

# Comparative Physiochemical and Anatomical Changes of Metabolic Pathways in Women Because of Obesity, A Clinical Study

RIZWANA HUSSAIN<sup>1</sup>, SEHAR KHOWAJA<sup>2</sup>, JAZIB ANDLEEB<sup>3</sup>, ARISHA SANA MEMON<sup>4</sup>, ALINA SAQIB<sup>5</sup>, NAVEED SHUJA<sup>6</sup>

<sup>1</sup>Associate Professor Physiology Department, Allama Iqbal Medical College, Lahore, Pakistan.

<sup>2</sup>Assistant Professor Department of Anatomy Isra University Hyderabad, Pakistan.

<sup>3</sup>Assistant Professor Physiology Department, CMH institute of medical sciences (CIMS) Bahawalpur, Pakistan.

<sup>4</sup>Senior Lecturer Anatomy Department Indus Medical College Tando Muhammad Khan, Pakistan.

<sup>5</sup>Professor Department of Anatomy Indus Medical College Tando Muhammad Khan, Pakistan.

<sup>6</sup>Associate Professor Biochemistry Department Lahore Medical & Dental College Lahore, Pakistan.

Corresponding author: Naveed Shuja, Email: [rananaveedshuja@gmail.com](mailto:rananaveedshuja@gmail.com), Cell: +92 3334205687

## ABSTRACT

**Aims and objectives:** To identify physiological, biochemical and anatomical changes in obese women of our community for health awareness were the aims and objectives of this study and it was conducted from October 2021 to March 2022 at different medical institutes of Pakistan comparatively.

**Materials and Methods:** 300 total women of 30-40 years of age group were selected and divided them into two different groups. In Control group there was 100 normal women while in obese group, 200 women were sort out. BMI, skin fold thickness, random glucose levels, uric acid levels, systolic and diastolic blood pressure and Disc height index were measured comparative. Raw data of all variables were presented through bio-statistically model SPSS-2018. Mean standard deviation and significant ( $p < 0.05$ ) changes were consider for the description of obtained results.

**Results:** Different parameters such as BMI, skin fold thickness, systolic and diastolic blood pressure, disc height index, random glucose and uric acid levels of group-2 ( $34.12 \pm 0.01$ ,  $33.2 \pm 0.01$ ,  $140.01 \pm 0.04$ ,  $90.01 \pm 0.01$ ,  $6.6 \pm 0.04$ ,  $150.11 \pm 0.04$ ,  $7.02 \pm 0.01$ ) showed a significant changes ( $p < 0.05$ ) than group-1 ( $20.07 \pm 0.03$ ,  $28.6 \pm 0.04$ ,  $118.02 \pm 0.01$ ,  $69.02 \pm 0.02$ ,  $7.4 \pm 0.02$ ,  $130.01 \pm 0.02$ ,  $4.12 \pm 0.03$ ) randomly.

**Conclusion:** In this study BMI, skin fold thickness, systolic and diastolic blood pressure, disc height index, random glucose and uric acid levels are biomarkers were showed a significant changes in obese women as compared with the normal women. It has seen that obesity caused severe metabolic changes in the biological system which is so harmful for human health.

**Keywords:** Basic metabolic index, Skin fold thickness, Skin fold thickness.

## INTRODUCTION

All chemical reactions that occur within living organisms are classified as metabolism. Catabolism refers to processes that involve the breakdown of compounds, while anabolism refers to processes that involve the creation of new molecules [2]. Catabolism is an oxidative process that utilizes coenzymes such as NAD<sup>+</sup> as an electron acceptor. The sequence of enzyme-catalyzed processes that lead to the conversion of a material into a final product is referred to as a metabolic pathway [6]. The term metabolic cycle refers to a sequence of processes in which the substrate is constantly rebuilt and the intermediate metabolites are constantly reformed [7]. Feeders of the cycle are substances that enter in the cycle and products are generated by different biochemical reactions [5]. In other words a metabolic route is a set of chemical processes that begin with a substrate and end with an end product [3]. Within a cell, metabolic pathways are connected and controlled enzyme-catalyzed reactions.

There are thousands of metabolic pathways, and the majority of them have numerous steps and all metabolic pathways work together to produce a complicated network that keeps life going [8]. Obesity is a common chronic disease that affects people from all areas of life. Obesity is an epidemic in all over the world and its social impacts are very prominent [1]. Different researchers conducted research on obese people and uncovered all facts of obesity for its treatment protocol [9]. Overweight and obesity are serious public health concerns that impact almost half of the world's adult population, with women having a higher prevalence than men [10]. Overweight and obesity is high in low- and middle-income countries, especially in urban areas compared to rural areas [11]. The complications of overweight or obese on one's health have been extensively studied. It is concluded that the worldwide burden of disease associated with a high BMI, which is responsible for more than 4.2 million deaths worldwide [13].

Obesity is caused mostly by a combination of excessive dietary energy intake, lack of physical activity, and genetic vulnerability, while disorder of endocrine system, genes, and drugs play a significant role in a few cases [12]. Obesity is frequently associated with a number of co-morbidities, such as diabetes mellitus, cardiovascular disorders, and malignancy etc. It has seen

in many studies that high blood pressure, myocardial infarction, gout, and number of different physiological and biochemical complications caused by obesity [14]. Anatomical changes in body are also correlated problems of obesity. Abdomen appearance and phenotypically changes in human body appeared because of high BMI

## Materials and Methods:

**Groundwork:** Present study and it was conducted from October 2021 to March 2022 at different medical institutes of Pakistan.

**Number of participants:** In this study 300 total women of 30-40 years of age group were selected and divided them into two different groups.

**Group-1: Control individuals:** In Control group there was 100 normal women.

**Group-2: Obese individuals:**

In obese group, 200 women were sort out

**Considered age:** The age was 30-40 years in both groups.

**Body mass index (BMI):** In group-1 the body mass index was 20-24 kg/m<sup>2</sup>. While in group-2 the BMI was 25-35 kg/m<sup>2</sup>.

**Sample collection:** 5ml blood sample was collected from superficial vein in the upper limb and store in vials.

**Selected parameters:** BMI, skin fold thickness, random glucose levels, uric acid levels, systolic and diastolic blood pressure and Disc height index were measured comparative.

**Raw data Collection:** Raw data of all individuals of group-1 and group-2 were posted on questionnaire/ proforma.

**Bio Statistical presentation:** Raw data of all variables were presented through bio-statistically model SPSS-2018. Mean standard deviation and significant ( $p < 0.05$ ) changes were consider for the description of obtained results.

## RESULTS

Different parameters such as BMI, skin fold thickness, systolic and diastolic blood pressure, disc height index, random glucose and uric acid levels of group-2 ( $34.12 \pm 0.01$ ,  $33.2 \pm 0.01$ ,  $140.01 \pm 0.04$ ,  $90.01 \pm 0.01$ ,  $6.6 \pm 0.04$ ,  $150.11 \pm 0.04$ ,  $7.02 \pm 0.01$ ) showed a significant changes ( $p < 0.05$ ) than group-1 ( $20.07 \pm 0.03$ ,  $28.6 \pm 0.04$ ,  $118.02 \pm 0.01$ ,  $69.02 \pm 0.02$ ,  $7.4 \pm 0.02$ ,  $130.01 \pm 0.02$ ,

4.12± 0.03) randomly. It has seen that there is a remarkable difference between the BMI of both groups, similarly skin fold thickness of women of obese group is higher than control. On the other hand an amazing changes were noted in Random glucose and Uric acid levels of group-2 as compared than group-1. Disc height index become decreased in obese group than control because of high BMI which may cause lower back pain. The combative analysis of both graphically represented in figure-1, 2.

Table 1: Control, normal individuals, n= 100, age=30-40 years

Parameters	Units	Mean ±SD	(p<0.05)
BMI	kg/m <sup>2</sup>	20.07± 0.03	0.00
Skin fold thickness	mm	28.6±0.04	0.00
Systolic BP	mmHg	118.02± 0.01	0.00
Diastolic BP	mmHg	69.02± 0.02	0.00
Disc height	mm	7.4 ± 0.02	0.00
Random glucose levels	mg/dl	130.01± 0.02	0.00
Uric acid levels	mg/dl	4.12± 0.03	0.00

Table 2: Obese individuals, n= 200 age=30-40 years

Parameters	Units	Mean ±SD	(p<0.05)
BMI	kg/m <sup>2</sup>	34.12 ± 0.01	0.00
Skin fold thickness	mm	33.2±0.01	0.00
Systolic BP	mmHg	140.01± 0.04	0.00
Diastolic BP	mmHg	90.01± 0.01	0.00
Disc height index	mm	6.6 ± 0.04	0.00
Random glucose levels	mg/dl	150.11± 0.04	0.00
Uric acid levels	mg/dl	7.02± 0.01	0.00

Figure-1

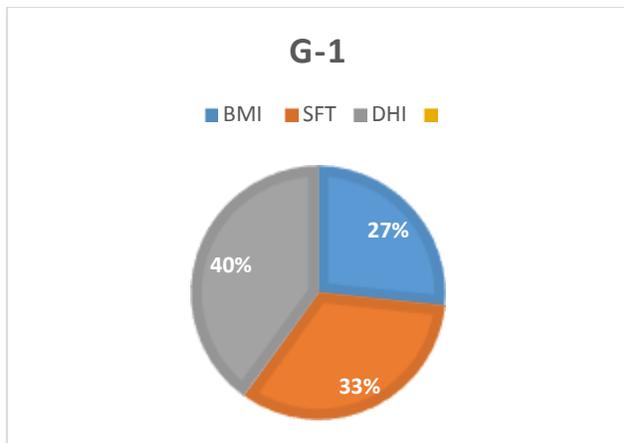
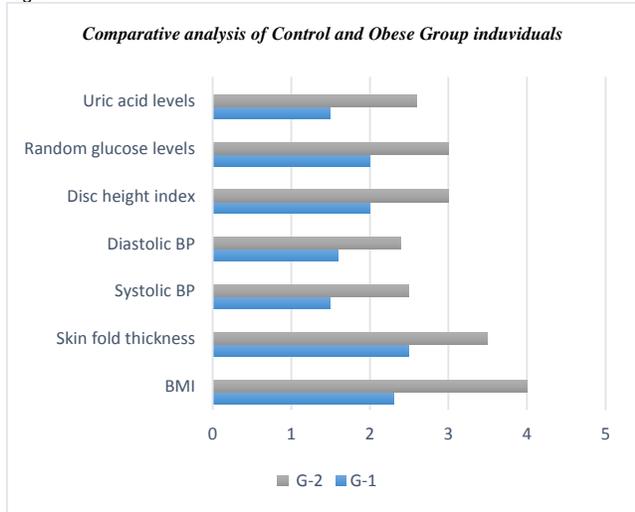


Figure-2

## DISCUSSION

A person's BMI is calculated by multiplying their weight in kg by their height in meters squared. BMI considers natural differences in body form to determine a healthy weight range for a given height [14]. According to a study muscle is substantially denser than fat, people who are extremely muscular, such as heavyweight boxers, weight trainers, and sportsmen, may be at a healthy weight while having an obese BMI. One of the oldest and most frequent way of evaluating a person's body composition and body fat percentage is the skinfold measurement test. The fat beneath the skin, also known as subcutaneous adipose tissue, is measured by the thickness of these folds [16]. Skinfold measurements are usually obtained on the right side of the body at particular locations. The skinfold thickness is then measured in millimeters using special skinfold calipers. The best place is abdomen for its measurement and to judge the BMI level [15].

Low back discomfort and degenerative lumbar illnesses are caused by the progression of disc degeneration mostly in the elder age. Nerve impingement, bone and joint inflammation, and pain can all occur when disc height is reduced [19]. The reduction of joint space caused by disc degeneration is similar to the pain and inflammation associated by arthritis. Pain may be persistent in extreme situations. The amount of glucose in a person's blood at any particular time is referred to as blood glucose levels [18]. Blood glucose levels that may too high or too low could suggest an underlying health problem in such condition medical applications are valuable for further complications.

Hyperuricemia is a condition in which the blood contains too much uric acid. Uric acid enters in the bloodstream via liver, for the maintenance of normal levels of uric acid majority of it is expelled in urine or passed through intestines [17]. Purines are nitrogen-containing molecules that are biosynthesis within cells or obtained from meals. Purine catabolize into uric acid. The levels of uric acid increased by the purine metabolism. High levels of uric acids may cause Gout and joint complications [11]. Different researchers described in their studies that BMI, skin fold thickness, systolic and diastolic blood pressure, disc height index, random glucose and uric acid levels are biomarkers showed a significant changes in obese women as compared with the normal one. The results of current study were very similar to the previous studies by number of researchers. But further research work is required in this field because obesity is a mother of different life threatening disease.

## REFERENCES

1. Amir LH, Donath S. A systematic review of maternal obesity and breastfeeding intention, initiation and duration. BMC Pregnancy Childbirth 2007; 7.
2. Aviram A, Hod M, Yogev Y. Maternal obesity: implications for pregnancy outcome and long-term risks – a link to maternal nutrition. Int J Gynaecol Obstet. 2011; 115:S6.
3. Baker JL, Michaelsen KF, Sorensen TIA, Rasmussen KM. High prepregnant body mass index is associated with early termination of full and any breastfeeding in Danish women. Am J Clin Nutr 2007;86:404–11.
4. Bennett WL, Gilson MM, Jamshidi R, et al. Impact of bariatric surgery on hypertensive disorders in pregnancy: retrospective analysis of insurance claims data. BMJ 2010;340:c1662.
5. Bhaskaran K, Douglas I, Forbes H, et al. Body-mass index and risk of 22 specific cancers: a population-based cohort study of 5.24 million UK adults. Lancet. 2014;384:755–765.
6. Chu SY, Bachman DJ, Callaghan WM, et al. Association between obesity during pregnancy and increased use of health care. N Engl J Med 2008;358: 1444–53.
7. Guelinckx I, Devlieger R, Beckers K, et al. Maternal obesity: pregnancy complications, gestational weight gain and nutrition. Obes Rev. 2008;9:140–150.
8. Kaaks R, Lukanova A, Kurzer MS. Obesity, endogenous hormones, and endometrial cancer risk: a synthetic review. Cancer Epidemiol Biomarkers Prev 2021;11:1531– 43.
9. Kim SY, Dietz PM, England L, Morrow B, Callaghan WM. Trends in pre-pregnancy obesity in nine states, 1993–2003. Obesity 2007;15:986–93. 52.

10. Kristensen J, Vestergaard M, Wisborg K, Kesmodel U, Secher NJ. Pre-pregnancy weight and the risk of stillbirth and neonatal death. *BJOG* 2005; 112:403–8.
11. Liu J, Smith MG, Dobre MA, Ferguson JE. Maternal obesity and breast-feeding practices among white and black women. *Obesity* 2010;18:175–82.
12. Maggard MA, Yermilov I, Li Z, et al. Pregnancy and fertility following bariatric surgery: a systematic review. *JAMA* 2008;300:2286–96. 50. Callaway LK, Prins JB, Chang AM, McIntyre HD. The prevalence and impact of overweight and obesity in an Australian obstetric population. *Med J Aust* 2006;184:56–9.
13. Norman RJ, Noakes M, Wu R, Davies MJ, Moran L, Wang JX. Improving reproductive performance in overweight/obese women with effective weight management. *Hum Reprod Update* 2004; 10:267–80.
14. O'Reilly JR, Reynolds RM. The risk of maternal obesity to the long-term health of the offspring. *Clin Endocrinol (Oxf)* 2013;78:9–16.
15. Rasmussen KM. Association of maternal obesity before conception with poor lactation performance. *Annu Rev Nutr* 2007;27:103–21.
16. Robker R. Evidence that obesity alters the quality of oocytes and embryos. *Pathophysiology* 2008;15: 115–21. 46.
17. Stothard KJ, Tennant PW, Bell R, Rankin J. Maternal overweight and obesity and the risk of congenital anomalies: a systematic review and metaanalysis. *JAMA* 2009;301:636–50.
18. Weintraub AY, Levy A, Levi I, Mazor M, Wiznitzer A, Sheiner E. Effect of bariatric surgery on pregnancy outcome. *Int J Gynaecol Obstet* 2008;103:246–51.
19. Yilmaz N, Kilic S, Kanat-Pektas M, Gulerman C, Mollamahmutoglu L. The relationship between obesity and fecundity. *J Womens Health (Larch)*