DOI:10.24041/ejmr2018.56

THE PREVELENCE OF OBESITY AND OVERWEIGHT AMONGST STUDENTS AND STAFF OF ERA'S LUCKNOW MEDICAL COLLEGE & HOSPITAL LUCKNOW

Vishnu Kumar, Abdus Salam*, Aparna Misra, Tanvir Raza Jafri, Eqbal Anwer*, Seema Singh*

*Department of Biochemistry, Department of Physiology**

Era's Lucknow Medical College & Hospital, Sarfarazganj Lucknow, U.P., India-226003

ABSTRACT

This study had designed, to explore prevalence of obesity and overweight, on two criteria, Indian and World Health Organization (W.H.O.), amongst students and staff of Era's Lucknow Medical College & Hospital, Lucknow and Era Institute of Health Sciences and Research, Lucknow. As well as, assessment of association of oxidative stress with obesity. MBBS, Nursing and DMLT students as well as Hospital Laboratory Services (HLS) staff had included in this study. Study had carried out in Department of Biochemistry with collaboration of Department of Physiology and HLS. Results of this study had showed that, prevalence of obesity and overweight were high in staff with respect to students. The levels of reduced glutathione (GSH) were decreased in obese with respect to normal; on the other hand Malondialdehyde (MDA) levels were increased in obese with respect to normal.

Received on : 28-05-2018
Accpected on : 10-06-2018

Address for correspondence
Dr. Vishnu Kumar
Department of Biochemistry
Era's Lucknow Medical College & Hospital, Lucknow - 226003
Email: madhwapur1976@gmail.com
Contact no: +91-8953589756

KEYWORDS: Obesity, Anthropometric measurements, Indian Criteria of BMI to detect Obesity, WHO Criteria of BMI to detect Obesity

INTRODUCTION

Obesity is defined as excess body weight (>20% of ideal weight) due to accumulation of fat (1). Acknowledged evidence suggests that obesity is almost invariably associated with chronic low rank inflammation and oxidative stress and is calamitous for health and scourge on mankind (2). The disproportionate rapid rise in prevalence of overweight and obesity in both developed and developing Nations distinctly indicate that environmental changes are major determinants of this epidemic (3). Of course genetic disposition may act independently or may abet the environmental factors (4). A closely related parallel relationship between excess adiposity and poor health outcome is clearly visible adverse effects of obesity have explicitly been linked with serious diseases like diabetes mellitus, cardiovascular disease and cancer. Further there is gathering evidence that obesity also induces and/ or promotes a number of other diseases and that it increases the chances of premature death unless managed properly (5).

In the recent years, however, two more parameters have found in frequent use waist/hip ratio and waist circumference. (6) In many populations all these three parameters have been found to be related where as in some population's waist/hip ratio and waist circumference have been found a better expression of obesity as central obesity is better predictor of risk. It has been stressed by WHO and other workers that these parameters should be assessed in different populations because categorization may differ from population to population due to differing standards of nutrition, environmental variants, genetic disposition and finally unavoidable abdominal adiposity. Anthropometric measurements are useful in many fields. For example, athletes understand that body size and composition are important factors in sports performance. For example, a petite man with a low percentage of body fat will be more successful as a jockey in the Kentucky Derby than he would be as a defensive lineman in the National Football League. Sports coaches can also use these measurements to monitor an athlete's body to ensure they stay in peak physical shape (7).

MATERIALS AND METHODS

This study had carried out to assess the prevalence of obesity and overweight among the students and staff of Era's Lucknow Medical college and Era Institute of Allied Health Sciences and Research, Lucknow. In this study total subjects had categorized on two basis of two criteria lay down by WHO and Govt. of India. To, compare the relative importance of BMI, waist circumference and waist/Hip ratio for health assessment (7).

1. **Indian Criteria of BMI cut offs were classified in accordance with the revised Indian guidelines for BMI by Union Health Ministry of India (2005) : Less than 18.4 Kg/m2 (underweight), 18.5-22.9 Kg/m2 (normal), 23-24.9 Kg/m2 (overweight) and >25 Kg/m2 (obese). (7)**

1. INDIAN CRITERIA OF BMI TO DETECT OBESITY		
S. No.	**Group**	**BMI**
1.	Underweight	<18.4 Kg/m2
2.	Normal	18.5–22.9 kg / m2
3.	Overweight	23-24.99 kg / m2
4.	Obese	25-32.4 kg / m2
5.	Morbid Obese	≥ 32.50 kg / m2

2.W.H.O. Criteria (8)

W.H.O. CRITERIA OF BMI TO DETECT OBESITY		
S. No.	**Group**	**BMI**
1.	Normal	18 – 24.99 kg / m2
2.	Per- obese (Overweight)	25 – 29.99 kg / m2
3.	Obese class 1 (Moderate)	30 – 34.99 kg / m2
4.	Obese class 2 (Severe)	35 – 39.99 kg / m2
5.	Obese class 3 (Morbid)	≥ 40.00 kg / m2

Cutoff waist circumference (9)

Male: 90 cm

Female: 80 cm

Selection of Subjects

All Volunteer Students and staff of Era's Lucknow Medical college and Era Institute of Allied Health Sciences and Research, Lucknow were included in this study after their written consent.

Anthropometric measurement

Equipment

For anthropometric measurements (weight, height, waist and hip circumference) the following equipment were used

- Calibrated weighing machine digital
- Measuring rod, typically mounted on balanced beam scales
- Flexible, but non-stretchable measuring tape
- Full body-length mirror with 10cm ´ 10 cm grid lines
- Calibrated length rods of 150 cm and 200 cm.

Measurement procedures

Weight measurement

Weight had measured in all participants.

Setting up scale at the examination site

The scale had placed on a hard-floor surface (not on a floor which is carpeted or otherwise covered with soft material). Carpenter's level had used to verify that the surface on which the scale had placed was horizontal.

Calibration of scale

Calibration had done at the beginning and end of each examining day.

The scale was balanced with both sliding weights at zero and the balance bar aligned. The scale was checked using the standardized weights and calibration is corrected if the error is greater than 0.2 kg. The results of the checking and the recalibrations had recorded in a log book.

Normal weighing procedure

1. Participants were asked to remove their heavy outer garments (jacket, coat, trousers, skirts, etc.) and shoes. If subjects refuse to remove trousers or skirt, at least make them empty their pockets and record the fact in the data collection form.
2. The participant stands in the centre of the platform, weight distributed evenly to both feet. Standing off-centre may affect measurement.

Weighing procedure for heavily overweight persons

Heavily overweight, i.e. weighs more than the upper limit of the scale, this fact was noted in the data collection form, together with the upper limit of the scale.

Height measurement

Height had measured in all participants

Calibration of height rule

At the beginning and end of each examination day, the height rule had checked with standardized rods and corrected if the error is greater than 2 mm. The results of the checking and recalibrations had recorded in the log book.

Normal height measurement procedure

1. Participants had asked to remove their shoes, heavy outer garments, and hair ornaments.
2. The participants were asked to stand with his/her back to the height rule. The back of the head, back, buttocks, calves and heels should be touching the upright, feet together. The top of the external auditory meatus (ear canal) should be level with the inferior margin of the bony orbit (cheek bone). The participant was asked to look straight.

Waist circumference measurement

Setting up the place for the waist circumference measurement

The full body length mirror had placed against the wall to the measurement place. Using the carpenter level, it had been verified that grid lines on the mirror are horizontal.

Checking of tape

The length of the measuring tape had checked with the calibrated length rod.

Position of waist circumference measurement Waist circumference had measured at a level midway between the lower rib margin and iliac crest with the tape all around the body in horizontal position.

Waist circumference measurement procedure

1. Participants had asked to remove their clothes, except for light underwear. If this is not possible, for example due to cultural reasons, the alternative is to measure the circumference on the subject without heavy outer garments and record this fact in the data collection form. Tight clothing, including the belt, had loosened and the pockets were emptied.
2. The measurer was stand at the side of the participant in order to have a clear view of the mirror.
3. Participants had been standing with their feet fairly close together (about 12-15 cm) with their weight equally distributed to each leg. Participants had asked to breathe normally; the reading of the measurement should be taken at the end of gentle exhaling. This will prevent subjects from contracting their abdominal muscles or from holding their breath.
4. The measuring tape was held firmly, ensuring its horizontal position. Grid lines on the mirror had used to verify that the tape position is horizontal all around the waist. The tape was loose enough to allow the observer to place one finger between the tape and the subject's body.

Hip circumference measurement

Position of hip circumference measurement

Hip circumference had measured as the maximal circumference over the buttocks. The grid lines on the mirror had used to verify that the tape position is horizontal all around the body.

Hip circumference measurement procedure was same as for waist circumference, except for tape position.

Height (cm), Weight (kg), Waist and hip circumferences (cm) were noted using a measuring tape to the 0.1 cm. Waist circumference was measured at the midpoint between the lower border of rib cage and the iliac crest. Hip circumference was measured at the level of trochanter, the widest part of the hip region. Weight (kg) was measured to the nearest 0.1 kg using a weighing machine simultaneously. Waist hip ratio (WHR) was calculated as waist circumference divided by hip circumference. BMI was calculated as weight (kg) divided by height (m^2). Obesity is defined on two criteria (7- 9).

Study Design

At first Subjects were divided in to 4 groups (Group 1 to 4; Table 1):

Group 1: MBBS Students (Age 19.07 ±1.36, batch 2009 and 2010: n=200)

Group 2: Nursing Students (Age 19.07±1.36, batch 2009 and 2010: n=30)

Group 3: DMLT Students (Age 19.17 ±1.36, batch 2009 and 2010: n=30)

Group 4: Staff (Age 40.00 25.36, 2010: n= 60)

After, assessment of oxidative stress and anthropometric measurements in all above groups, these groups had divided in further groups as per Indian (Group 1 to 5; Table 2) and W.H.O. (Group 1 to 6; Table 3) Criteria of BMI to detect obesity in different groups (10).

Collection of blood samples

Blood samples had collected, from the antemedian cubital vein of the subjects, using disposable plastic syringes with all aseptic precautions. Blood was transferred immediately in to a dry clean plastic test tube with a gentle push to avoid hemolysis. Blood was collected from all groups, for GSH and MDA estimations in plain vials.

Separation of serum

To separate serum, the whole blood was kept in plain (red top) vacuutainer at 37 °C for 30 minutes after which this coagulated blood was centrifuged at 1500 rpm for 15 minute at 4°C in Eppendorf centrifuge machine. The supernatant was pipette out in a new tube and kept at - 20 °C till analysis (11).

Biochemical analysis of serum

Lipid peroxide (LPO; MDA), and reduced glutathione (GSH) by standard spectrophotometric methods (12-13).

Statistical analysis

One-way-analysis of variance (ANOVA- Newman's student test) was performed by comparison of values. All hypothesis testing were two-tailed. $P < 0.05$ was considered statistically significant and the results were expressed as mean ± SD. The Graph pad INSTAT 3.0 software was used to carried out the statistical analysis (14).

RESULTS

Variables → Groups ↓	Status of markers used for oxidative stress in Serum		Anthropometric Measurements				
	GSH (mg/dl)	MDA (nmol /ml)	Height (cm)	Weight (kg)	BMI (kg/ m^2)	BSA (m^2)	WHR
Group 1 (MBBS Students; Age 19.07±1.36, n=200)	55.00± 6.76	2.27 ±1.56	167.00 ±12.10	73.50 ±16.10	33.45 ±3.84	1.99 ±0.14	0.89 ±0.04
Group 2 (Nursing Students; Age 19.07±1.36, n=30)	48.79± 3.63	3.10 ±2.36	165.30 ±20.00	73.50 ±17.67	31.69 ±4.07	1.98 ±0.16	0.93 ±0.03
Group 3 (DMLT Students) (Age 19.07±1.36, n=30)	*53.*79± 3.63	2.90 ±2.36	160.10 ±19.10	65.50 ±15.00	22.79 ±2.36	1.66 ±0.16	0.87 ±0.03
Group 4 (Staff; Age 40.00 ±25.36, n= 60)	35.79± 3.63	3.30 ±2.36	168.12 ±17.60	59.50± 12.70	21.79 ±2.36	1.61 ±0.16	0.85 ±0.04

Table 1: Status Of Oxidative Markers And Anthropometric Measurements Amongst Mbbs, Nursing, Dmlt Students And Hls Staff Of Era's Lucknow Medical College & Hospital, Lucknow During Year 2009 And 2010

Values expressed as mean ± SD of anthropometric measurements of subjects and GSH with MDA values.

Groups ↓ Variables & Students →	Status of markers used for oxidative stress in Serum		MBBS Students (%)	Nursing Students (%)	DMLT Students (%)	Biochemistry and HLS staff (%)
	GSH (mg/dl)	MDA (nmol /ml)				

Table 2: Prevalence Of Obesity And Overweight Amongst Mbbs, Nursing, Dmlt Students And Staff Of Era's Lucknow Medical College & Hospital, Lucknow As Per Indian Criteria Of Bmi To Detect Obesity.

Group 1 (Normal; BMI 18.5 – 22.9 kg / m2)	70.00± 5.76	1.27± 0.56	53.00	67.00	73.00	25.00
Group 2 (Underweight BMI < 18.4 kg/m2)	48.79± 3.63* (- 47%)	2.18± 2.36* (+208%)	1.00	7.00	7.00	0.00
Group 3 (Overweight BMI 23-24.99 kg / m2)	53.79± 3.63* (-47%)	2.90 ± 2.36* (+208%)	21.00	13.00	7.00	13.00
Group 4 (Obese; BMI 25-32.4 kg / m2)	35.79± 3.63* (-47%)	4.30 ± 2.36* (+208%)	24.00	13.00	13.00	62.00
Group 5 (Morbid Obese; BMI≥ 32.50 kg / m2)	25.79± 3.63* (-47%)	5.30 ± 2.36*	1	0	0	0

Cont... Table 2: Prevalence Of Obesity And Overweight Amongst Mbbs, Nursing, Dmlt Students And Staff Of Era's Lucknow Medical College & Hospital, Lucknow As Per Indian Criteria Of Bmi To Detect Obesity.

GSH and MDA values expressed as mean ± SD of subjects and other values are percentage of student's different groups (1 to 5). Values in the parenthesis indicate percent change in GSH and MDA with respect to normal control.

Groups ↓ Variables & Students →	**Status of markers used for oxidative stress in Serum**		**MBBS Students (%)**	**Nursing Students (%)**	**DMLT Students (%)**	**Biochemistry and HLS staff (%)**
	GSH (mg/dl)	**MDA (nmol /ml)**				
Group 1 (Normal BMI 18 - 24.99kg/m2)	70.00± 5.76	2.27± 0.56	72	80	86	30
Group 2 (Underweight BMI< 18.00kg/m2)n	48.79± 3.63* (-47%)	3.10 ± 2.36* (+208%)	1.00	7.00	7.00	00.00

Table - 3: Prevalence Of Obesity And Overweight Amongst Mbbs, Nursing And Dmlt Students And Staff Of Era's Lucknow Medical College & Hospital, Lucknow As Per Who Criteria Of Bmi To Detect Obesity.

Group 3 (Pre-obese 25 – 29.99 kg / m2)	53.79± 3.63* (-47%)	2.90 ± 2.36* (+208%)	21.00	13.00	7.00	13.00
Group 4 (Obese-class 1 ;moderate, BMI 30 – 34.99 kg / m2)	35.79± 3.63* (-47%)	4.30± 2.36* (+208%)	5.00	0.00	0.00	17.00
Group 5 (Obese- class 2 severe, BMI 35 – 39.99 kg / m2)	25.79± 3.63* (-47%)	6.30± 2.36*	0.00	0.00	0.00	25.00
Group 6 (Obese- class 3 ;morbid;BMI ≥ 40.00 kg / m2)	22.79± 3.63* (-47%)	11.30± 2.36*	1.00	0.00	0.00	15.00

Cont... Table - 3: Prevalence Of Obesity And Overweight Amongst Mbbs, Nursing And Dmlt Students And Staff Of Era's Lucknow Medical College & Hospital, Lucknow As Per Who Criteria Of Bmi To Detect Obesity.

GSH and MDA values expressed as mean ± SD of subjects, and other values are percentage of students in different groups (1 to 6). Values in the parenthesis indicate percent change in GSH and MDA with respect to normal control.

DISCUSSION

Results of this study are showing that prevalence of obesity is more in staff with respect to students group; it may be due to sedentary life style of staff. Our observation is dependable with frequent previous studies which have documented a strong correlation between sedentary life style, decreased GSH and increased MDA with obesity. Elevated levels of GSH and MDA in overweight group as well as different obese groups as per Indian and WHO criteria of BMI to detect obesity, are predicting cardiovascular events with obesity (1, 8, 9 and 10). Our data suggest a possible role of GSH and MDA in the pathophysiology of obese individuals. The World Health Organisation estimated that approximately half a million people in North America and Europe died from obesity related chronic diseases in 2002, and this is set to increase by one third over the next 20 years if nothing is done. (10-19, 33) As current intervention strategies are failing to result in sufficient weight loss to reduce levels of obesity, it is now thought that rather than concentrating on weight loss as a sole success endpoint, reduction in the risk of obesity related chronic disease should also be an important consideration. Modest weight loss has been associated with reduction in total mortality, reduction in total cholesterol, obesity related cancers, diabetes related deaths and hypertension. (20-26) The Coronary Artery Disease (CAD) progress in Young Adults Study, the Atherosclerosis Risk in Communities and the prevention of weight gain may be the easiest way to prevent the development of undesirable changes in Cardiovascular Disease (CVD) risk factors including, increased Low Density Lipoprotein (LDL) cholesterol, total cholesterol, triglycerides, fasting glucose, and decreased High Density Lipoprotein (HDL) cholesterol. (27-34). Thus this type of study will be very useful at national and International Levels.

CONCLUSION

The definition of the cutoff value for "normal" BMI in a population would depend on identifying the risk

association with a disorder strongly associated with BMI. Further, such type of studies will specially help health workers and clinicians to suggest health and therapeutic regimen in a particular population. Needless to say, this study in due course of time is expected to be of great practical relevance to the students and staff of Era University.

Research recommendation

a. Build evidence of the impact of environmental/educational interventions in a variety of settings such as schools and other educational settings, workplaces, restaurants/cafeterias/cafe´s and other settings and institutions with catered food.

b. Improve the methods for measuring body composition, dietary intake, physical activity in populations. Develop and validate indicators for environmental determinants of obesity and weight gain.

c. Maintain and enhance systems for monitoring trends in overweight/ obesity, nutrition and physical activity and their environmental determinants. Conduct the body composition studies and prospective studies

d. Conduct studies to describe the mechanisms of overweight and obesity. Conduct trials on the force of carbohydrate type (glycemic index) on body weight.

A variety of potential interventions and their implications have also been outlined. Overall, the level of evidence for population-based interventions is weak either because they have been tried and shown to have a modest impact (such as dietary guidelines and workplace interventions) or they have not been tried and evaluated (such as fiscal food policies and banning Television advertisements to young children). In either case, the need to continue to develop and evaluate population-based interventions (especially environmental interventions) is paramount. A failure to act in a substantive way will undoubtedly result in continued massive increases in obesity and its complications—the burden of which will become unbearable for most countries.

ACKNOWLEDGEMENT

One of us (Vishnu Kumar) is grateful to the Director Academics, Era's Lucknow Medical College and Hospital, Lucknow for their guidance and support.

REFERENCES

1. Park K, Obesity Park's Text Book of Preventive and Social Medicine. Pub. m/s Banarsidas Bharot. Jabalpur. 2005: 317-319.
2. Ogden CL, Carroll MD, Curtin LR, Mc Dowell MA, Tabak CJ and Flegal KM. Prevalence of overweight and obesity in the United States 1999-2004 JAMA 2006; 295: 1594-1555.
3. Parcchini V, Redotti P and Talioli E. Genetic of leptin and obesity: A huge review Am J Epid 2005; 162: 101-114.
4. Ferranti S., Mozaffarian D. The perfect storm: Obesity adipocyle dysfunction and metabolic consequences. 2008; 54: 945-955.
5. Eckel RH. Surgical management of obesity N Eng J Med. 2008; 358: 1941-50.
6. Lemos-Santos MGF, Valente JG, Cioncalves-Silva RMV and Sichieri, R. Waist circumference and waist to hip ratio as predictors of serum concentration of lipids in Brazilian mer. Nutrition. 2004; 20:857-862.
7. Pandey V. Think you are slim? New Names may make you obese. DNA. www. DNAINDIA.com. 2008.
8. Barker M, Chorghade G, Crozier S,and Fall C. Gender differences in Body Mass Index (BMI) in rural India are determined by socioeconomic factors and life style. J Nutrition. 2006; 136:3062-3068.
9. Munjal YP and Sharma SK. API Text book of Medicine, publisher jaypee brothers. 2015; 2: 1735
10. Raja rajeswari D, Ramlingam K, Krishnamma M, Sharmila Krishna T Association of TNF-A with obesity in type 2 diabetes mellitus. Inter J Pharma & Bioscie 2011; 2: B 352- B 357.
11. Thomas DE, Elliot EJ and Baur L Low glycemic index or low glycemic load diets for overweight and obesity. Cochrane Database Sys Rev. 2007: CD 005-105.
12. Ohkawa H and Ohishi N. Reaction of thiobarbituric acid with linoleic acid hydroperoxide. J Lipid Res., 1978; 19:1053-1057.
13. Ellman G. Tissue sulfhydryl groups. Arch Biochem., 1959; 82: 70-77.
14. Woodson RF. Statistical Methods for the analysis of Biochemical Data. Chichester: Wiley. 1957:315.
15. Hotamisligil GS, Bdavari A, Murray D, Spiegelman BM Reduced tyrosine kinase activity of the insulin receptor in obesity diabetes, Central role of TNF-α J Clin Investi 1994; 94: 1543-1549.
16. Gwozdziewiczova S, Lichnovska R, Yahia RB, Chulp R, Hrebicek J. TNF-α in the development of insulin resistence and other disorder in metabolic syndrome, Biomed. 2005; 149: 109-117.
17. B Zahorska Markiewicz, J Janowska, M Olszanecka Glinianowicz and A Zurakowski Serum concentration TNF-α and soluble TNF-α

receptor in Obesity. 2000; 24: 1392-1395.

18. D Dixon, R Goldberg, N Schneiderman and Delamter. Gender differences in TNF-α levels among obese vs non obese Latino children Europ. J Clin Nutrit. 2004; 58: 696-699.
19. Spranjer J, Korke A, Mohling M, et al., Inflammatory cytokines and the risk to develop t2 diabetes mellitus. Results of the prospective population based European prospective investigation in to cancer and nutrition (EPIC) postsdam study. Diabetes. 2003; 52: 812-817.
20. Shoelson SE, Lee J, Gold G. Fine AB Inflammation and Insulin Resistance J Clin Invest. 2006; 116: 1793-1801.
21. Nakamura S, Takamura T, Matsuzasa - Nagata N, Takayana IT, Misu H, Nabeinoto S, Kurila S, Ota T, Ardo H, Miyanoto K and Kanek S (2009) Palmitate indicus insulin resistance in H411 Ec 3 Hepatocytes through reactive oxygen species produced in mitochondria J Biol Chem 284: 14809-18.
22. Wells G.D., Noseworthing M.D., Hamilton J, Tarnopolsk M, Teir I. Skeletal muscle metabolic dysfunction in obesity and metabolic syndrome. Con J News Sci. 2008; 35: 31-40.
23. Hotamisligil GS, Arner P, Atkinson RL, Atkinson RL, Spiegelman BM Differential regulation of the P80 TNF factor receptor in human obesity and insulin resistance. Diabetes. 1997; 46: 451-455.
24. Hotamisligil GS, Shargil NS, Spiegelman BM Adipose expression of TNF-α: A direct role in obesity induced insulin resistance. Science. 1993; 25: 87-91.
25. Nilksson J,Jowinge S. Nieman R, Rene lend r, Lithell h Relationship between plasma TNF alpha and Insjulin sensitivity in elderly men with type2 Diabetes Mellitus. Arterio Selero. Throm Vas Bio. 18 :1199-1202ve (1998).
26. Dandone P, Weinstock R, Thusuk K, Abdel Rahman A, Aljada A, Wadden T, TNF alpha in serum of abese patients, fall with weight loss. J Clin End Met. 1998;83:2907-2910.
27. Tsigos C, Kyrou I, Chala E, Tsapogas P, Stuidis JC, Raptis SA, Katsilambros N. Circulatingt TNF –alpha concentratios are higher in abdominal verses peripheral obesity. Metabolism. 1999; 48:1332-1335.
28. Shai I, Schulze MD, Manspn JE, et al. A prospective study of soluble TNF alpha receptor 2 and risk of coronary heart disease among women with type2 Diabetes Mellitus. Diabetes care. 2005; 28:1376-1382.
29. Lindgrade F,Gottsater A, Ahren BO. Dissociated relation between plasma tumor necrosis factor- α, Interlukin- 6 and increased body weight in American women: A long term prospective study of natural body weight variation and impaired glucose tolerance. Diabetolo Metab Synd 2010; 2:38
30. Herder C, Schneitler S, Rathmann W, Haastert B, Scheitler HW et al. Low - grade inflammation, obesity and Insulin Resistance in Adolescents. The J Clini Endocrino Metabo 2007; 92(12):4569-4574.
31. Kumar V, Mishra D, Khanna P, Karoli R and Mahdi F. A review of antioxidant enzymes, oxidative stress, lipid profile and lipoprotein constituent in the patients of coronary artery disease (CAD) with type 2 diabetes mellitus (T2DM) Int J Bioassay. 2015; 4 (10): 4443-4447.
32. Singh M, Anwer E and Kumar V. Assessment of Biochemical parameters in the patients of Coronary Artery Disease with type 2 Diabetes Mellitus IJPSR, 2017; Vol. 8(3): 1420-1426.
33. Barker M, Chorghade G, Crozier S,and Fall C. Gender differences in Body Mass Index (BMI) in rural India are determined by socioeconomic factors and life style. J Nutrition. 2006; 136:3062-3068.
34. Siervogel RM, Wisemandle W, Maynard LM, Guo SS, Roche AF, Chumlea WC and Towne B. Serial changes in body composition throughout adulthood and their relationships to changes in lipid and lipoprotein levels. The FELS Longitudinal Study. Arterioscler Thromb Vasc Biol.1998; 18:1759-1764.

How to cite this article : Kumar V., Salam A., Misra A., Jafri T.R., Anwer E., Singh S., The Prevelence Of Obesity And Overweight Amongst Students And Staff Of Era's Lucknow Medical College & Hospital Lucknow. EJMR2018;5(1):9-16.