferences were measured on all the subjects by standardized techniques.

Results: Results of the present study depicted that statistically significant differences ($p < 0.3-0.001$) were observed between vegetarian pre- and post-menopausal women in dominant and non-dominant handgrip strength, age, body weight, height vertex, hip and waist circumferences. Statistically significant differences ($p < 0.02-0.002$) were noted in dominant and non-dominant handgrip strength and in age only vegetarian and non-vegetarian post-menopausal women and between non-vegetarian pre- and post-menopausal women. However, statistically no significant differences were reported in vegetarian and non-vegetarian pre-menopausal women.

Conclusion: Vegetarian pre-menopausal women and non-vegetarian post-menopausal women had greater handgrip strength than vegetarian post-menopausal women and non-vegetarian post-menopausal women. Aging and physical inactivity/sedentary life style are the most important factors responsible for decrement in handgrip strength.

Keywords: Handgrip strength. Vegetarian pre- and post- menopausal women. Non-vegetarian pre- and post-menopausal women.

INTRODUCTION

Menopause, like menarche, is one of the most important events in the reproductive life of women. It marks the end of reproductive years in women. [1] During

this phase, there is a decline in production of estrogen and progesterone hormone, which are the most vital hormones in the female body. The diminished amount of these hormones causes loss of follicular

activity of ovaries, resulting in permanent stoppage of menstruation. [2] It is a part of normal ageing process, which causes hormonal imbalance as well as alters the overall health of women. [3] Vasomotor symptoms, like hot flashes, night sweats occurs due to changes in the temperature centre in hypothalamus through the different neurotransmitter system which results in alternations in estrogen levels and may lead to various symptoms in the body. [4]

Muscle strength is one of the important factors for maintaining of activities of daily life and with the process of ageing, human hand undergoes various anatomical and physiological changes. [5] Studies had been demonstrated to find the relationship between handgrip strength and menopausal status in females. Dominant handgrip strength in pre-menopausal women was higher as compared to their post-menopausal counterparts. [6-8] The lower value of handgrip strength of *post*-menopausal women was due to decreased levels of estradiol hormone. With ageing, there is progressive reduction in skeletal muscle mass that is mainly related to a change in body composition and known as sarcopenia. [9] It might be due to increase in the non-contractile tissue and changes in the muscle contraction properties. [10-13] The reduced levels of hormones, mainly estradiol, cause increase in fat mass which causes decline in lean body mass and affects the muscle strength. [14]

Food habits influence greatly for the formation of muscle fibers and their performance. Ageing, reduced physical activity, poor nutritional status and sedentary life style are the important factors responsible for decline in the handgrip strength in post-menopausal urban Haryanvi women as compared to post-menopausal rural counterparts. [15] Similar type of findings were also noted by Ranganathan et al. [16] Literature related to the handgrip strength in vegetarian and non- vegetarian pre- and post- menopausal women are scanty, especially in north Indian context, thus the present study was planned.

MATERIALS AND METHODS

In the present study, a total of 802 middle aged women were selected purposively as samples from Civil Hospital, Amritsar and Guru Nanak Dev Hospital, Amritsar, Punjab, India. Of those, 403 samples were the pre-menopausal and 399 post-menopausal women. Further, these women were divided into various groups on the basis of their food habits, like vegetarian pre- (n=282) and post-menopausal women (n=276), and non-vegetarian pre- (n=121) and post-menopausal women (n=123). The age of the subjects were recorded from their date of birth. Demographic data such as, socio-economic status, ethnicity and food habits of the subjects were collected through self-structured questionnaire. A written consent was obtained from the subjects. The data were collected under natural environmental conditions in morning (between 8 AM. to 12 noon). The study was approved by the institutional ethical committee.

Anthropometric measurements

Six anthropometric variables viz., height vertex, body weight, body mass index, upper arm, waist and hip circumferences were measured following standard techniques. [17] The height was recorded by using anthropometric rod in cm. The body weight was measured by digital standing scales (Model DS-410, Seiko, Tokyo, Japan) to the nearest 0.1 kg. Body mass index (BMI) was calculated from height and weight as follows: $BMI = \text{weight (kg)} / \text{height}^2 (\text{m}^2)$. Upper arm, hip and waist circumferences were assessed with the help of the steel tape in cm.

Handgrip strength measurement

The grip strength of both right and left hands was measured using a standard adjustable digital handgrip dynamometer (Takei Scientific Instruments Co., LTD, Japan) at standing position with shoulder adducted and neutrally rotated and elbow in full extension. The dynamometer was held freely without support, not touching the subject's trunk. The position of the hand remained constant without the downward

direction. The subjects were asked to put maximum force on the dynamometer thrice from both sides of the hands. The maximum value was recorded in kg. Handgrip dynamometer was calibrated before each assessment. All subjects were tested after 3 minutes of independent warm-up. Thirty seconds time interval was maintained between each handgrip strength testing.

Statistical analysis

Standard descriptive statistics (mean \pm standard deviation) were determined for directly measured and derived variables. Data were analyzed using SPSS (Statistical Package for Social Science) version 20.0. Student's t-test was applied for comparisons of data between vegetarian and non-vegetarian pre- and post-menopausal women. A 5% level of probability was used to indicate statistical significance.

RESULTS

The comparison of handgrip strength and selected anthropometric variables between vegetarian pre- and post-menopausal women were shown in table 1. Statistically significant differences ($p < 0.03$ -

0.001) were found between vegetarian pre- and post-menopausal women in dominant and non-dominant handgrip strength, age, height vertex, waist and hip circumferences.

Table 2 showed the comparison of handgrip strength and selected anthropometric variables between vegetarian and non-vegetarian pre-menopausal women. Statistically, no significant differences were noted between them.

Further, the comparison of handgrip strength and selected anthropometric variables between vegetarian and non-vegetarian post-menopausal women was shown in table 3. Statistically significant differences ($p < 0.02$ -0.002) were noted in dominant and non-dominant handgrip strength and in age only.

Table 4 highlighted the comparison of handgrip strength and selected anthropometric variables between non-vegetarian pre- and post-menopausal women. Once again, statistically, significant differences were noted in dominant and non-dominant handgrip strength and in age only.

Table 1. Comparison of handgrip strength and selected anthropometric variables between vegetarian pre- and post-menopausal women

Variables	Vegetarian pre-menopausal women (n=282)		Vegetarian post-menopausal women (n=276)		t-value	p-value
	Mean	SD	Mean	SD		
Dominant handgrip strength (kg)	21.39	5.71	16.7	4.67	10.57	<0.001
Non-dominant handgrip strength (kg)	17.57	5.48	13.6	4.52	9.20	<0.001
Age (years)	40.38	4.89	50.79	4.40	26.40	<0.001
Height vertex (cm)	154.65	4.80	153.69	5.34	2.23	<0.03
Body weight(kg)	66.97	13.22	67.59	12.85	0.56	0.57
Body mass Index (kg/m ²)	28.23	5.58	28.91	5.46	1.44	0.15
Upper arm circumference (cm)	31.35	5.51	32.12	4.10	1.85	0.06
Waist circumference (cm)	96.15	11.13	101.0	11.05	5.18	<0.001
Hip circumference (cm)	108.38	10.97	112.1	11.35	4.02	<0.001

Table 2. Comparison of handgrip strength and selected anthropometric variables between vegetarian and non-vegetarian pre-menopausal women

Variables	Vegetarian pre- menopausal women (n=282)		Non -vegetarian pre-menopausal women (n=121)		t-value	p-value
	Mean	SD	Mean	SD		
Dominant handgrip strength (kg)	21.39	5.70	21.36	5.31	0.54	0.95
Non-dominant handgrip strength (kg)	17.57	5.48	18.19	5.66	1.02	0.30
Age (years)	40.38	4.88	40.50	4.97	0.21	0.83
Height vertex (cm)	154.64	4.80	154.36	5.69	0.51	0.60
Body weight (kg)	66.96	13.22	65.21	13.43	1.21	0.22
Body mass Index(kg/m ²)	28.23	5.58	27.56	5.26	1.12	0.26
Upper arm circumference (cm)	31.35	5.50	31.09	4.08	0.46	0.64
Waist circumference (cm)	96.14	11.13	96.56	11.54	0.34	0.72
Hip circumference (cm)	108.37	10.97	108.22	12.42	0.12	0.89

Table 3. Comparison of handgrip strength and selected anthropometric variables between vegetarian and non-vegetarian post-menopausal women

Variables	Vegetarian post-menopausal women (n=276)		Non-vegetarian post-menopausal women (n=123)		t-value	p-value
	Mean	SD	Mean	SD		
Dominant handgrip strength (kg)	16.72	4.67	17.71	4.76	1.94	<0.05
Non-dominant handgrip strength (kg)	13.65	4.51	15.26	5.08	3.15	<0.002
Age (years)	50.79	4.40	49.88	4.27	1.91	<0.05
Height vertex (cm)	153.68	5.33	152.74	10.95	1.15	0.24
Body weight (kg)	67.59	12.85	66.26	11.68	0.98	0.32
Body mass Index (kg/m ²)	28.90	5.45	28.31	4.58	1.05	0.29
Upper arm circumference (cm)	32.11	4.09	31.40	3.76	1.63	0.10
Waist circumference (cm)	101.01	11.05	99.08	10.32	1.65	0.10

Table 4. Comparison of handgrip strength and selected anthropometric variables between non-vegetarian pre- and post-menopausal women

Variables	Non-vegetarian pre-menopausal Women (n =121)		Non-vegetarian post-menopausal women(n=123)		t-value	p-value
	Mean	SD	Mean	SD		
Dominant handgrip strength (kg)	21.36	5.31	17.71	4.76	5.65	<0.001
Non-dominant handgrip strength (kg)	18.19	5.66	15.26	5.08	4.25	<0.001
Age (years)	40.50	4.97	49.88	4.27	15.79	<0.001
Height vertex (cm)	154.36	5.69	152.76	10.95	1.44	0.15
Body weight (kg)	65.21	13.43	66.26	11.68	0.64	0.51
Body mass Index (kg/m ²)	27.56	5.26	28.31	4.58	1.18	0.23
Upper arm circumference (cm)	31.09	4.08	31.40	3.76	0.62	0.53
Waist circumference (cm)	96.57	11.54	99.08	10.32	1.78	0.07

DISCUSSION

Menopause is an important event in the reproductive life of women. It is the transition period characterized by physiological, psychosocial and sociological changes that complement depletion of ovarian function. [18] It is the part of normal ageing process, which causes hormonal imbalances as well as alters the overall health of women. [3] The objectives of the present study were to compare the handgrip strength and selected anthropometric variables between vegetarian and non-vegetarian pre- and post-menopausal women. Statistically significant differences were noted in dominant and non-dominant handgrip strength, age, body weight, height vertex, and hip and waist circumferences between vegetarian pre- and post-menopausal women. Similar kinds of results were reported by earlier studies also. [8,19] Nevertheless, statistically no significant differences were found in any case between vegetarian and non-vegetarian pre-menopausal women. Whereas, statistically significant differences were found in dominant and non-dominant handgrip strength and age between vegetarian and non-vegetarian post-menopausal women

and between non-vegetarian pre- and post-menopausal women. These differences were probably due to the physical and physiological changes more for post-menopausal status than food habits. In fact, handgrip strength has been correlated with nutritional status in number of studies. [20,21] Further, these studies also revealed that handgrip strength was a powerful predictor of subject's nutritional status. It has also been found that the subjects having lower body mass index had lower mean values in their handgrip strength. [22] The subjects with improper nutritional status had lower mean values of body mass index and arm muscle area which was the strong determinants of poor handgrip strength in these participants. [23] Similar findings of the study were noticed in female laborers, who had high physical activity than sedentary women, but they had lower values in handgrip strength than sedentary female counterparts and their nutritional indices were low due to their poor nutritional status. [24]

CONCLUSION

It can be concluded from the present study that vegetarian pre-menopausal

women and non-vegetarian post-menopausal women had greater handgrip strength than vegetarian post-menopausal women and non-vegetarian post-menopausal women. Ageing, sedentary life style and physical inactivity are the most important factors responsible for decrement in handgrip strength. Special emphasis should be made on protein rich diet including proper exercise program for maintaining lean body mass, which helps to maintain the muscle strength.

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