ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 16, Issue, 03, pp. 27433-27437, March, 2024
DOI: https://doi.org/10.24941/ijcr.46859.03.2024

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

THE STUDY OF CORRELATION OF BMI AND BLOOD PRESSURE IN YOUNG HEALTHY MEDICAL STUDENTS

***Dr. Siddiqui Mahaiboob Fatima Mohd Sirajuddin Ahmed Siddiqui**

Asst Professor Department of Physiology, Pravara Institute of Medical Sciences, Loni Ahmed Nager

ARTICLE INFO

Article History:
Received 14th December, 2023
Received in revised form
20th January, 2024
Accepted 24th February, 2024
Published online 30th March, 2024

Key words:

Blood Pressure, BMI and Medical Students

***Corresponding author:** **Dr. Siddiqui Mahaiboob Fatima Mohd Sirajuddin Ahmed Siddiqui**

ABSTRACT

Background: The widely reported associations between body mass index (BMI) and various chronic diseases, such as hypertension and coronary heart diseases have garnered significant attention. Nonetheless, there remains a dearth of research dedicated to understanding the health impacts of medical college on the students, who experience considerable academic pressure. In that context, this study was driven by the goal of investigating the intricate interplay between BMI, blood pressure (BP) among medical students. Blood pressure (BP) has been found to rise among populations due to the high body mass index (BMI). Overweight and persons who have high BP are prone to develop heart diseases. The objective of this study was to evaluate the correlation between BMI and BP among medical students in both males and females aged 18 years and above. ***Methods:*** 120 medical students were enrolled in the study. BMI (Kg/m2) and blood pressure (mmHg) were measured. The data was analysed using appropriate statistical tests. ***Results:*** The mean value of systolic blood pressure in normal weight participants was 111.70±3.34, the mean value in overweight was 114.10±3.78 and in obese volunteers the mean value was 126.90 ±5.04. It was observed that as the weight goes on increasing the BP also increases and was statistically significant. The mean value of diastolic blood pressure in normal weight was 70.10 ± 1.75, the mean value in over weight was 75.60 ±1.51 and in obese the mean value was 85.60 ±5.67 which was found to be increased in obese. The p value was <0.001 hence statistically significant. In our study significant increase in pulse rate, systolic blood pressure and diastolic blood pressure was observed in overweight and obese as compared to normal weight. ***Conclusions:*** BMI demonstrated a notably strong positive correlation with both diastolic BP and systolic BP. Therefore, for medical students as well as the daily health care of patients, weight control is recommended to better combat obesity-related diseases, for example, cardiovascular diseases, hypertension and dyslipideamia.

Citation: Dr. Siddiqui Mahaiboob Fatima Mohd Sirajuddin Ahmed Siddiqui. 2024. *"The study of correlation of BMI and blood pressure in young healthy medical students". International Journal of Current Research, 16, (03), 27433-27437.*

INTRODUCTION

Body mass index is positively and independently associated with morbidity and mortality from hypertension, cardiovascular disease, type II diabetes mellitus, and other chronic diseases (1). In Caucasian populations, a strong association has been depicted between BMI and mortality (2, 3). A similar association has also been demonstrated among Asian populations (4, 5). Increasing BMI is associated with increased likelihood of SCD (sudden cardiac death) related to cardiomegaly or dilated cardiomyopathy compared with other causes of SCD in the young (6). The increasing rate of overweight and obesity in the developing countries contributed to the rapid incline in nutritional, epidemiologic, and socio-economic burden (7). The risk of development of hypertension increases in overweight or obese. Weight gain increases the risk of hypertension, (8) whereas reduction in weight causes reduction of chances of development of hypertension (9-11). In a British birth cohort study it was observed that high BMI and increase in BMI at any life stage, more importantly when recent was associated with increased blood pressure levels (12). A strong positive association between being overweight in early adulthood was reported to be associated with elevated midlife blood pressure levels (13). To date, only a few large longitudinal studies investigated the role of BMI in early adulthood in the prediction of future hypertension, (8, 14) and these studies did not clarify the effect of the lifetime maximum BMI (BMI max) on the development of hypertension. In addition, although a few studies suggested that the association between weight gain and incident hyper tensiontended to be greater in younger than in older participants (8, 15) it remains undetermined whether histories of elevated BMI in early adulthood such as the 20s (BMI age 20y) or the BMI max would be positively associated with an increased risk of hypertension even in later life. India and many developing countries are facing health problems because of cardiovascular diseases, especially coronary heart diseases. These diseases are increasing in India and other developing countries whereas incidence of these diseases has decreased in developed nations of Europe and North America. Societal changes and lifestyle factors like sedentary lifestyle and lake of exercise are important causes of this cardiovascular epidemic (16). There are very few studies on trends in cardiovascular risk factors in India (17).

Aims and Objectives

Aim: To study the correlation of BMI on blood pressure and in young healthy medical students.

Objective:

1) To access the obesity in medical students.
2) To study the correlation of BMI on blood pressure.

3) To explore various effects of obesity on B.P.

MATERIAL AND METHODS

The present study was conducted in the Department of Physiology MGM Medical College Aurangabad, India.

Sampling Procedure: The study was carried out in the Department of Physiology MGM Medical College & Hospital. In this study 120 young medical students between age group 18 to 22 years were included after the prevalence of incidence in the the Aurangabad city studying in MGM Medical college Aurangabad, satisfying inclusion and exclusion criteria.

Ethical committee Approval: MGMUHS (DU) / IEC / 15-16/ 187.
Study Design: Observational, Comparative study.

Sample size: 120
Period of Study: 2 YEARS.
Study Population: Ist Year MBBS students.
Study Area: Department of Physiology, MGM Medical College, Aurangabad.

1)Inclusion Criteria:

The student were grouped according to the BMI into normal, over weight and obese.

Table 1. Classification of obesity

Parameters	WHO CRITERIA	Indian criteria
Normal	18.5-24.9	18.5-22.9
Over weight	25-29.9	23.0-24.9
Obese	>30	>25

- Normotensive (<140 mm of Hg) laying and supine.
- Systolic BP -110 to 140 mm of Hg.
- Diastolic BP-70 to 90 mm of Hg, were included in the study.

Exclusion Criteria

- Subject having any cardiovascular disease diabetes, hypertensive on medications were excluded from the study.
- Detail clinical history was taken. Willingness, biodata and general examinations was done for all subjects. Grouping of the students was done on the basis of BMI with 30 subjects in each group.

Method of Collection of Data

- The study was carried out on 120 normal healthy medical students of 18 to 22 years of age.
- The blood pressure and pulse were recorded. The body mass index was calculated. The lipid profile was done in all volunteers.

1. Pulse rate per minute was measured by palpatory method.
2. Arterial blood pressure (mm of Hg): Blood pressure was recorded with standard sphygmomanometer by auscultatory method. Before recording the blood pressure, subjects were allowed to rest for 5 min to reduce the anxiety. The first Korotk off sound indicates systolic blood pressure (SBP) and fifth Korotk off sound/sound disapear indicate diastolic blood pressure (DBP).
3. Body Mass Index (BMI): At the time of examination, the participant's weight and height was measured. Weight was measured using balance scales to within 100 gm measurements. Weight was taken with subjects wearing light clothing and no shoes. Height was measured in standing positions, with shoulders and buttocks against the wall, the subject looking straight ahead, with joined feet, and arms hanging on both sides. BMI was calculated as weight/height^2 (kg/m^2) (18).

Statistical Analysis: The data will be compiled in master chart i.e. in MS-EXCEL Sheet and for analysis of this data; SPSS (Statistical package for social sciences) Version 20th was be used.

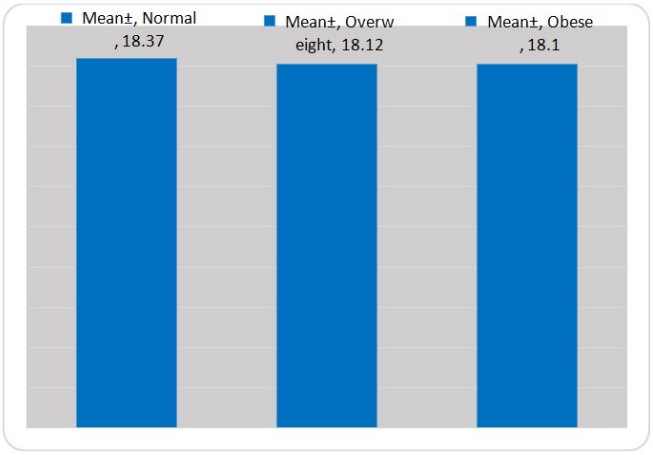
Frequencies and percentages were calculated to show the distribution of i.e. Gender etc.

- ANOVA and probability values was calculated to show mean difference between three groups, Also the Spearman's KarlPearson correlation coefficient was applied to show relationship between two variables. The significance level of this test was checked at 0.05

OBSERVATIONS AND RESULTS

Table 6. Comparison of Mean Age of participants in Groups

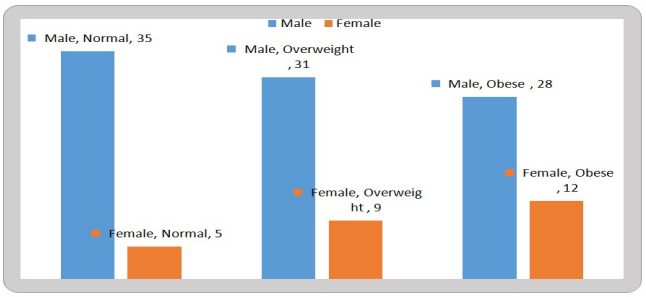
Groups	Mean±SD	F-value	P-vale
Normal	18.37±0.54	2.59	P=0.127 NS
Overweight	18.12±0.33		
Obese	18.10±0.30		



Graph 1. Distribution of participants according to Age

Table 7. Distribution of Participants according to Gender

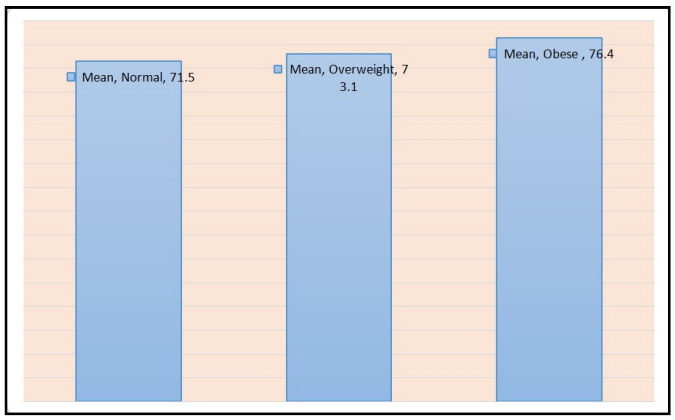
Gender	Normal	Overweight		Obese	
	No %	No	%	No	%
Male	35 87.5%	31	77.5%	28	70.0%
Female	05 12.5%	09	22.5%	12	30.0%
Total	40 100.0%	40	100.0%	40	100.0%



Graph 2. Gender of participants in Groups

Table 8. Comparison of Mean Pulse Rate of Participants in Groups

Pulse Rate	Mean±SD	F-value	P-vale
Normal	71.50±4.48	7.955	P=0.001 S
Overweight	73.10±4.87		
Obese	76.40±7.09		



Graph 3. Comparison of Mean Pulse Rate of Participants in Groups

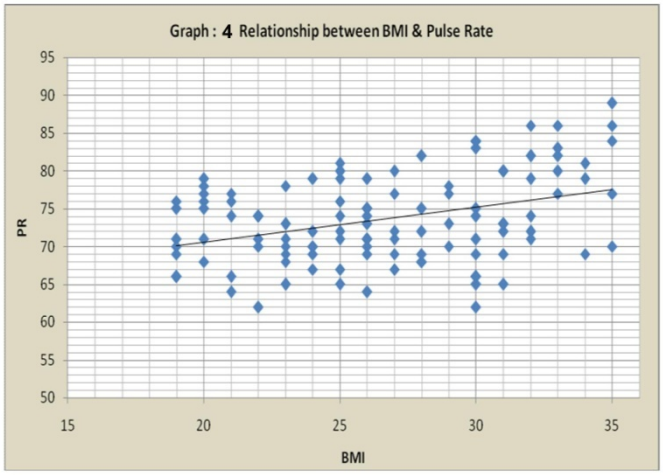
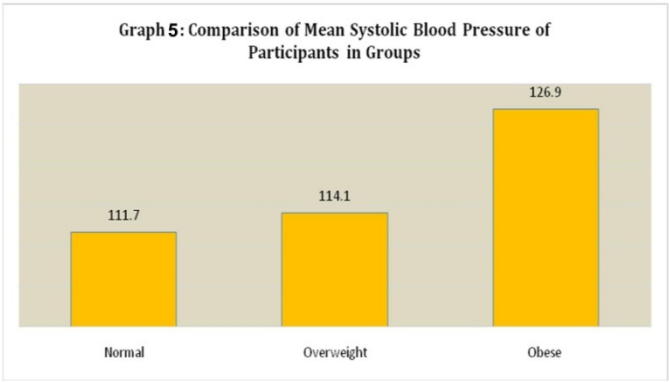


Table 9. Comparison of Mean Blood Pressure of Participants in Groups

BP		Mean±SD	F-value	P-vale
Systolic BP	Normal	111.70±3.34	157.224	P< 0.0001 S
	Overweight	114.10±3.78		
	Obese	126.90±5.04		
Diastolic BP	Normal	70.10±1.75	197.021	P< 0.0001 S
	Overweight	75.60±1.51		
	Obese	85.60±5.67		



DISCUSSION

Total number of students recruited in this study were (n=130) among these ten students dropped out due to absenteeism. Hence the study was carried out in 120 students. The study was carried out in the Department of Physiology MGM Medical College & Hospital Aurangabad. In this study 120 young healthy medical students between age group 18 to 22 years were included and comparison of BMI groups i.e. normal, overweight and obese) with regards to Systolic and diastolic blood pressure and pulse rate was measured. Body mass index was calculated by measuring height and weight. The data was compiled in master chart i.e. in MS-EXCEL Sheet and for analysis of this data; SPSS (Statistical package for social sciences) Version 20th was used. Frequencies and percentages were calculated to show the distribution of Gender and age etc. ANOVA and probability values was calculated to show mean difference between three groups, Also the Spearman's Karl Pearson correlation coefficient was applied to show relationship between two variables. The significance level of this test was checked at 0.05. Obesity and overweight are serious problems that pose a huge and growing financial burden on public resources. The causes of obesity and overweight are sedentary life style, lake of regular exercise and packaged food with loaded calories all over the world, leading to development of many chronic diseases such as coronary heart diseases, non-insulin-dependent diabetes mellitus, hypertension and some cancers, as well as early death. Many scientific studies have found that risk of development of various diseases is associated with relatively small increases in body weight, not just with marked obesity (18).

Pulse Rate: In present study the mean value of pulse in the normal weight participants was 71.50 ± 4.48, in overweight the mean value was 73.10±4.86and in the mean value of obese participants was 76.40± 7.09 which was found to be increased in obese participants.

P value was 0.001 which was statistically significant.

Blood pressure: The mean value of systolic blood pressure in normal weight participants was 111.70±3.34, the mean value in overweight was 114.10±3.78 and in obese volunteers the mean value was 126.90 ±5.04. It was observed that as the weight goes on increasing the BP also increases and was statistically significant. The mean value of diastolic blood pressure in normal weight was 70.10 ± 1.75, the mean value in over weight was 75.60 ±1.51 and in obese the mean value was 85.60 ±5.67 which was found to be increased in obese. The p value was <0.001 hence statistically significant. In our study significant increase in pulse rate, systolic blood pressure and diastolic blood pressure was observed in overweight and obese as compared to normal weight. Obesity is not a homogeneous disorder. In a subgroup of obese individuals, the sympathetic tonus is increased to key organs, including the kidney, muscles and peripheral vessels. Evidence for increased sympathetic tonus of the heart is less strong, especially in individuals without hypertension. Obese individuals are at increased risk of developing cardiac arrhythmia and sudden death when compared to normal weight individuals. In healthy animals, obesity induced by excessive feeding is associated with sympathetic activation and hypertension. Sympathetic activation is precociously induced by overfeeding, and is reversed by weight loss. Modification in the sympathetic system induced by overfeeding seems to precede alterations in the renin-angiotens in system (19). Anthropometric indicators such as BMI have been recognized for estimating cardiovascular disease risk factors, particularly due to their positive association with hypertension (Pi-Sunyer 1993; Han et al 1997; Cox et al 1998; Olatunbosun et al 2000; Guagnano et al 2001; Sergeant et al 2002; Belahsen et al 2004). The well-known correlates of anthropometric indicators and BP have again been confirmed in this study. The findingof this study corroborates the earlier investigations that reported significant positive correlation of anthropometric factors such as BMI with SBP and DBP (Seidell et al 1991; Kadiri et al 1999; Hsieh et al 2000; Olatunbosun et al 2000; Shahbazpour 2003; Yekeen et al 2003; Gus et al 2004) (20).

Our study provides support for and extends previous findings by showing positive relation between BP and weight gain. Our datafurther underscore the importance of weight control in preventing high BP. The exact mechanism by which adiposity raises BP is not well understood. Obesity and insulin resistance, along with hypertension, are major components of metabolic syndrome. It has been proposed that insulin resistance and subsequent. Hyper insulinaemiamay play an important role in mediating the obesity–hypertension association. Hyperinsulinaemia may raise BP by multiplemechanisms, including enhanced activity of sympathetic

nervous system, increased renal sodium reabsorption, endothelial dysfunction and up regulation of renin–angiotensin system. Recent research also suggests a role for inflammatorymediators in altering mechanisms of vascular tone regulation, leading to high BP (21). Studies carried out during the last decade indicated that India has entered the era of dual nutrition burden; underand over nutrition both coexist in all segments of the population. Studies of Dr. P. Rajeshwari et al found that both systolic and diastolic blood pressure increase with increase of BMI (22).

Our results are in accordance with majority of previous studies: M. Behjati et al, documented that elevated BMI was strongly associated with elevated blood pressure. Our study correlates with this observations (23).

P. Chhabra et al observed that students of BMI more than 25 were more likely to have elevated pressure. Similar observations are made in the present study (24).

Study of Qain Ren et al showed that increased BMI was positively associated with the incidence of hypertension. Their finding implied that change in BMI could affect the change of blood pressure, and reducing BMI by modifying lifestyle could prevent and control incidence of hypertension (25).

Study of Ravi Venkatachelam et al showed significant association between excess weight and prehypertension, similar to findings in other studies (26). A study among medical students in coastal Karnataka has found a significant correlation between prehypertension and BMI in boys (27). A study from Israel concluded that BMI was the strongest predictor of prehypertension among males and females (28). Study of WB Droyvold et al showed a strong association between change in BMI and change in SBP and DBP both among women and men (29). In contrast to our studies, study of L.N. Achi (30) came to the conclusion that the correlation between blood pressure and BMI was not statistically significant, however there was positive correlation between blood pressure and BMI and the study of Nadia Danon-Hersch (31) suggested that the relationship between the values BMI and blood pressure was not linear.

CONCLUSIONS

Total number of students recruited in this study were (n=130), among these ten students dropped out due to absenteeism. Hence the study was carried out in 120 students, age group 18 to 22 years were included in the Department of Physiology MGM Medical College & Hospital Aurangabad. All the volunteers were assessed for body mass index, systolic blood pressure, diastolic blood pressure and pulse rate.

- ***Pulse rate:*** In the present study the mean value of pulse rate in the normal weight, overweight and obese volunteers was statistically significant. It was observed that as the weight goes on increasing the pulse rate also increases.

Blood pressure:

- **Systolic Blood Pressure:** The mean value of systolic blood pressure in normal weight, overweight and obese was statistically significant. It was observed that as the weight goes on increasing the systolic BP also increases.
- **Diastolic Blood Pressure:** The mean value of diastolic blood pressure in normal weight, overweight and obese was statistically significant. It was observed that as the weight goes on increasing the diastolic blood pressure also increases.
- Alternation in body mass index due to weight gain is related to many disorders like hypertension, cardiovascular diseases and dyslipidemia.

Recommendations : We found in our study a strong positive association of weightgain and increased adiposity during adulthood with BP among normotensive individuals. Along with previous findings, these data suggest that for the prevention of hypertension weight reduction should be promoted. The importance of this finding is to enable “caregivers” in high blood pressure pay more attention to the control of obesity so that Coronary Heart Disease (CVD),Type2 Diabetes and dyslipidemia associated with obesity might be prevented. The risk factors of hypertension already seen in several of the obese patients can be lowered by dietary intervention, life style modification, improving knowledge, attitude and practices regarding nutrition, regular exercise as well as other medical control of hypertension. It is clear that the population prevalence of obesity, high blood pressure and dyslipidemia if known will be useful in planning interventions. Therefore, strategies designed to limit cardiovascular risk should address weight reduction. In our study addition to body mass index, our finding could have been strengthened with simultaneous measurement of waist circumference, waist hip ratio, Tri Ponderal Mass Index and body fat percentage (%BF), which forms the future scope of our study.

Acknowledgment: I would like to acknowledge all those medical students for their participation in this study and staff members of MGM medical college for their continuous help and support.

Declaration of patient consent: The authors certify that they have obtained all appropriate consent.

Conflict of Interest: None to declare.

Source of funding: Nil.

REFERENCES

(1) F. X. Pi-Sunyer, “Medical hazards of obesity,” *Annals of InternalMedicine*, vol. 119, no. 7, pp. 655–660, 1993.

(2) M. D. A. F. Hoffmans, D. Kromhout, and C. De LezenneCoulander, “The impact of body mass index of 78,612 18-year old Dutch men on 32-year mortality from all causes,” *Journal of Clinical Epidemiology*, vol. 41, no. 8, pp. 749–756, 1988.

(3) J. Stevens, J. Cai, E. R. Pamuk, D. F. Williamson, M. J. Thun, and J. L. Wood, “The effect of age on the association between body-mass index and mortality,” *New England Journal ofMedicine*, vol. 338, no. 1, pp. 1–7, 1998.

(4) C. Ni Mhurchu, A. Rodgers, W. H. Pan et al., “Body massindex and cardiovascular disease in the Asia-Pacific Region: an overview of 33 cohorts involving 310 000 participants, ”*International Journal of Epidemiology*, vol. 33, no. 4, pp. 751–758, 2004

(5). X. Weng, Y. Liu, J. Ma, W. Wang, G. Yang, and B. Caballero, “Use of body mass index to identify obesity-related metabolic disorders in the Chinese population,” *European Journal of Clinical Nutrition*, vol. 60, no. 8, pp. 931–937, 2006.

(6) Francis J. Ha etal “Sudden Cardiac Death in the Young Incidence, Trends, and Risk Factors in a Nationwide Study”, https: //www.ahajournals.org/doi/suppl/101161/CIRCOUTCOMES.119006470.

(7) Hu F: Obesity Epidemiology. Oxford University Press, New York, USA; 2008.

(8). Yoriko Heianza, Satoru Kodama, Yasuji Arase, Shiun Dong Hsieh, Sakiko Yoshizawa, Hiroshi Tsuji, Kazumi Saito, Shiro Tanaka, Shigeko Hara, Hirohito Sone Role of Body Mass Index History in Predicting Risk of the Development of Hypertension in Japanese Individuals. http: //hper.ahajournals.org *Hypertension*. 2014;64:247-252.

(9). He J, Whelton PK, Appel LJ, Charleston J, Klag MJ. Long-term effectsof weight loss and dietary sodium reduction on incidence of hypertension. *Hypertension*. 2000;35:544–549.

(10).Stevens VJ, Obarzanek E, Cook NR, Lee IM, Appel LJ, Smith WestD, Milas NC, Mattfeldt-Beman M, Belden L, Bragg C, Millstone M, Raczynski J, Brewer A, Singh B, Cohen J; Trials for the Hypertension Prevention Research Group. Long-term

weight loss and changes in blood pressure: results of the Trials of Hypertension Prevention, phase II. *Ann Intern Med*. 2001;134:1–11

(11) Moore LL, Visioni AJ, Qureshi MM, Bradlee ML, Ellison RC, D' Agostino R. Weight loss in overweight adults and the long-term risk of hypertension: the Framingham study. *Arch Intern Med*. 2005;165:1298–1303

(12).Li L, Law C, Power C. Body mass index throughout the life-course and blood pressure in mid-adult life: a birth cohort study. *J Hypertens*.2007;25:1215–1223.

(13). Wills AK, Hardy RJ, Black S, Kuh DJ. Trajectories of overweight and body mass index in adulthood and blood pressure at age 53: the 1946British birth cohort study. *J Hypertens*. 2010;28:679–686.

(14). Tirosh A, Afek A, Rudich A, Percik R, Gordon B, Ayalon N, Derazne E, Tzur D, Gershnabel D, Grossman E, Karasik A, Shamiss A, Shai I. Progression of normotensive adolescents to hypertensive adults: a study of 26,980 teenagers. *Hypertension*. 2010;56:203–209.

(15). Juhaeri Stevens J, Chambless LE, Tyroler HA, Rosamond W, Nieto FJ, Schreiner P, Jones DW, Arnett D. Associations between weight gain and incident hypertension in a bi-ethnic cohort: the Atherosclerosis Risk in Communities Study. *Int J Obes Relat Metab Disord*. 2002; 26:58–64.

(16). Rajeev Gupta, Soneil Guptha, Aachu Agrawal, Vijay Kaul, Kiran Gaurand Vijay P Gupta Secular trends in cholesterol lipoproteins and triglycerides and prevalence of dyslipidemias in an urban Indian population *Lipids in Health and Disease* 2008, 7:40http://www.lipidworld.com/content/7/1/40BioMed Central

(17) Leeder S, Raymond S, Greenberg H, Liu H, Esson K: A race against time: the challenge of cardiovascular disease in developingeconomies. New York. Columbia University; 2004.

(18). Abdul Rahman Al-Ajlan, Lipid Profile in Relation to Anthropometric Measurements among College Male Students in Riyadh, Saudi Arabia: A Cross-Sectional Study. (*Int J Biomed Sci*2011; 7 (2): 112-119).

(19). Dr. P. Rajeshwari et al Correlation between body mass index and blood pressure indices in under weight, normal weight and over weight adolescents INDIAN JOURNAL OF APPLIED RESEARCH. Volume: 5 | Issue: 2 | Feb 2015 | ISSN - 2249-555X

(20). Rufus A Adedoyin et al, Relationship of anthropometric indicators with blood pressure levels and the risk of hypertension in Nigerian adults. *International Journal of General Medicine* 2008:1 33–40

(21). G Yang Body weight and weight change in relation to blood pressure in normotensive men. Journal of Human Hypertension (2007) 21, 45–52doi:10.1038/sj.jhh.1002099; published online 5 October 2006.

(22) Aidah Juliaty Relationship Between Blood Pressure and Lipid Profile on Obese Children. American Journal of Health Research 2015; 3(4): 198-202. (http://www. Science ublishinggroup. Com//ajhr)doi: 10.11648/j.ajhr.20150304.11.

(23) . M. Behjati, et al The Relation between Blood Pressure and Body Mass Index in Iranian School Age Children. Iran J Med Sci 2006; 31(1): 33-36

(24) P. Chhabra, et al Nutritional Status and Blood Pressure of Medical Students in Delhi68CIndian Journal of Community Medicine Vol. 31, No. 4, October-December, 2006

(25) Qain Ren, et al HChange in Body Mass Index and Its Impact on Incidence of Hypertension in 18–65-Year-OldChinese Adults. Int. J. Environ. Res. Public Health 2016, 13, 257; doi: 10.3390/ijerph13030257

(26) .Ravi Venkatachelam Chitrapu, et al Prehypertension among Medical Students and its Association with Cardiovascular Risk Factors.8http://www.jdrntruhs.org on Monday, March 16, 2015, IP: 117.203.54.156(27) Setty SS, Naik, et al Prevalence of Prehypertension amongst medicalstudents in Coastal Karnataka. *J Evoln Med Dent Sci* 2012; 1:975-80

(28) Grotto I, Grossman E, Huerta M, Sharabi Y. Prevalence of prehypertension and associated cardiovascular risk profile among young Israeli adults. Hypertension 2006; 48:254-9.

(29) WB Drøyvold,et al Change in body mass index and its impact on bloodpressure: a prospective population study. *International Journal of Obesity* (2005) 29, 650–655.

(30) L.N. Achie, K.V. Olorunshola, J.E. Toryila and J.A. Tende. The Body Mass Index, Waist Circumference and Blood Pressure of Postmenopausal Women in Zaria, Northern Nigeria. Current Research journal of Biological Sciences 2012. 4(3): 329-332.

(31). Nadia Danon-Hersch, Arnaud Chiolero, Conrad Shamlaye, Fred Paccaud, and Pascal Bovet. 2007. Decreasing Association between Body Mass Index and Blood Pressure over Time. Epidemiology. 2007 Jul;18(4):493-500.COHORT OF 361 662 ME.STEPHEN B. HULLEY1 LEWIS H. KULLER3 DEBORAH WENTWORTH4

****