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COMPARATIVE STUDY OF FAT MASS INDEX AND FAT FREE MASS INDEX ON BLOOD PRESSURE OF YOUNG AGE GROUP

Physiology

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ABSTRACT

There are so many studies associating blood pressure and body mass index in older age and some in young age but very few studies about correlation of fat body mass index and fat free mass index with blood pressure in young age. Our purpose was to do comparative study of fat body mass index and fat free body mass index with blood pressure in young adults. The study was performed and concluded that Fat mass index has strong association with systolic blood pressure in males as compare to females while fat free mass index has more positive association with systolic blood pressure in females as compare to males.

KEYWORDS

Introduction: Hypertension has become a major cause of morbidity and mortality worldwide and it is now ranked third as a cause of disability-adjusted life years(1). The World Health Report(2) states that elevated blood pressure alone contributes to about 50% of cardiovascular disease (CVD) worldwide. Furthermore, the risk for CVD starts even at upper limits of normal levels of blood pressure(3). "Uncontrolled high blood pressure can lead to heart attack or stroke, aneurysm, heart failure, organ malfunction, vision loss, metabolic syndrome and memory problems", Therefore it would be desirable to achieve optimal or normal BP (below 130/80 mmHg) in the young and middle-aged(4). The American Heart Association (AHA) have now changed the blood pressure standards for the first time in a decade, with the result that people with a reading of 130/80 and above are now considered to be suffering from high blood pressure or hypertension. The association lowered the standards from the reading of 140/90 and above to facilitate early management of high BP and reduce disability and deaths related to complications from hypertension. Estimates put the incidence of hypertension at 20-40% in urban areas and 12-17% in rural areas in the country."The new guideline will bring an additional 15-20% of the Indian population in the ambit of abnormal blood pressure". "It will now encompass more of the younger generation (age 20-30) as hypertensive." This means nearly 40% of India's adult population may be considered to be suffering from high BP under the new guideline(5).

The new 2017 ACC/AHA high blood pressure guidelines,(6) released November 13, 2017, has reclassified grades of hypertension for the first time as having "elevated" blood pressure with a systolic blood pressure (SBP) level of 120-129 mmHg (and with a diastolic blood pressure [DBP] level remaining <80 mmHg) and stages I versus II hypertension as being 130-139/80-89 mmHg and >140/>90 mmHg, respectively. In the old 2003 JNC 7 guidelines SBP of 120-139 mm Hg and DBP of 80-89 mm Hg were called pre-hypertension--a term no longer used. The new classification is estimated to increase the total number of American adults with elevated blood pressure to 46%, using the proposed SBP and DBP cut-points for definition of "elevated" BP, as compared to 32% of elevated BP in the adult population recommended in the 2003 JNC guidelines. However, non-drug treatment management is recommended for the majority of adults who would be newly classified as having SBP 120-129 mmHg with DBP remaining <80 mmHg.

OBJECTIVE:- 1. To find correlation between blood pressure and fat mass index. 2. To find correlation between blood pressure and fat free mass index.

METHODLOGY: Total 250 subject between 17 to 25 years of age group were chosen for this study. Body fat percentage was measured by OMRON HBF-306 body fat monitor, by which total body fat percentage obtained and then body fat mass and fat free mass of total body weight was calculated, on the basis of which various indices e.g. Fat Mass index and Fat Free Mass were calculated and blood pressure was measured by mercury sphygmomanometer. Association of fat mass index and fat free mass index with blood pressure was computed using chi square test and P value.

Formula: Body Fat Percentage = (Total Body Fat Mass/Total Body Mass) x 100 Cut of values for Fat Mass Index (FMI):[13]

Classification of blood pressure (Age 18 & above) Indian guidelines 2013 (7).		
Category	SBP (mmHg)	DBP (mmHg)
Optimal	<120	<80
Normal	<130	<85
High normal	130-139	85-89
	Hypertension	
Stage 1	140-159	90-99
Stage 2	160-179	100-109
Stage 3	>180	>110
	ISH	
Grade 1	140-159	<90
Grade 2	>160	<90

FMI	Males	Females
Low	<1.8	3.9
Normal	1.8-8.3	3.9-11.8
High	>8.3	>11.8

Cut-off values for Fat free Mass Index (FFMI):[13]

FFMI	Males	Females
Low	<16.7	<14.6
Normal	16.7-19.8	14.6-16.8
High	>19.8	>16.8

OBSERVATION AND RESULT:

Table-1 Correlation of fat free body mass index (FFMI) and systolic blood pressure (for males):

FFMI	Systolic blood pressure, ≤120 mmHg	Systolic blood pressure, >120 mmHg	Chi square test	P value
Normal(16.7 to 19.8)	102	35	4.178	0.128
High (>19.8)	13	10		
Total(n=175)	115	45	15 student shows FFMI and SBP both low	

- The association between rows (groups) and columns (outcomes) is considered to be statistically significant.
- The above table shows that out of 175 male adults, 102 having

blood pressure ≤120 mmHg and fat free mass index (FFMI) is in normal range (16.7 to 19.8).
- The 13 individuals having blood pressure ≤120 mmHg but their fat free mass index (FFMI) is high i.e. >19.8.
- The 35 male adults having blood pressure >120 mmHg but their fat free mass index (FFMI) is in normal range (16.7 to 19.8).
- Total 10 male aults shown both blood pressure and fat free mass index on higher side.

Table-2 Correlation of fat free body mass index (FFMI) and systolic blood pressure (for females):

FFMI	Systolic blood pressure, ≤120 mmHg	Systolic blood pressure, >120 mmHg	Chi squared test	P value
Normal(14.6 to 16.8)	43	11	4.847	0.027
High (>16.8)	7	8		
Total (n=75)	50	19	6 individuals show SBP and FFMI both low.	

- The association between rows (groups) and columns (outcomes) is considered not to be statistically significant.

The above table shows that out of 75 female young aults, 43 having blood pressure ≤120 mmHg and fat free mass index (FFMI) is in normal range (16.7 to 19.8).

- The 7 individuals having blood pressure ≤120 mmHg but their fat free mass index (FFMI) is >19.8.
- The 11 female individuals having blood pressure >120 mmHg but their fat free mass index (FFMI) is in normal range (16.7 to 19.8).
- Total 8 female individuals having their blood pressure and fat free mass index both on higher side.

Table-3 Correlation between fat mass index (FMI) and systolic blood pressure (for males):

Fat Mass index (FMI)	Systolic blood pressure, ≤120 mmHg	Systolic blood pressure, >120 mmHg	Chi squared test	P value
Normal (1.8-8.3)	110	35	6.415	0.0113
High (>8.3)	11	12		
Total (n=175)	121	47	7 individuals shown SBP and FMI both low.	

- The association between rows (groups) and columns (outcomes) is considered to be statistically significant.
- The above table shows that out of 175 male young adults, 110 students having blood pressure ≤120 mmHg and fat mass index (FMI) is in normal range (1.8 to 8.3).
- The 11 individuals having blood pressure ≤120 mmHg but their fat mass index (FMI) is >8.3.
- The 35 male individuals having blood pressure >120 mmHg but their fat mass index (FMI) is in normal range (1.8 to 8.3).
- Total 12 male individuals shown both blood pressure and fat mass index on higher side.

Table-4 : Correlation between fat mass index (FMI) and systolic blood pressure (for females):

Fat Mass Index (FMI)	Systolic blood pressure, ≤120 mmHg	Systolic blood pressure, >120 mmHg	Chi squared test	P value
Normal (3.9 to 11.8)	42	15	1.627	0.202
High (>11.8)	6	6		
Total(n = 75)	48	21	6 students having SBP and FMI both low.	

- The association between rows (groups) and columns (outcomes) is considered to be statistically significant.
- The above table shows that out of 75 young female adults, total 42 having blood pressure ≤120 mmHg and their fat mass index (FMI) is in normal range (3.9 to 11.8).
- The 6 individuals having blood pressure ≤120 mmHg but their fat mass index (FMI) is >11.8.
- The 15 young female adults having blood pressure >120 mmHg but their fat mass index (FMI) is in normal range (3.9 to 11.8).
- Total 6 young female adults, shown their blood pressure and fat mass index both on higher side.

From above tables:

1. It has been observed that blood pressure has significant association (P value= 0.0113 i.e. <.05) with fat mass index in males while in female no significant association (P value=0.202 i.e. >.05) observed.

2. On doing study between systolic blood pressure and fat free mass index it has been observed that there was a significant association for females (p value=0.027 i.e. <.05) while for male no significant association (P value=0.128 i.e. >.05) seen.

CONCLUSION: Fat mass index has strong association with systolic blood pressure in males as compare to females while fat free mass index has more positive association with systolic blood pressure in females as compare to males. So after finding increased systolic blood pressure, our concerned was, give advice to reduce body fat and change in lifestyle as well as eating pattern(8) to prevent development of hypertension.

PHYSICALACTIVITY: Increase in aerobic physical activity such as brisk walking, jogging, swimming, or bicycling has been shown to lower blood pressure. This reduction is independent of weight loss(9). A meta-analysis of 54 randomised control trials show a net reduction of 3.8 mmHg in systolic and 2.6 mmHg diastolic blood pressure in individuals performing aerobic exercises. Compared to controls(9), physical activity reduces systemic vascular resistance due to decreased sympathetic and nervous system activity. This is evidenced by lower plasma norepinephrine level in exercising individuals as compared to sedentary ones(10).There is also decrease in renin activity, insulin-resistance and endothelial dysfunction(11) (12).

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