Original Research

CORRELATION OF BODY MASS INDEX (BMI) & BODY FAT PERCENTAGE WITH BLOOD PRESSURE INDICES, HAND GRIP STRENGTH (HGS) & HAND GRIP ENDURANCE (HGE) IN HEALTHY YOUNG ADULTS

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INTRODUCTION

Physical inactivity is a serious public health issue that impacts a large number of people worldwide, according to the WHO. One of the main underlying causes of illness, mortality, and disability is a sedentary lifestyle. The level of life has risen in developing nations due to industrialisation and urbanisation. Obesity has become more common as a result of sedentary lifestyles and improper eating habits. One of the main causes of disorders like hypertension, sleep apnoea, diabetes mellitus, coronary heart disease, stroke, osteoarthritis, and dyslipidaemia, obesity can have a major negative impact on one's physical and emotional well-being and increase morbidity and mortality.Furthermore, these circumstances may have severe social and economic repercussions, particularly in developing and poor nations (WHO, 2008).

BMI, which is calculated as body weight in kilograms divided by height in square meters, is a reliable indication of obesity. Despite being a popular tool for measuring obesity, BMI has the drawback of not differentiating between fat and fat-free mass. Studies have shown that body fatness has a stronger correlation with morbidity, such as hypertension, than lean body weight.In essence, body fat helps with prevention and control and is a predictor of cardiovascular risk factors. Obesity is a major risk factor for the development of hypertension and is linked to sympathetic activation[2].

www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 27-02-2026
Date Acceptance: 06-03-2026
Date of Publication: 03-04-2026

Any formula that predicts cardiovascular risk must include hypertension as a crucial measure for cardiovascular illnesses[3–6]. There is a favourable association between blood pressure and BMI, according to studies. In light of this, our study aims to determine the relationship between blood pressure and body fat % and BMI. Despite this, physical activity has become more important recently due to its global health advantages. Simultaneously, non-communicable diseases are becoming more common, primarily as a result of poor dietary habits and inactivity.

HGS is regarded as a trustworthy indicator of muscle action, a clinical measure for evaluating physical fitness and nutritional health, and a predictor of upper extremity muscular strength[7,8]. Precise hand functions like gripping and pulling have been discovered to be influenced by a number of characteristics, including age, gender, muscle mass, and BMI. Muscle quality can be impacted by nutritional status, which in turn can affect muscle strength.

One readily quantifiable indicator of physical strength (upper extremity muscular strength) is handgrip strength.

The ability of a muscle to sustain a force generated during physical exercise over extended periods of time is known as handgrip endurance. It depends on the intensity of a short maximum effort[17].The availability of nutrients for the muscle is a major factor in muscular endurance[18].Although muscular strength and muscular endurance are two distinct aspects of physical fitness, they are frequently combined into a single component of HRPF (Health Related Physical Fitness) known as muscular fitness[20]. Other factors that can impact muscular endurance include cardio-respiratory fitness,

skeletal muscle functions, blood flow, and muscle temperature.

Since nutritional status of muscle & the cardio respiratory conditions are interrelated we need to explore the relation between BMI & BF% with blood pressure indices, HGS & HGE.

MATERIALS & METHODS

The present piece of work described in this thesis "Correlation of Body Mass Index (BMI) & Body Fat Percentage with Blood Pressure Indices, Hand Grip Strength (HGS) & Hand Grip Endurance (HGE) In healthy young adults" was under taken in the Post Graduate Research Laboratory of Department of Physiology, M.K.C.G. Medical College, Berhampur, Orissa. The study was approved by the Institutional Ethics Committee.

Study Design: A prospective (in relation to time only), cross-sectional study was designed according to the concerned research question.

Place of Study: The study was carried out in the Postgraduate Research Laboratory of Department of Physiology, M.K.C.G Medical College, Berhampur, Ganjam, Odisha. The laboratory was equipped with the required instruments for the study.

Study Period: The Subjects for the study was 2018-2019 batch of MBBS students of M.K.C.G Medical college, Berhampur. Anthropometric measurements and data were taken throughout the study period. The subjects participated in this study lead a sedentary life style and none of them were exercising regularly.

Inclusion Criteria:

- Age between 17-22 years
- Consent for participation (i.e. Signed consent form submitted)
- Passed the initial screening by PAR-Q.

Exclusion Criteria:

- Any YES answer in the PAR-Q
- Subjects with any history of – Hypertension, Ischaemic Heart Disease, Valvular Heart Disease, Chronic Obstructive Pulmonary Disease, Acute Respiratory Tract Infection, Acute asthma, Tuberculosis, Bronchiectasis, Pleural Disease, Diabetes mellitus.
- Subjects with Anaemia.
- Any addiction of Smoking or Alcoholism.

Instruments Used :

- Stadiometer
- Digital weighing scale
- Omron Body Fat monitor
- Bio plus digital blood pressure instrument
- Electronic Hand Dynamometer
- Pulse oxymeter
- Stopwatch
- Case record form: A case record form was designed to write down particulars including all the anthropometric parameters, Pulse rate, blood pressure etc. This form was used as a survey instrument to record all the parameters obtained during the data collection.

RESULT

Table: 1

	NUMBER	PERCENTAGE
MALES	114	62.3%
FEMALES	69	37.7%
TOTAL	183	100%

In our study a total no. of 183 subjects were taken out of which 114 were male & 69 were female

Pie Chart Showing Male & Female Distribution

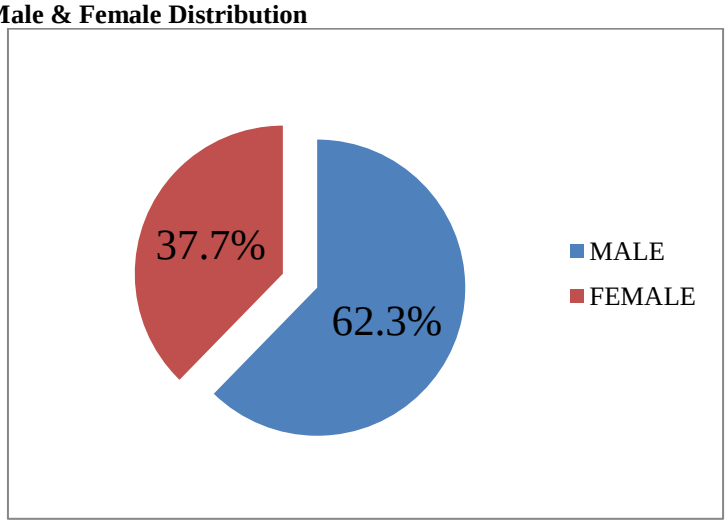

Table: 2 Age Distribution of Study Population

Age(yrs)	MALE	FEMALE
Mean±SD	19.114±1.218	18.98±1.036
Minimum	17	17
Maximum	22	21
Median	19	19

Age distribution of study population shows the mean age in males 19.11 & in females 18.98. Maximum no. of subjects were 19yrs old in both the sexes.

Table: 3 Measured and Calculated Parameters

	MALES	FEMALES
HEIGHT(m)	1.721±0.062	1.596±0.032
WIGHT(kg)	68.329±11.979	56.926±6.170
BMI(kg/m^2)	22.967±3.146	22.318±2.061
FAT%	20.118±5.376	23.522±2.897
HR(bpm)	74.193±3.331	76.420±3.972
SBP(mmHg)	126.895±11.158	123.188±7.583
DBP(mmHg)	82.912±7.911	80.623±5.763
PP(mmHg)	43.982±6.136	42.565±4.888
MAP(mmHg)	97.573±8.652	94.811±6.000
HGS(kg)	41.018±7.258	24.323±2.952
HGE(sec)	120.316±31.847	112.652±41.633

Table 3 shows measured anthropometric parameters of subjects, blood pressure indices, HGS & HGE in both male & females. Mean systolic & diastolic blood pressure in case of both male & female were within normal range with a MAP 97.573±8.652 & 94.811±6.000 respectively. Mean HGS in males 41.018±7.258 & in females 24.323±2.952.

Table: 4 Correlation between BMI & HR in Males

Pearson's correlation coefficient(r)	**0.2269**
r^2	0.05147
p-value	0.0152

The Correlation Between BMI & HR In Males Is Positive & Significant.

Table: 5 scatter Of Correlation Between Fat% & HR in Males

Pearson's correlation coefficient(r)	**0.2301**
r^2	0.05292
p-value	0.0138

The correlation between FAT% & HR in males is positive & significant.

Table: 6 Correlation between BMI & SBP in Males

Pearson's correlation coefficient(r)	**0.6145**
r^2	0.3776
p-value	<0.0001

The correlation between BMI & SBP in males is positive & significant.

Table: 7 Correlation between Fat% & SBP in Males

Pearson's correlation coefficient(r)	0.4941
r^2	0.2442
p-value	<0.0001

The Correlation Between FAT% & SBP In Males Is Positive & Significant.

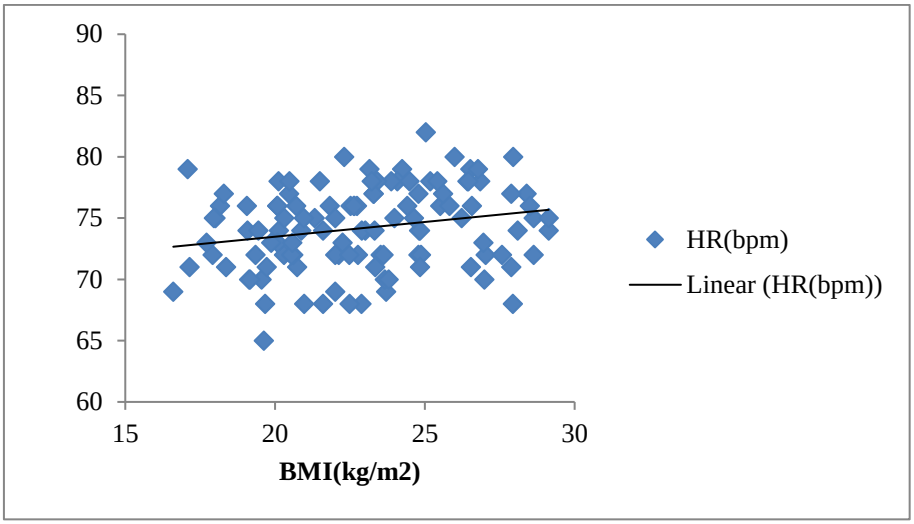

Figure: 1 Scatter Plot of Correlation between BMI & HR in Males

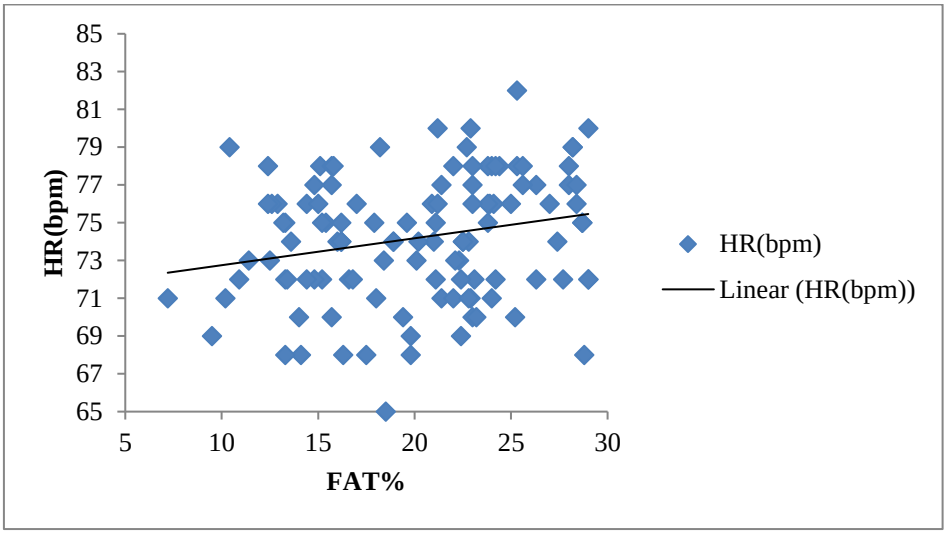

Figure: 2: Scatter Plot Of Correlation Between Fat% & HR In Males

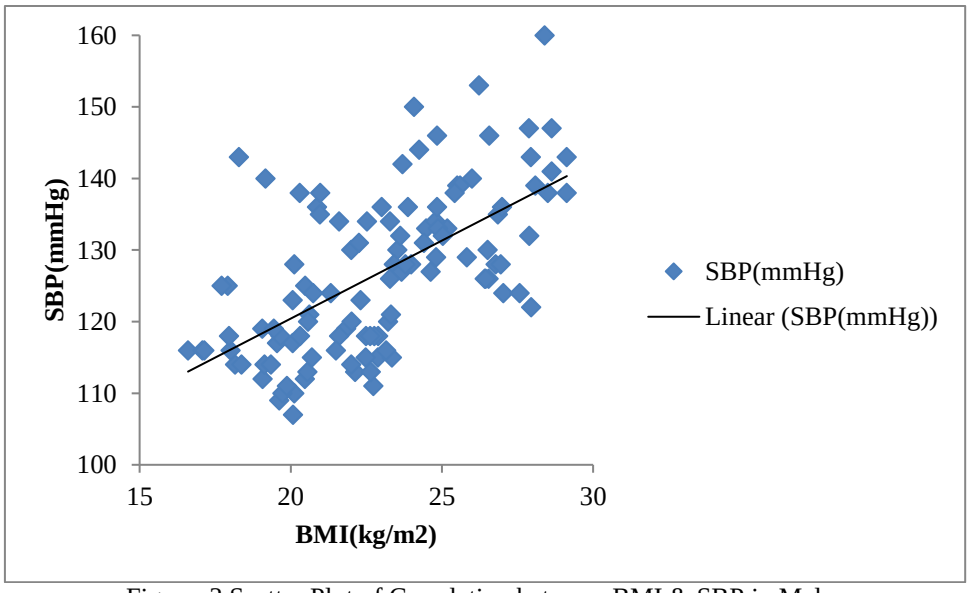

Figure: 3 Scatter Plot of Correlation between BMI & SBP in Males

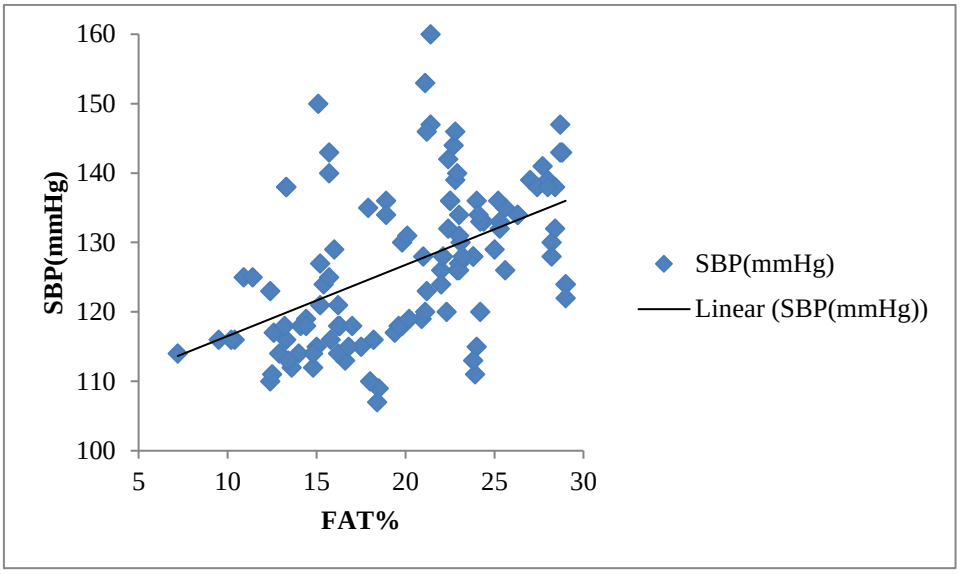

Figure: 4 Scatter Plot of Correlation between Fat% & SBP in Males

DISCUSSION

The current study, "Correlation Of Body Mass Index (BMI) & Body Fat Percentage with Blood Pressure Indices, Hand Grip Strength (HGS) & Hand Grip Endurance (HGE) in Healthy Young Adults," was conducted between 2018 and 2020 in the postgraduate research laboratory of the physiology department at MKCG Medical College in Berhampur, Orissa.following the Institutional Ethics Committee's clearance. There were 114 males and 69 females among the 183 individuals in total; the mean age of the males was 19.11 years, while the mean age of the females was 18.98 years. For both males and females, the minimum age was 17. Male and female maximum ages are 22 and 21, respectively.

The mean BMI for men and women was nearly identical, at 22.967 kg/m2 for men and 22.318 kg/m2 for women.

The highest BMI for both males and females was 29.132 kg/m2 and 27.344 kg/m2, respectively. None of the participants, regardless of gender, fell into the obese group. Male and female mean fat percentages were 20.11% and 23.5%, respectively. Both the male and female mean resting heart rates fell within the typical range. Both male and female blood pressure indicators (SBP and DBP) were within normal limits. Both groups' calculated MAP and pulse pressure were within normal limits.

Heart rate and fat percentage were shown to be significantly correlated in both males and females. When examined for both males and females, blood pressure indices such as SBP, DBP, and MAP shown a positive connection with BMI and FAT%. In the case of males, a substantial positive association was also discovered between BMI and FAT% with PP. However, we discovered that, although not statistically significant, BMI and pulse pressure were positively associated in females. Nonetheless, a strong relationship between FAT% and pulse pressure was found.PP changes are negatively correlated with arterial compliance and directly correlated with changes in volume.(Homan TD et al.)192 Research indicates that a higher risk of CVD is linked to elevated pulse pressure (Blacher J et al.). The danger can rise by 20% with every 10 mmHg increase.

Although P Ravisankar P et al.'s study included participants from various BMI1 groups, similar correlations were discovered. Furthermore, blood pressure indices are probably influenced by a number of other factors, including age, gender, body fat percentage, physical activity, and lifestyle. In fact, there is proof that the association between BMI and blood pressure is largely due to genetic factors. The study by Brighton et al. (Pan American medical journal) used skinfold thickness as a measure of body adiposity, although the link between BMI and FAT% with blood pressure indices revealed that BMI is a better predictor of blood pressure level than fat percentage.

According to earlier studies, people with high BMIs had a higher prevalence of high blood pressure. A positive association between body fat percentage and blood pressure indices may be explained by excessive sympathetic activity brought on by an elevated body fat percentage. For both males and females, there was a strong association between BMI and HGS. When body fat % was considered, this was not the case. The relationship between body fat percentage and HGS was not significant in either male or female individuals.

In the current investigation, there was no discernible relationship between fat percentage and HGS or HGE in either the male or female participants. There is no solid proof that body fat percentage affects muscle strength or endurance, according to all of the findings from earlier researchers (ref). An extensive

study that takes fat free mass into consideration to determine the association with HGS & HGE could be definitive, as BMI has the limitation of not differentiating between fat mass and fat free mass.

CONCLUSION

Our study "Correlation Of Body Mass Index (BMI) & Body Fat Percentage with Blood Pressure Indices, Hand Grip Strength (HGS) & Hand Grip Endurance (HGE) In healthy young adults" was conducted in the department of physiology. For the study, total number of 183 healthy volunteers from either sex aged between 17 to 22 years were assessed for blood pressure indices, handgrip strength and handgrip endurance. The data obtained were analyzed statistically for correlation with BMI and Body FAT%. All subjects were taken as a single group with a mean BMI within normal limits but taking subjects from different groups of BMI, the results obtained could be better. To establish a correlation between handgrip endurance and body mass index, athletes or subjects involved in sports to be included. Our study is a cross-sectional study. A prospective longitudinal study taking subject who are undertaking physical training might help to establish a definite correlation between body mass index & body fat percentage with handgrip endurance.

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How to cite this article: Dr. K Pradeep Kumar, Dr. Jagnyaseni Panda, Dr. Sanjaya kumar Panigrahi, Dr. Monalisa Khuntia, CORRELATION OF BODY MASS INDEX (BMI) & BODY FAT PERCENTAGE WITH BLOOD PRESSURE INDICES, HAND GRIP STRENGTH (HGS) & HAND GRIP ENDURANCE (HGE) IN HEALTHY YOUNG ADULTS, Asian J. Med. Res. Health Sci., 2026; 4 (1):-929-935.
Source of Support: Nil, Conflicts of Interest: None declared.