International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Review Article

Relation between Obesity and Ghrelin, Leptin Hormones, Vitamin D and Viruses

Serap Çetinkaya[1], Havva Sert[2]

[1]Research Assistant, [2]Assistant Professor,
İnternal Medicine Nursing, Faculty of Health Science, Sakarya University, Serdivan, Türkiye

Corresponding Author: Havva Sert

ABSTRACT

Obesity, also named as New World Syndrome, is emerging as a frequent global health issue with increasing incidence rate and exercise influence over the world. Recent researches have shown that obesity was associated with levels of ghrelin and leptin hormones, vitamin D deficiency, SMAM-1 avian adenovirus, Canine distemper virus (CDV), Rous-associated virus-7 (RAV-7), Borna disease virus (BDV), Adenovirus 5 (AD-5), Adenovirus 36 (AD-36) and lastly, Adenovirus 37 (AD-37). In this study, it was aimed to examine the relation between obesity and levels of ghrelin and leptin hormones, vitamin D deficiency and several viruses.

Key Words: Ghrelin, Leptin, Vitamin D, Obesity, Viruses

OBESITY

Obesity, also named as New World Syndrome, is emerging as a frequent global health issue with increasing incidence rate and exercise influence over the world. [1]

The World Health Organization (WHO) has stated that the worldwide prevalence of obesity has almost doubled between 980 and 2014. [2] Based on findings of the US-National Nutrition and Health Survey (NHANES) study conducted by Centers for Disease Control and Prevention (CDC); between 2011-2012, it has been declared that over 34,9% of adults were obese in United States of America, where obesity is the most common. [3]

When status of obesity in Turkey is considered, it is clear that both incidence and prevalence of obesity is increased likewise condition in the world. Conceiving studies conducted in Turkey, Turkish Obesity and Hypertension Study (TOHTA), Study of Heart Disease and Risk Factors in Turkish Adults (TEKHARF), Turkish Diabetes, Obesity and Hypertension Epidemiology (TURDEP I and II) and Turkey Obesity Profiling Study (TOAD); prevalence of obesity was seen to be varied from 30% to 43% for females and from 13% to 21,5% for males. [4]

According to WHO; obesity which is defined as abnormal or excessive fat accumulation in body, is the consequence of industrial revolution and developing technologies with increased prevalence and incidence, and its progression was caused by hormones, vitamin D deficiency and some viruses. [1,2-5]

Obesity and Ghrelin and Leptin Hormones

Latest studies have emphasized that ghrelin and leptin hormones were associated with obesity. [6-7] These hormones play roles in the control of the body weight by modulating the individual's hunger, degree of satiety, and mealtime. The leptin hormone delivers perceiving the feeling of

satiety to terminate eating event, whereas ghrelin hormone creates a sense of hunger and results in starting eating event. When ghrelin was secreted redundant, individuals felt more hunger and their appetite rose. When leptin was secreted less, it was observed that the feeling of satiety decreases, satiety sense was lost and act of eating was elevated. [8] In a study, it was reported that insomnia increases ghrelin and decreases leptin level, leading to an increased risk of obesity. [6] In addition, a randomized controlled study conducted by Broussard et al. (2015) where one group had restricted sleep and the other group did not have any intervention. In the sleep-restricted group, leptin levels were not affected however, ghrelin level increased, and high-calorie sweet consumption amplified with this increase. [7]

Obesity and Vitamin D

It is known that vitamin D increases fat oxidation by regulating genes involved in fatty acid oxidation and mitochondrial metabolism, thereby limiting weight gain. [9] Recent studies remark that obesity was associated with vitamin D deficiency. [10-11] Radhakishun et al. (2015) reported that vitamin D deficiency was present in 20% of children with normal weight and 87,5% of obese children aged 6-18 years. [12] In addition, Sitokic et al. (2014) stated that vitamin D was deficient in 88% of obese people and that vitamin D level was negatively correlated with BMI, waist circumference, body fat percentage. [11] According to a different study, BMI was found to be inversely correlated with increased 25 (OH) D levels in patients prescribed with vitamin D supplements. [13] On the other hand, there are studies argue that vitamin D was not associated with obesity. [14-15] The precise determination of this relationship requires numerous randomized controlled trials with large sample sizes.

Obesity and Viruses

Recent studies have suggested that many viruses were associated with obesity, especially SMAD-1 avian adenovirus, Canine distemper virus (CDV), Rous-associated virus-7 (RAV-7), Borna disease virus (BDV), Adenovirus 5, Adenovirus 36, and finally, Adenovirus 37. [5,16-20] It was also stated that among these viruses, SMAM-1, Canine Distemper Virus, Rous-associated virus Type 7 and Borna Disease virus were generally caused obesity in animals while adenoviruses in humans. Particularly, it was underlined that AD-36 suppresses leptin synthesis and that increases the rate of conversion and production of pre-adipocytes to mature adipocytes and increase lipid accumulation subsequently leading to weight gain and fat deposition. [5,16,18-24]

It has been indicated that SMAM-1 leads to impairment of liver functions, CDV reduces leptin receptor amount in hypothalamus, RAV-7 inducing hypothyroidism while BDV causes endocrine dysregulation, AD-5 enhances conversion of pre-adipocytes to mature adipocytes, AD-37 suppresses leptin synthesis and that increases the rate of conversion and production of pre-adipocytes to mature adipocytes and increase lipid accumulation subsequently leading to weight gain and fat deposition. [23]

In several studies have been demonstrated that, obese individuals with SMAM-1 virus have high BMI and the children with AD-36 antibody positivity have high levels of serum triglyceride and total cholesterol. [18-25] Carter et al. (1983) reported that RAV-7 virus may lead to obesity by decreasing thyroid hormone level. [19] In the literature it was stated, this issue was controversial, although there was no definite proof that the viruses cause obesity.

CONCLUSION

In conclusion; The development of obesity is proposed to be caused by levels of ghrelin and leptin hormones, vitamin D deficiency and several viruses. In this context, it is possible to educate individuals about risk factors that can be changed, to

determine conditions affecting ghrelin and leptin levels, to provide vitamin D to individuals with vitamin D deficiency or to benefit from sufficient sunlight, to provide hygienic conditions to avoid viral infections.

REFERENCES

1. Aygün M. Obesity and Management In:Chronic Disease and Care. Durna Z. Nobel Tıp Kitabevleri, İstanbul, s.341-380.
2. World Health Organization. Obesity and Overweight. Fact sheet. [Updated June 2016] http://www.who.int/mediacentre/factsheets/fs311/en/ . (accessed 10 August 2015).
3. Centers for Disease Control and Prevention. Prevalence of Obesity Among Adults: United States, 2011–2012. NCHS Data Brief No. 131, October 2013. http://www.cdc.gov/nchs/data/databriefs/db131.htm (accessed 10 October 2015).
4. Ministry of Health Turkey Public Health Institution, Department of Obesity Diabetes and Metabolic Diseases. Obesity Prevalence in Adults. http://beslenme.gov.tr/content/files/home/turkiye_saglikli_beslenme_ve_hareketli_hayat_programi.pdf . (accessed 1 February 2016).
5. Cakmakliogullari E, Sanlidag T, Ersoy B et al. Are human adenovirus-5 and 36 associated with obesity in children? J Investig Med 2014, 62:821-824.
6. Beccuti G, Pannain S. Sleep and obesity. Curr Opin Clin Nutr Metab Care 2011,14(4):402.
7. Broussard J, Kilkus J, Delebecque F et al. Elevated ghrelin predicts food intake during experimental sleep restriction. Obesity 2016,24(1):132-138.
8. Kayar H, Utku S. Disease of our time:Obesity and its treatment. Mersin Üniv Sağlık Bilim Derg 2013,6(2):1-8.
9. Marcotorchino J, Tourniaire F, Astier J et al. Vitamin D protects against diet-induced obesity by enhancing fatty acid oxidation. J Nutr Biochem 2014, 25(10):1077-1083.
10. Li YX, Zhou L. Vitamin D deficiency, obesity and diabetes. Cellular and Molecular Biology 2014,61(3):35-38.
11. Stokic E, Kupusinac A, Tomic-Naglic et al. Obesity and vitamin D deficiency: Trends to promote a more proatherogenic cardiometabolic risk profile. Angiology 2015;66(3), 237-243.
12. Radhakishun N, Van Vliet M, Von Rosenstiel I et al. High prevalence of vitamin D insufficiency/deficiency in Dutch multi-ethnic obese children. European journal of pediatrics 2015, 174(2):183-190.
13. Saliba W, Barnett-Griness O, Rennert G. The relationship between obesity and the increase in serum 25 (OH) D levels in response to vitamin D supplementation. Osteoporosis international 2013, 24(4):1447-1454.
14. Pathak K, Soares MJ, Calton EK et al.Vitamin D supplementation and body weight status: a systematic review and meta-analysis of randomized controlled trials. Obes Rev 2014;15(6):528-537.
15. Gronborg IM,Lundby IM, Mølgaard C et al. Association of body fat and vitamin D status and the effect of body fat on the response to vitamin D supplementation in Pakistani immigrants in Denmark. Eur J Clin Nutr 2015;69(3):405-407.
16. Dhurandhar NV, Israel BA, Kolesar JM et al. Increased adiposity in animals due to a human virus. Int J Obes Relat Metab Disord 2000, 24:989–96.
17. Atkinson RL, Dhurandhar NV, Allison DB. Human adenovirus-36 is associated with increased body weight and paradoxical reduction of serum lipids. Int J Obes 2005, 29:281–286.
18. Dhurandhar NV, Kulkarni PR, Ajiinkya SM et al. Association of adenovirus infection with human obesity. Obes Res 1997, 5(5):464-9.
19. Carter JK. Ow CL, Smith RE, Rous-Associated virüs type 7 induces a syndrome in chickens characterized by stunting and obesity. Infect Immun1983, 39: 410–422.
20. Pasarica M, Shin AC, Yu M et al. Human adenovirus 36 induces adiposity, increases insulin sensitivity, and alters hypothalamic monoamines in rats. Obesity 2006, 14:1905–1913.
21. Lyons MJ, Faust IM, Hemmes RB, Buskirk DR, Hirsch J, Zabrikie JB. A

virally induced obesity syndrome in mice. Science 1982, 216(4541):82-5.
22. Gosztonyi G, Ludwig H. Borna disease: Neuropathology and pathogenesis. Current Topics in Microbiol. Immunol 1995,190: 39-73.
23. Tuncer P, Yeşilbağ K. Vıral etıology ın obesıty. Turkish Journal of Infection 2008,22(4):241-249.
24. Lacerda Suplicy H, Bornschein A. Infeccions as the etiology for obesity. Arq Bras Endocrinol Metab 2009, 53(2):159-164.
25. Na HN, Hong YM, Kim J et al. Association between human adenovirus-36 and lipid disorders in Korean schoolchildren. Int J Obes 2010, 34(1):89-93.

How to cite this article: Çetinkaya S, Sert H. Relation between obesity and ghrelin, leptin hormones, vitamin D and viruses. Int J Health Sci Res. 2017; 7(8):438-441.

****