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THE EFFECT OF OBESITY ON IMMUNITY, CALCIUM, AND TOTAL CHOLESTEROL IN FEMALE

Alaa A. Saleh[1],Tagreed Ali Obad[2], Entiha Abdul-Zahra Abdul-Kareem[3]
1,2,3 Medical Laboratory Department, Technical Institute, Southern Technical University, Basra, Iraq

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Abstract:

Obesity is an excessive or an increased accumulation of fat that affects health. It was caused if an energy imbalance between the calories that enter and their burns in the body. 36 participants were included in this study. The subjects who are eligible for the study were adults of female, age 23-75 years, categorized according to Body Mass Index (BMI) into 3 groups. Our results revealed that the percentage of female were 35.48% of women normal weight group (18.5-24.9 Kg/m2), 35.48% in the increase in weight group (25-29.9 Kg/m2), and 29.04% in the first category fat group (30-34.9 Kg/m^2). The current study showed that the level of white blood cells (WBC) and neutrophils were higher in the first category of the fat group compare to other two groups, total cholesterol were higher in first category of fat group compared to other groups. The levels of calcium were higher in normal weight of women compare to other groups. Finally, a weak positive correlation was estimated between BMI and total cholesterol level, negative correlation was estimated between BMI and serum calcium level.

Keywords: Obesity, immunity, calcium, total, cholesterol, female.

INTRODUCTION

Obesity can define as an accumulation of fat in the body, it causes an imbalance between the calories that enter the body and it burns. which is evaluated by a BMI higher than (30kg/m2) [1,2]

Obesity is health problem among people, which increased in recent years, several studies have related obesity and increase the count of death in both sex. It is a pathological condition, which effect the quality of life and increased morbidity, effects on the activity of the immune system and causes many diseases like cardiovascular diseases, hypercholesterolemia, hypertension, diabetes, and inflammatory diseases and many types of cancer [3,4].

Obesity is related to immunological dysregulations [5]. Many white blood cells (WBC) such as lymphocytes and macrophages can infiltrate into the adipose tissue in an obese body, those cells can release proinflammatory cytokines as well as adipocytes, causing systemic inflammation [6,7]. Previous studies have observed that obese body has elevated WBC such as monocytes, lymphocytes and neutrophils [8-10].

Total Cholesterol was the important factor associated with obesity, the previous study reported that an increase in levels of total cholesterol was related to obesity in the middle-age [11].

Obesity can affect bone metabolism in many ways, it could lead to declining in the production of bone and an increases in adipogenesis, therefor the amount of calcium was effects in blood and bone of human [12].

The aim of the current study is to stimulate the counts of WBC, lymphocytes, and neutrophils, and estimated the correlation between obesity and immunity included WBC, lymphocyte, and neutrophils counts as well as serum total cholesterol levels and calcium in adult female in south of Iraq/Basra.

MATERIALS AND METHODS

Study Subjects

A total of 36 females were included in this study, weight was measured by a digital scale and barefoot; height was measured by tape meter. Participates were categorized according to Body Mass index (BMI). BMI were Calculated the ratio of weight of person in kilograms (Kg) to the height square in meters (m^2). All women classify into three groups included 1-Normal weight group between (18.5-24.9 Kg/m^2), 2-Increase in weigh group (25-29.9 Kg/m^2) and 3- First category of fat group (30-34.9

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Kg/m^2). All female fill a questionnaire related to their status.

All blood samples of 4cc were collected from a peripheral vein, after 8:30 AM in a fasting condition. A complete blood count (CBC) including WBC, lymphocyte, and neutrophils counts were calculated by the automated hematology analyzer (Genex count 60.USA). Serum calcium and total cholesterol (using Colorimetric kits) Data were measured in Medical Laboratory Department, Technical Institute, Southern Technical University.

Statistical analyses were used SPSS software SPSS, Chicago, IL, USA (version 19). Data were calculated as means ± SD. Statistical significance was depended on t-tests and used the Pearson correlation test. Significant differences were determined if P-values were less than 0.05.

RESULTS

Thirty-six of adult's female were comprised in this study, age between 23-75 years, the mean age was 40.43 ± 15.09 years**,** all participants were classified according to BMI into three groups, our results revealed that the percentage weas 35.48% of women in normal weight group, 35.48% in an increase in weight the group, and 29.04% in first category fat group.

The mean of BMI was 22.59±1.02 Kg/m^2 in normal weight group, 27.70± 1.26 Kg/m^2 in increase in weight group, 32.25± 1.01 Kg/m^2 in the first category fat group, as figure 1.

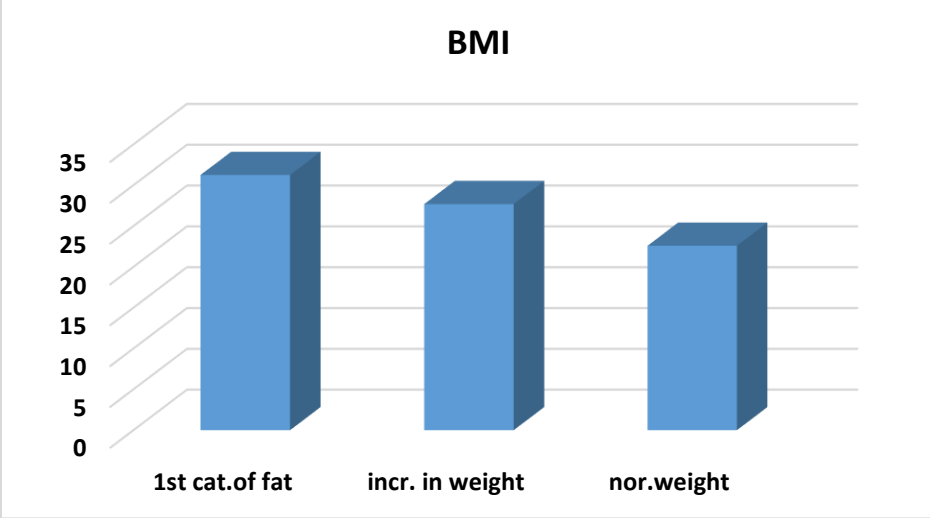

Figure 1: The mean of BMI of women in three groups

The results showed that the mean age of women in normal weight was 33.27±14.70 yrs., which less than other weight groups, as figure 2

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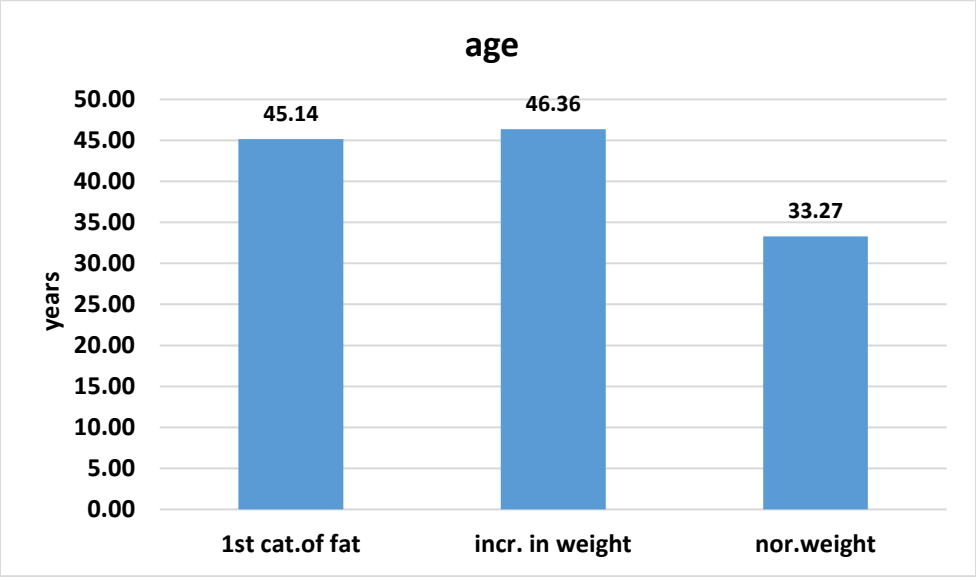

Figure 2: The mean age of women in three groups

The current study showed that the counts of white blood cells were $6.90*10^9$, lymphocytes $2.30*10^2$ and neutrophils $4.12 *10^9$ cells were higher but no significant differences ($p>0.05$) in first category of fat compared to an increase in weight group and normal weight group. As fig.3

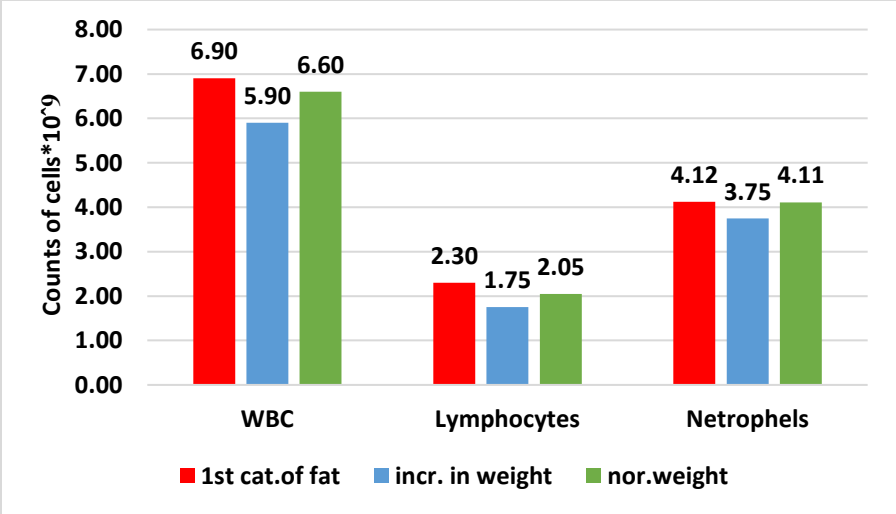

Figure 3: The mean white blood cells, lymphocytes and neutrophils in first category of fat, increase in weight and normal weigh groups

The correlation between BMI and WBC, lymphocytes, and neutrophils can be illustrated as follow: Firstly, from BMI values with WBC counts in female, the results showed a positive correlation between the two factors. R- value was 0.024 (Fig. 4 A). Secondly, plotting BMI values with lymphocytes counts in three groups of female, the results showed a positive correlation between the two factors. R-value was 0.23 (Fig. 4 B). Thirdly, from plotting the BMI values with the neutrophils, the results showed a positive correlation between the two factors. The R value was 0.14 (Fig. 4 C).

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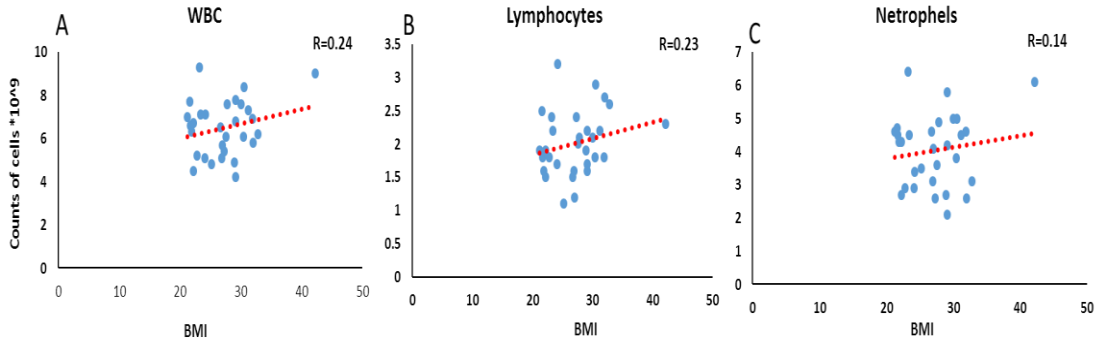

Fig. 4. The correlation between BMI and WBC, lymphocytes, and neutrophils

Our results showed that the levels of total cholesterol were within a normal range in three groups, but the levels were higher in first category of fat 166.18± 24.45mg/dL compared to the increase in weight and normal weight groups were 164.84±41.95mg/dL, 143.45±17mg/dL, respectively. as fig.5.

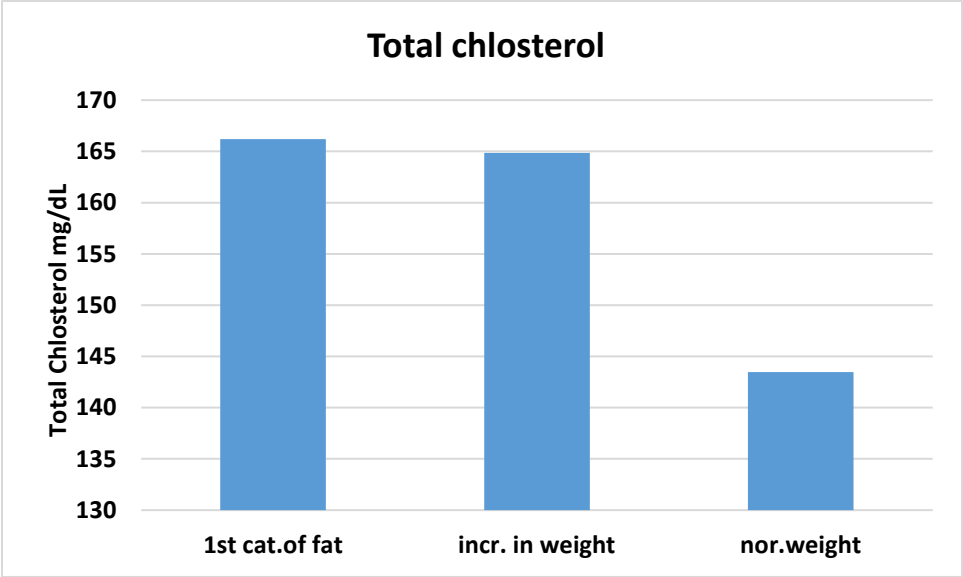

Figure 5: The mean of total cholesterol of women in three groups

A weak positive correlation between BMI and serum total cholesterol level in adult females was observed, R -value was 0.13, as figure 6

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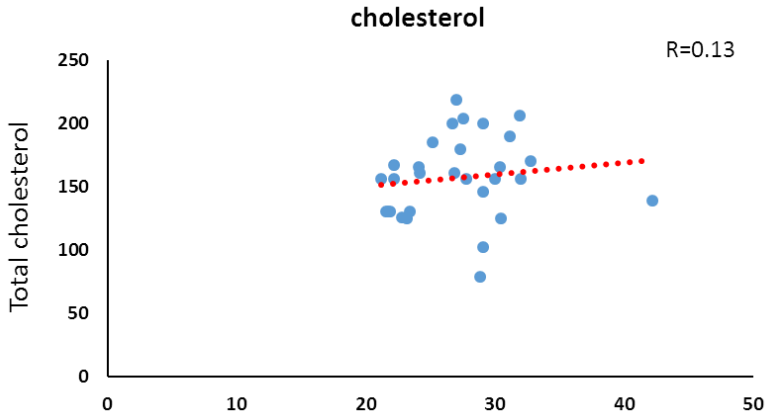

Figure 6: positive correlation between BMI and total cholesterol level in serum female

The current study showed that the levels of serum calcium were 10.53 ±3.33, this levels was high and near to optimal range of calcium in women (8.6-10.3mg/dL), and this level of calcium was higher in normal weight group compare to increase in weight and first category of fat groups,8.88±2.93mg/Dl ,7.85±2.47mg/dL, respectively .as fig.7

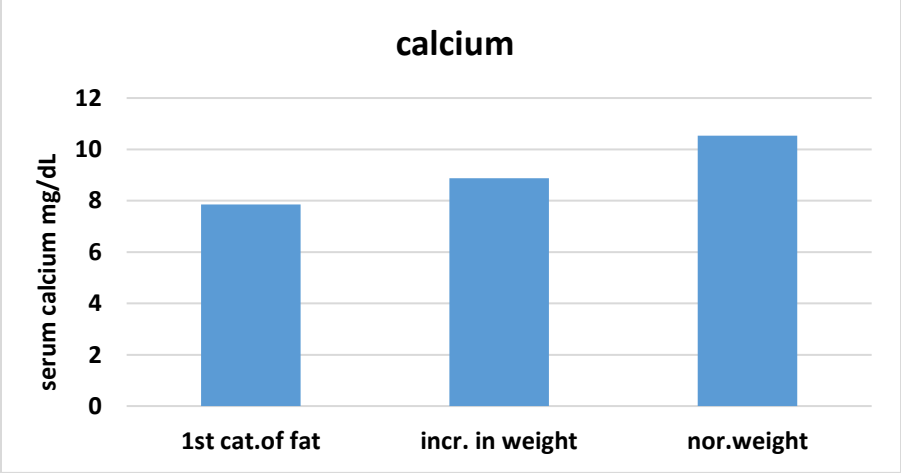

Figure 7: The mean of calcium of women in three groups

Finally, our study observed the negative correlation between BMI and serum calcium level in adult female, as figure 8.

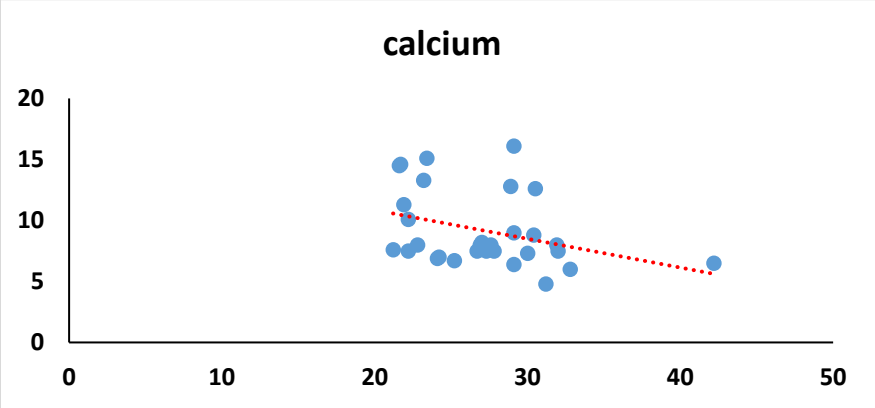

Figure 8: negative correlation between BMI and serum calcium level

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DISCUSSION

The results of this study were showed an increase in obesity associated with the increase in age, this result caused by occurring changes in metabolism and composition of the body with aging, between (20 to 70) years, in this period there is a decline of fat-free mass such as muscle, whereas fat mass rises [13-15].

In our results, we found that was associated between an increase in BMI and a higher count of WBC and lymphocytes, a potential mechanism for the correlation between BMI and the count of the immune cell may role of adipose tissue for produce adipokine leptin. High circulating levels of leptin can be appearing in human with height weight, consistent with a leptin-resistant state [16&17]. In immunity, leptin has important role to support proliferation in many of the immune cell and preventing apoptosis, as well as induce the production of some pro-inflammatory cytokines [18].

Serum total cholesterol levels were high with increase of BMI but no significantly different among the three groups. The results for the total cholesterol levels agree with other studies [19 &20]. Although there are many factors may be effect on levels of total cholesterol in the blood included genetic factors, lifestyle, Diet, job and some diseases [21].

Our results showed that the level of serum calcium in female had a negative association with their BMI, previous articles it was observed that changes in the metabolism of calcium is correlated with obesity [22-24]. On the other hands, obesity may be stimulating the production of special inflammatory cytokines that induces absorption of bone which might lead to a high serum calcium level in obese human [25].

CONCLUSIONS

High weight of subjects had high counts of total WBC, lymphocyte, and neutrophil cells, and total cholesterol levels. Thus, it may be concluded that participate with high weight had higher in inflammatory mediators levels, which may be elevated the risk of inflammatory diseases.

REFERENCES

1. Wellen KE, Hotamisligil GS.(2003). Obesity induced inflammatory changes in adipose tissue. *JCI*.;112(12):1785-8.
2. Koh-Banerjee P, Chu N-F, Spiegelman D, Rosner B, Colditz G, Willett W.(2003).Prospective study of the association of changes in dietary intake, physical activity,alcohol consumption, and smoking with 9-y gain in waist circumference among16587 US men. *Am J of Clin Nutr*. 78:719–27
3. Cercato C, Fonseca FA. Cardiovascular risk and obesity.(2019). *Diabetol Metab Syndr*,11:74. doi:10.1186/s13098-019-0468-0
4. 4.Milano W, and Capasso A.(2018). Diseases and health risks associated with obesity*. Integr Obesity Diabetes,* 4(1): 1-4
5. 5.Moulin CM, Marguti I, Peron JP, Rizzo LV, Halpern A: Impact of adiposity on immunological parameters. .(2009) *Arq Bras Endocrinol Metabol* ,53:183-189.
6. 6.Sell H, Eckel J.(2010). Adipose tissue inflammation: novel insight into the role of macrophages and lymphocytes. *Curr Opin Clin Nutr Metab Care* ,13:366-370.
7. 7. Mahassni S. H. and Bashanfar N. O.(2019). High Levels of Inflammatory Adipokines and C-reactive protein, and Minimal Changes in Immune Cells in Overweight and Obese Saudi Female University Students. *Int. J. Pharm. Res. Allied Sci*, 8(1):171-183.
8. 8.Womack J, Tien PC, Feldman J, Shin JH, Fennie K, Anastos K*,* Cohene MH*,* Baconf MC*,* Minkoff H. .(2007). Obesity and immune cell counts in women. *Metabolism*,998-1004.
9. 9.Lee YJ, Lee HR, Shim JY, Moon BS, Lee JH, Kim JK.(2010). Relationship between white blood cell count and nonalcoholic fatty liver disease. *Dig Liver Dis,* 42:888-894.
10. **10.**Kim HL, Chung GE, Park IY, Choi JM, Hwang SM, Lee JH*,* Kim D. (2011). Elevated peripheral blood monocyte fraction in nonalcoholic fatty liver disease. *Tohoku J Exp Med* ,223:227-233.
11. 11. Veghari G, Sedaghat M, Maghsodlo S, Banihashem S, Moharloei P, Angizeh A, Tazik E, Moghaddami A, Joshaghani H. (2015). The association between abdominal obesity and serum cholesterol level. *Int J Appl Basic Med Res*. ,5(2):83-6. doi: 10.4103/2229-516X.157150. PMID: 26097812; PMCID: PMC4456899.
12. 12.Rosen CJ, B ouxein ML.(2006). Mechanisms of disease: is osteoporosis the obesity of bone? *Nat Clin Prac Rheumatol*.,2(1):35-43.
13. 13. Kennedy RL, Chokkalingham K, Srinivasan R. (2004). Obesity in the elderly: who should we be

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-10, MAY 2022
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treating, and why, and how? *Curr Opin Clin Nutr Metab Care*. 7:3–9.

14. 14. Zamboni M, Mazzali G, Zoico E, et al. (2005). Health consequences of obesity in the elderly: a review of four unresolved questions. *Int J Obes* (Lond). 29:1011–1029.
15. 15. Villareal DT, Apovian CM, Kushner RF, et al. (2005). Obesity inolder adults: technical review and position statement of the American Society for Nutrition and NAASO, The Obesity Society. *Obes Res*.,13:1849–1863.
16. 16. Kershaw EE, Flier JS. (2004). Adipose tissue as an endocrine organ. *J Clin Endocrinol Metab*,89:2548–2556.
17. 17. Dyck DJ, Heigenhauser GJ, Bruce CR. (2006). The role of adipokines as regulators of skeletal muscle fatty acid metabolism and insulin sensitivity. *Acta Physiol (Oxf)* ,186:5–16
18. 18. Lord GM, Matarese G, Howard JK, Bloom SR, Lechler RI. (2002). Leptin inhibits the anti-CD3-driven proliferation of peripheral blood T cells but enhances the production of proinflammatory cytokines. *J Leukoc Bio.,l* 72:330–338.
19. 19. Mahassni S. H. and Sebaa R. B. (2013). Obesity and CRP, Adiponectin, Leptin, and Lipid Profile in Saudi Arabian Adolescent .Females. *J. Basic Appl. Sci.*,9:500-509
20. 20. Mahassni S. H. and Bashanfar N. O. (2016). Waist Circumference a Predictor of Hypertension and Dyslipidemia in Young Saudi Females. *Int. J. Chem. and Biomol. Sci.,*2(1):15-24.
21. 21. Balder JW, Rimbert A, Zhang X, Viel M, Kanninga R, Dijk F ,et al.(2018). Genetics, Lifestyle, and Low-Density Lipoprotein Cholesterol in Young and Apparently.*Circulation*,137,8,820-831.
22. 22. Kuytak C, ÇatakJ. (2020). The relationship between calcium and obesity. *D J*
23. *MedSci.*, 6(1), 041-045 **DOI:** 10.5606/fng.btd.2020.25018
24. 23. Suhett LG, Silveira BKS, Filgueiras MS, Peluzio MDCG, Hermsdorff HHM, Novaes JF. (2018). Inverse association of calcium intake with abdominal adiposity and C-reactive protein in Brazilian children. *Public Health Nutr.*,21:1912-20.
25. 24.Skowronska-Józwiak E, Jaworski M, Lorenc R, Karbownik-Lewinska M, Lewinski A. (2017). Low dairy calcium intake is associated with overweight and elevated blood pressure in Polish adults, notably in premenopausal women*. Public Health Nutr.*,20:630-7.
26. 25.Gkastaris K, Goulis DG, Potoupnis M, Anastasilakis AD, Kapetanos G. (2020). Obesity, osteoporosis and bone metabolism. *J Musculoskelet Neuronal Interact.* 1;20(3):372-381. PMID: 32877973; PMCID: PMC7493444.