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Original Research Article

To Study the Prevalence of Obesity and Its Correlation with Cardiovascular Risk Factors

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Abstract:

Obesity is not a lethal disease in and of itself but is a significant risk factor associated with a range of serious non-communicable diseases and conditions. Overweight and obesity is considered as an intermediate risk factor for major chronic conditions including heart disease, stroke, cancer, chronic respiratory diseases and diabetes.

Aims and Objectives: This study was undertaken to study the prevalence of obesity and find out its correlation with BMI, hypertension and lipid profile.

Settings and Design: A prospective study in a tertiary referral centre

Material and Methods: The present study was a prospective study, a total of 100 cases were analysed. Their anthropometric indices, BMI, waist circumference, hip circumference, waist hip ratio, systolic and diastolic blood pressure were measured, and lipid profile was investigated in central pathology laboratory.

Statistical Analysis: All statistical analysis was done by using excel software and SPSS (V.22) statistical software. $p<0.05$ was considered significant.

Results: BMI is positively correlated with total cholesterol, serum triglycerides, serum lipoprotein and blood pressure and negatively correlated with HDL

Conclusion: early and immediate interventional measures like increase in physical activity healthy lifestyles and regular surveillance are required to prevent obesity and various complications like CVDs.

Keywords: obesity, cholesterol, blood pressure cardiovascular.

Introduction

Obesity is increasing at an alarming rate throughout the world and has become a global problem. The World Health Organisation (WHO) has declared overweight as one of the top 10 health risks in the world and one of the top five in developed nations (WHO,2002). [1] According to estimates, there are more than one billion overweight people worldwide, and some 250 million of these are estimated to be clinically obese (WHO,2019).[2] Overweight and obesity are rampant in the current world scenario and threatening as the major risk factors for many diet-related non-communicable diseases (NCDs) like type 2 diabetes, cardiovascular disease, hypertension, stroke and certain forms of cancer.[3] The causes for obesity and overweight being physical inactivity, unhealthy diet, genetic predisposition, behavioural factors like tobacco, alcohol.[4] In India the age of onset of obesity is progressively decreasing over the past years and the young individuals are being predisposed to obesity related health problems[5]. About 30-65% of adult urban Indians are reported to be either overweight or obese. This may leads to heart disease and other chronic diseases including hyperlipidaemia, hyperinsulinaemia, hypertension and early atherosclerosis.[6] In case of obese individual more calories are consumed than lost and appetite does not subsequently reduced to compensate for the increase in energy stores. The amount of the adipose tissue is tightly regulated through neural and humeral signals transmitted to the brain. Failure of fat cells to send adequate signals or failure of the brain to respond to appropriate signals causes obesity[7-8] The young individuals may not consume an adequate diet and healthy diet or exercise regularly and usually skip their breakfast. Their diet is high in fat, sodium and sugar because of frequent snacking and consumption of fast food. The body mass index (weight/height) is widely used in adult populations, and a cutoff point of 30 kg/m² is recognized internationally as a definition of adult obesity. Obesity and overweight is gradually becoming a health problem in many developing countries,

including India as obesity appears to increase the risk of subsequent morbidity. It is difficult to reduce excessive weight in adults once it becomes established. Hence, it would be more sensible to begin prevention and treatment of obesity and overweight right from childhood itself. Hence, this study will be undertaken to find out the prevalence of obesity. An attempt will be made to find out correlation between BMI and BP indices viz. systolic blood pressure (SBP), diastolic blood pressure (DBP), Lipid profile (Total cholesterol, Triglycerides, LDL, HDL) and to find out the relation of BMI with these cardiovascular risk factors.

Material and Methods

The prospective study was conducted in Department of pathology and physiology Maharani Laxmi Bai Medical College, Jhansi, UP for a period of April 2021 to Aug 2022. Sample size was 100 patients which were randomly selected from the central pathology laboratory whose lipid profile was deranged Out of 100 patients 53 were males and 47 female.

Ethical clearance was obtained from MLB Medical College, Jhansi and written informed consent was obtain from the patients Total no. of 100 subjects taken for study was randomly selected from the central pathology laboratory and their anthropometric indices viz- BMI, waist circumference, hip circumference, waist hip ratio were measured in physiology Department. Systolic and Diastolic blood pressure was measured and Total cholesterol, Triglyceride, HDL, LDL were investigated in central pathology laboratory The questionnaire contains several anthropometric data included information of age, height and weight. The BMI calculating formula will be weight in kg divided by square of height in meter. BMI will be classified into three groups:- Group 1: Normal (BMI 24 kg/m^2), Group 2: Pre obese (BMI 25-29.9 kg/m^2),Group 3: Obese (BMI ≥30kg/m^2),Waist circumference was measured at the midpoint between the lower margin of the last palpable ribs and the iliac crest. Hip circumference was measured around the widest portion of the buttocks.. Blood pressure was classified as normal (SBP <120 and DBP <80 mmHg), pre-hypertension (SBP-120-139 and/or DBP-80- 89 mmHg), stage I hypertension (SBP-140-159 and/or DBP-90-99 mmHg), and stage II hypertension (SBP >160 and/or DBP >100 mmHg). Radial pulse rate was counted manually.

Statistical analysis: All data were represented in form of percentage. All statistical analysis was done by using excel software and SPSS (V.22) statistical software. $p<0.05$ was considered significant.

Results and Observation

Table no 1 shows distribution of study patients according to age 41% of patients were in the age group of 30-40 years while 33% of patients were in the age group of 30-40 years. There was predominance of male patients 53 were male and 47 were female.

Table no 2 shows distribution of subjects according to sex with relation to their BMI (body mass index) out of total 100 students 58% in normal BMI range (≤ 24.9) in which 34 are males and 24 are females. 29% in preobese group (BMI 25-29.9) in which 14% males and 15% are females. 13% in obese group (BMI>30 in which 5% male and 8% females. Percentage of female is more than male in obese group while nearly equal to male in preobese group. Table no 3 showing anthropometric data in terms of waist circumference (WC), hip circumference (HC), and waist hip ratio(WHR) in mean ±SD according to BMI in male and female. In male there is increasing trends of WC, HC, and WHR as BMI and obesity increases while WHR is above normal in both preobese and obese males and in female there is increased trends of WC, HC, and WHR as BMI and obesity increasing. Table no 4 shows mean ±SD values of total cholesterol(TC), triglycerides (TG), HDL and LDL in respect to BMI. Data suggests high mean values of TC, TG, LDL in preobese and obese subjects. HDL showing decreasing trends with increasing BMI.

Table no 5 shows the correlation of BMI with blood pressure, total cholesterol and triglycerides. Data suggests that BMI has a positive correlation with systolic BP($r=0.785$) and diastolic BP($r=0.718$) with p value<0.0001. BMI has positive correlation with total cholesterol($r=0.866$), triglycerides($r=0.788$), and LDL($r=0.864$) with p value<0.0001. BMI has negative correlation with HDL($r=0.809$) p value <0.0001. All the correlations are highly significant.

Table 1: Site wise Distribution of Various Nodular Like Lesions

Site	Benign		Inflammatory cases		Tumor like conditions		Malignant cases		Total cases in each region
Head & neck	28	54.90%	3	6.82%	16	44.44%	8	42.11%	55
Upper extremity	15	29.41%	4	9.09%	11	3.56%	4	21.05%	34
Lower extremity	3	5.88%	6	13.64%	6	16.67%	5	26.32%	20
Multiple sites	2	3.92%	26	59.09%	1	2.78%	0	0.00%	29
Trunk	3	5.88%	5	11.36%	2	5.56%	2	10.53%	12
Total	51		44		36		19		150

Table 2: Distribution of Nodular lesions of skin according to histopathological correlation

S. No.	Pathological Lesions	No. of Cases	Percentage
1	Benign	51	34.00%
2	Inflammatory	44	29.33%
3	Tumor like Lesions	36	24.00%
4	Malignant	19	12.67%
	Total	150	

Table 3: Distribution of Benign Nodular Lesions of Skin by Histopathological Diagnosis

S. no.	Type of lesion	cases	Percentage
1	Lipoma	16	31.37%
2	Haemangioma	14	27.45%
3	Neurofibroma	5	9.80%
4	Nodular fasciitis	4	7.84%
5	Fibroma	3	5.88%
6	Angiofibroma	3	5.88%
7	Dermatofibroma	2	3.92%
8	Pilomatrixoma	2	3.92%
9	Trichoepithelioma	2	3.92%
	Total	51	

Table 4: Distribution of Malignant Nodular Skin Lesions by Histopathological examination:

S.no.	Type of lesions	No. of cases	Percentage
1	Squamous cell carcinoma(SCC)	11	57.89%
2	Basal cell carcinoma(BCC)	4	21.05%
3	Dermatofibrosarcoma protuberance(DFSP)	2	10.53%
4	Malignant melanoma	2	10.53%
	Total	19	

Table 5: Results of cytohistopathological correlation of nodular skin lesions

Nature of pathological lesions	Total no. of cases	FNAC done	Corrected diagnosis is by FNAC	Wrong diagnosis is by FNAC	Confirmed histopathological diagnosis	FP	FN	Diagnos. Of FNAC
Inflammatory	44	28	18	4	44			64.28%
Tumor like lesions	36	27	19	1	36	1		70.37%
Benign	51	45	35	3	51	2		77.77%
Malignant	19	18	12	4	19		4	66.66%
Total	150	118	84	12	150	3	4	

Table 6: Overall Sensitivity Specificity & Predictive Value for Positive Cases of Nodular Skin Lesions by FNAC

S. no	FNAC	Histopathological diagnosis		Total
		Carcinoma present(+)ve	Carcinoma absent(-)nt	
1	Malignant	12(A)	3(B)	15
2	Benign/tumor like Inflammatory	4(C)	72(D)	76

True positive – 12, False positive – 3, True positive – 72, False positive – 4, Sensitivity=75%. Specificity=96%. Positive predictive value=80%, diagnostic Accuracy=92.3%

Discussion: BMI is the most commonly used parameter internationally to calculate adipose tissue using anthropometric data and is an effective way to screen obesity. In this study total 100 patients participated out which 53 were male and 47 were female. Out of 100 patients 41% were 30-40 years age group and 33% were 40-50 years of age.

Out of 100 Students 58% students were normal (BMI<24.9) in which 34% male and 24% female. 29% students were preobese (BMI 25- 29.9) in which 14% male and 15% female.13% students were obese (>30) in which 5% male and 8% female. The present study shows that obesity is more in young individuals with 23% male individuals and 19% of females. Gender difference was statistically not significant. Such results were also stated in other studies. Aggarwal et al, 2008 reported the prevalence of obesity to be 3.4% in their study group with no significant difference between male and female.[9]

In our study waist circumference, hip circumference, waist hip ratio is significantly higher in preobese male mean±SD values WC (90.1+ 3.6) HC (98±3.5) WHR (0.91) and obese male WC (98.2±4.1) HC (103.4 ±4.2) WHR (0.94) than normal male WC (83.2+4) HC(93.6±4.2) WHR (0.88). Overweight and obesity in young individuals is gradually emerging as a health problem. Young individuals are more prone to obesity due to the lifestyles with less physical activity and disordered eating habits and thereby prone to obesity related health hazards. From this study it is obvious that obesity and overweight is prevalent in young individuals. Prevention and management strategies applicable to all regions of the world should be developed.

NCEP recommends lipid screening beginning at age twenty and continuing every five years with normal levels and more frequently with abnormal levels throughout adulthood. The present study was designed to measure serum lipids and lipoproteins as markers for cardiovascular diseases among obese and overweight medical students.[10] Increase in TC, TG and LDL above a certain level and decrease in HDL carries the risk of cardiovascular diseases. In our study normal subjects mean±SD value TC(140.6 16.9), TG(88.6±15.5) LDL (70.5±8.1) and HDL(52.3±3.1) while in preobese TC(165.9±5.6) TG (142.8±8.2) LDL(92.9±6.2) HDL(44.4±3.1) and in obese TC(196.4±8) TG (166.8±10.7) LDL(126.2±8.8) HDL(36.7±3.6) it shows higher mean values of Total cholesterol, Triglyceride, LDL and lower mean values of HDL in preobese and obese patients than normal individuals. In our study there is statistical analysis of correlation and association of BMI with lipid profile. Pearson correlation r and p value shows the positive correlation of BMI with total cholesterol(r=0.866 p value <0.0001), triglyceride(r=0.788 p value <0.0001), LDL(r=0.864 p value <0.0001) and relationship is significant.

Negative correlation is found between BMI and HDL (r=0.809 p value <0.0001) and relationship is significant. In similar study by saghafi-Asl *et* al 2013 on overweight and obese 63 patients and stated that WHR has a strong correlation with TC(r= 0.37).[11] In another study Darmawan and irfanuddin *et* al 2007 reported the relative higher level of correlation between central obesity and lipid profile in 22 to 55 years subjects.[12] They found a correlation between WC and TG(r=0.369) in male and (r=0.535) in female. Furthermore, correlation found between WHR and TG was (r= 0.543) in male and (r=0.271) in female. Comparing this data to another study done by R Bowden *et* al.2004 in bayler university where 41.3% had elevated LDL 19.8% elevated TC 4.8% elevated Triglycerides 38.8% had lower HDL levels.[13] Similar results also found with the cross-sectional studies done during 2009 to 2010 by Michael Khoury, cedric manlhiot *et* al which shows statistically significant association between lipid profile and measures of adiposity.[14]

The Framingham study and other large epidemiologic studies have reported a correlation between obesity and increased coronary heart disease-related events[15]. Elevated LDL and decrease HDL has been reported to increase the risk of CVD in several studies.[16] (Barter et al 2007).[17] So our results are in accordance with studies done before and comparable to them. BMI is a key indicator for developing chronic condition such as CVDs. Accumulation of excess visceral fat is associated with elevated levels of TC, TG, and LDL with reduced levels of HDL. The prevalence of Hypertension (HTN) in developing countries appears to be on the rise. Higher blood pressure level in young adulthood is associated with a greater hazard of premature cardiovascular disease according to Joung sik son et al 2018[18]. An attempt was made in the present investigation to determine the correlation between HTN and obesity among young individuals.

Our study found that elevated systolic and diastolic blood pressure values in preobese SBP(125.1± 3) DBP(81.79±1.8) and obese SBP(132.6±3.9) DBP(86±3.5) normal subject SBP(114.8±3.8) DBP(75.0± 3.4). In our study statistical analysis of correlation and association of BMI with blood pressure Pearson correlation r and p value shows strong positive correlation of BMI with systolic BP (r=0.785 p value <0.0001) diastolic BP (r=0.718 p value <0.0001) and relationship is highly significant. These data suggest increase BMI is associated with increase in systolic and diastolic BP. Martins *et* al. 2013 determined the proportions of pre HTN and HTN among college students in Brazil. Moreover, they showed that the rates of excess weight was 18.2% and increase in body mass index (BMI) was associated with an elevation in mean BP. Wofford *et* al.2004 reviewed the association between obesity and HTN and indicated that excess weight gain accounts for 65-75% of the risk for essential HTN.[19]

These data suggest Obesity is strongly associated with hypertension and thus cardiovascular disease risk. Several central and peripheral abnormalities that can explain the development high arterial pressure in obesity have been identified; include activation of the sympathetic nervous system and endothelial dysfunction, renin-angiotensin-aldosterone system associated with renal functional abnormality. Because HTN is a significant, but modifiable, risk factor for cardiovascular diseases, strategy to achieve even a modest lowering of levels of BP in the population should be an important public health goal.

So, our study is mostly coherent with the studies carried out previously and comparable to previous studies. In our study of young individuals, high prevalence of overweight and obesity was found. There were also strong correlation found between BMI and systolic and diastolic blood pressure and lipid parameters TC, TG, LDL and HDL levels. It is essential to note that the various risk factors interact with each other. Concerns grows that the current dramatic rise of obesity among adolescents predicts a future wave of increasing cardiovascular disease as these overweight youth reach the adult years. Managing the occurrence of one factor would have positive effects on the other. Reducing the BMI and obesity is imperative as it would reduce the risk of CVDs. Interventional measures like increase in physical activity, modification in dietary habits, healthy lifestyle should be taken to prevent obesity.

Conclusion

Prevalence of overweight and obesity according to WHO classification was 29% and 13%. It can be concluded that obesity and overweight are quite prevalent in the young individuals. Body Mass Index (BMI) is a simple and effective way to screen them so that timely measures could be taken to prevent their progression and complications. Persons with BMI >24.99 kg/m2 should be motivated for regular physical activity and diet modification and healthy lifestyle.

BMI is positively correlated with Total cholesterol level, blood pressure, Serum triglyceride, LDL level. And is negatively correlated with HDL increase in BMI decreases HDL level. Obesity, measured by BMI has significant correlation with blood pressure and serum lipid profile. Early and immediate interventional measures like increase in physical activity, modification in dietary habits, healthy lifestyle and regular surveillance are required to prevent obesity and development of various complications like CVDs.

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