

KNOWLEDGE AWARENESS AND PERCEPTION ON COMORBIDITIES OF OBESITY AMONG DENTAL STUDENTS- A SURVEY

Running Title: Comorbidities of obesity among dental students- A Survey

ABSTRACT

Aim : The aim of this study is to evaluate the awareness of kap on comorbidities of obesity among dental students

INTRODUCION : Obesity is characterized by an excess of adipose tissue. The increase of food intake (hyperphagia) triggered by a period of fasting is a simple but compelling example of food-intake regulation. The balance between energy intake (food consumption) and energy expenditure (basal metabolic rate, i.e. biochemical processes required to maintain cellular viability, physical activity and adaptive thermogenesis) is tightly regulated.

MATERIALS AND METHODS : An online survey was conducted and circulated among dental students , which included a questionnaire assessing the awareness levels of the comorbidities related to obesity.

RESULTS AND DISCUSSION : The results obtained showed that 75.8% of the people are aware that obesity can lead to sleep apnea, 80.5 % of the people are aware that obesity can lead to gastrointestinal disturbances and diabetes.

CONCLUSION : The discussion makes an attempt to trace the basic modern day concepts of obesity and its effect on health.

KEYWORDS: Obesity; diabetes; sleep apnea; health; BMI, Innovative technology, Novel method

INTRODUCTION

Obesity, which broadly refers to excess body fat, has become an important public health problem. Its prevalence continues to increase worldwide(1).As the prevalence of obesity increases so does the burden of its associated comorbidities.(2,3)Non-communicable diseases and their risk factors including obesity are now becoming a significant problem not only in affluent societies but also in developing countries.Assessing total body fat accurately requires sophisticated technology which is not readily available for purposes of the epidemiology of the disease.The World Health Organisation (WHO) adopted body mass index (BMI), which is calculated by dividing the body weight in kilograms (Kg) by the square of the height in metres (m), as a surrogate measure of total body fat Obesity treatment may consist of a combination of different methods of treatment. Always seek diagnosis and treatment advice from your healthcare provider.(2–5)BMI correlates well with the percentage body fat in the young and middle aged where obesity is most prevalent. With this index, obesity is defined when the value is equal to or more than 30Kg/m² Obesity can be treated in a variety of ways. Using many methods, such as dietary adjustments and increased exercise, is effective. (6)However, not only does the total body fat matter but also the pattern of distribution. Excess visceral fat, also referred to as central obesity, has a stronger association with cardiovascular disease than subcutaneous fat which is deposited mainly around the hips and buttocks The main cause of weight increase should be addressed, and management should be focused on both weight loss and patient-centered health outcomes. A multidisciplinary approach is advocated, which includes dietary changes, physical activity, and changes in behavior.(7,8) Central obesity produces a characteristic body shape which resembles an apple and thus is also referred to as “apple shaped” obesity as opposed to “pear shaped” obesity in which fat is deposited on the hips and buttocks(9)(10–12). The rise in the prevalence and severity of pediatric obesity has been accompanied by higher rates of the known correlates of obesity as well as the emergence of new or newly identifiable health conditions. They include the classic cardiovascular risk factors, type 2 diabetes, menstrual abnormalities, sleep-disordered breathing, and psychosocial effects. to promote health and minimise health hazards Focus management on both weight loss and patient-centered health outcomes by addressing the primary cause of weight gain. Weight loss of 5-15 percent of body weight over 6 months is the short-term goal, with weight maintenance being the long-term goal. Depending on the severity of obesity and obesity-related comorbidity (ORC), such as poorly controlled diabetes despite receiving the finest medical care,Weight loss of 10%

or more may be required for nonalcoholic steatohepatitis and obstructive sleep apnea. Regaining 3 kg in 2 years and maintaining a 4 cm waist circumference reduction(13). Although stigmatization of obese children is convincingly documented, the evidence regarding the psychological consequences of child and adolescent obesity is more equivocal. (14)Identification of the full range of health consequences linked to obesity in the pediatric population may help direct resources to its primary, secondary, and tertiary prevention Aim for attainable targets (e.g., a 10% body weight loss in six months or a weekly weight loss of 0.5-1 kg). A multidisciplinary strategy (consisting of dietary changes, physical exercise, and behavioural changes) is suggested. Obese patients with T2DM or poorly controlled ORC should consider intensive therapy (e.g., a low-calorie diet, anti-obesity medications, or bariatric metabolic surgery).(14,15). Obstructive sleep apnea and obesity hypoventilation syndrome are important and serious consequences of obesity, and may in fact mediate components of the association between obesity and metabolic and cardiovascular morbidities, most likely via potentiation of inflammatory cascades. It is anticipated that the increased prevalence of obesity in children and adolescents in our society will be accompanied by a steady increase in the incidence.(14–16). The decreased bone mass with obesity may be due to increased marrow adipogenesis at the expense of osteoblastogenesis, or increased osteoclastogenesis because of up-regulated production of proinflammatory cytokines, or excessive leptin secretion, or reduced adiponectin production, and/or reduced calcium absorption associated with high fat intake. (14–17). Understanding the relationship between obesity and bone metabolism may help identify new molecular targets that can increase osteoblastogenesis while inhibiting adipogenesis and/or decreasing osteoclastogenesis. Ultimately, this knowledge may lead us to develop new therapeutic interventions to prevent both obesity and osteoporosis.Recent studies have reported an association between obesity and functional gastrointestinal disorders. Although high-protein, high-fat, low-carbohydrate diets are popular, the concentration of saturated fat in certain diets may offer major health problems in the long run. More than the nature of the food, successful weight loss that is maintained over time depends on limiting energy ingested (calories) and boosting energy expenditure (exercise and daily activity).(18). In addition, obesity is also becoming increasingly recognized at diagnosis of organic gastrointestinal diseases such as celiac disease and inflammatory bowel disease(19). An awareness of all possible complications and associations of obesity by the practicing physician is important so as to provide comprehensive care to obese people. Body position shifting during sleep is one conservative therapy for sleep apnea. Fasting can cause quick weight loss, but it can also cause the loss of lean muscle mass. Medical supervision is required for all-liquid diets. They can be utilised for a limited duration in obese patients. These liquid diets may be beneficial in the short term, but they are not a long-term weight loss solution. Fads, fasting, and popular diets with health consequences that haven't been proven in clinical trials may not be the best ways to lose weight.(18) However, it is reported that body position shifts are not effective for many obese patients with sleep apnea. Respiratory disorders were analyzed in supine and lateral decubitus position, and compared with obstructive sites of the upper airway during sleep. Certain factors like stress, nutrition, underactivity of thyroid, excess estrogen, diabetes , which can occur due to

obesity may also lead to alopecia.(18,20) People with obesity are more likely to develop a number of potentially serious health problems, including: Heart disease and strokes. Obesity makes you more likely to have high blood pressure and abnormal cholesterol levels, which are risk factors for heart disease and strokes. (21,22)(23),(24),(25),(26),(27),Our team has extensive knowledge and research experience that has translate into high quality publications (28),(29),(30), (31),(32),(33), (34), (35),(36),(37),(38),(39),(40),(41),(42)

MATERIALS AND METHODS

An online survey was circulated among dental students , 105 had responded to the survey. The questionnaire included questions regarding the various complications of obesity and the people were asked to choose the option according to their awareness and knowledge about the complications of obesity. Measures were taken to minimize the sampling bias. Validity was checked both internally and externally. Sample method carried out was simple random sampling. Method of representation of each output variable was in pie charts and bar graphs. The statistics were done using SPSS software , chi square test was done to check the association and a p value of 0.05 and lesser was said to be statistically significant . The people were asked to mark the most appropriate answer without any prompting by the surveyor. The results were analysed.

RESULTS

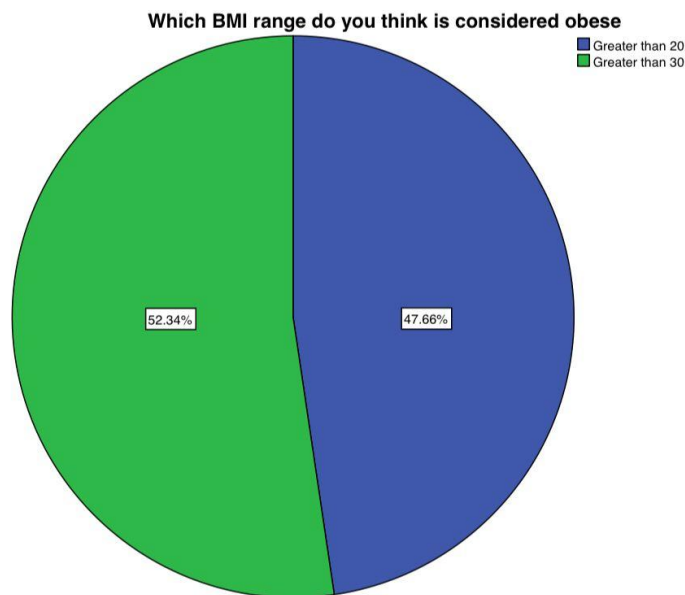


Figure 1 : The pie chart represents the results obtained 52.3% of the people think that BMI greater than 30 is considered obese and 47.7% of the people think that a BMI greater than 20 is considered obese.



Figure 2 : The pie chart represents 75.8% of the people who are aware that obesity can lead to sleep apnoea and 24.2% of the people are not aware that prolonged obesity can lead to sleep apnea

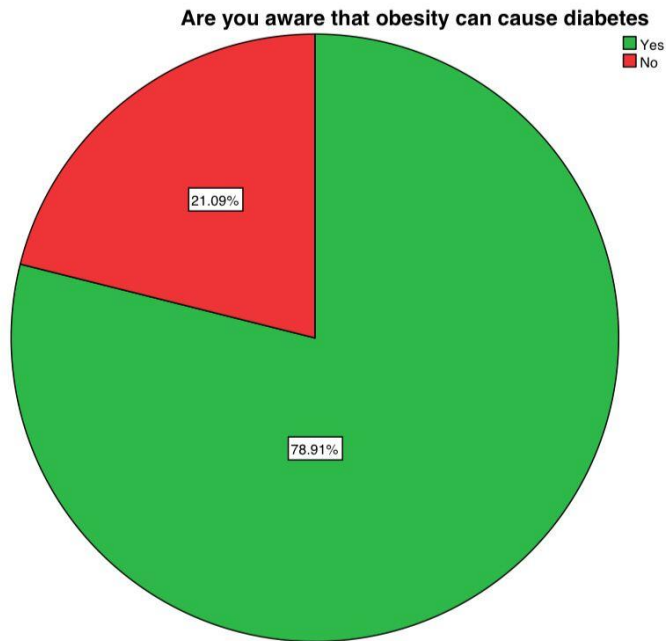


Figure 3 : The pie chart represents 78.9% of the people who are aware that obesity can cause diabetes whereas 21.2% of the people are not aware that obesity can cause diabetes.

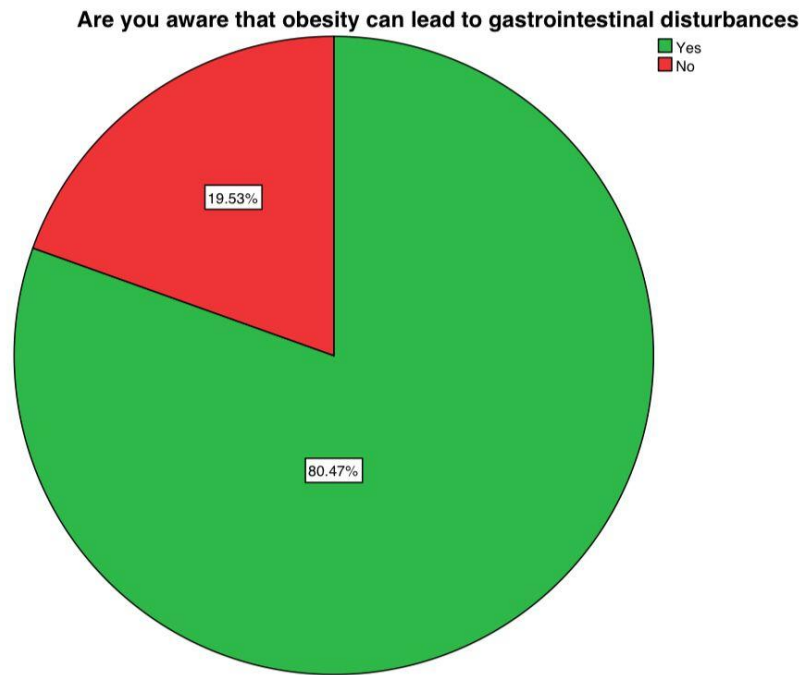


Figure 4 : The pie chart represents 80.5% of the people who are aware that obesity can lead to gastrointestinal disturbances and 19.5% of the people are not aware.

Are you aware that obesity can cause respiratory problems and lowered immunity

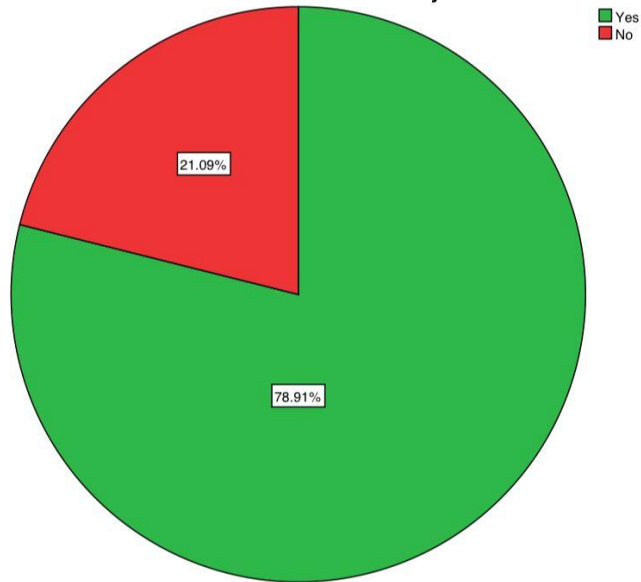


Figure 5 : The pie chart represents 78.9% of the people who are aware that obesity can lead to respiratory disorders and lowered immunity whereas 21.2% of the people are not aware.

Are you aware that recovery rate of COVID -19 is less in obese people as compared to non obese people

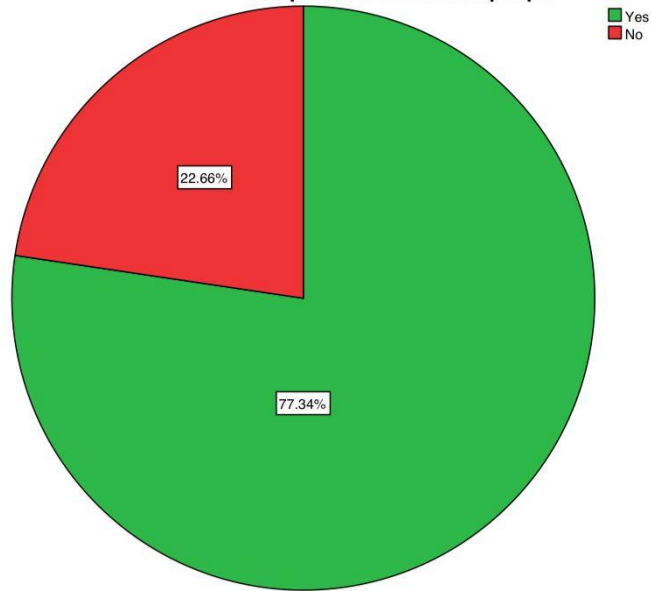


Figure 6 : The pie chart represents 77.3% of the people are aware that obese people showed a lower recovery rate on contracting the COVID-19 infection whereas 22.7% of the people were not aware.

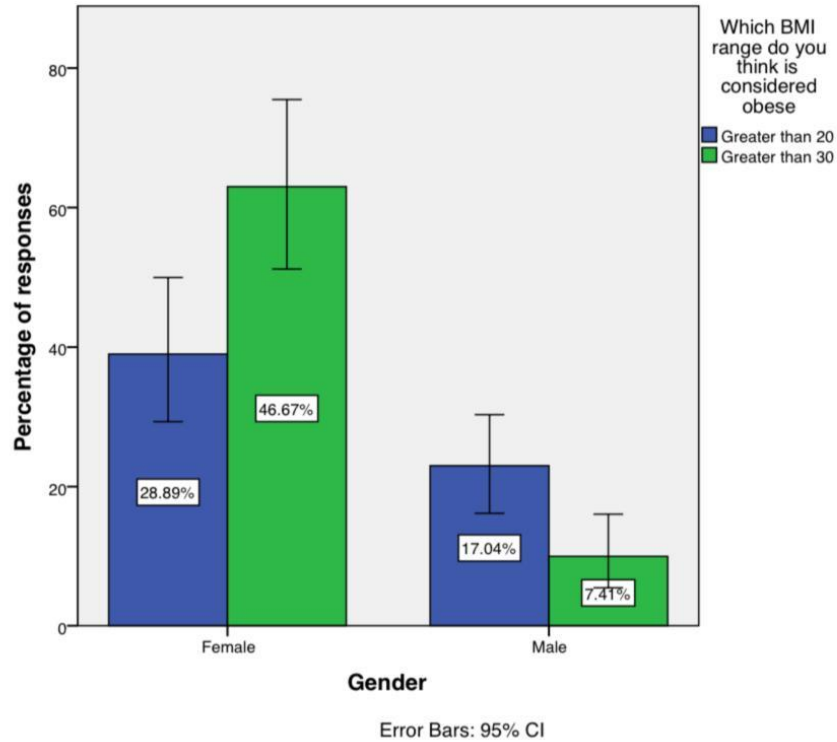


Figure 7 : The bar graph represents the association between gender and the percentage of participants. The X-axis represents the gender and Y-axis represents the percentage of responses. Chi-square test was performed and the association was not significant (p -value = 0.45 was obtained (p -value >0.16) showing statistically not significant. Most of the participants believe that a BMI greater than 20 is considered obese.

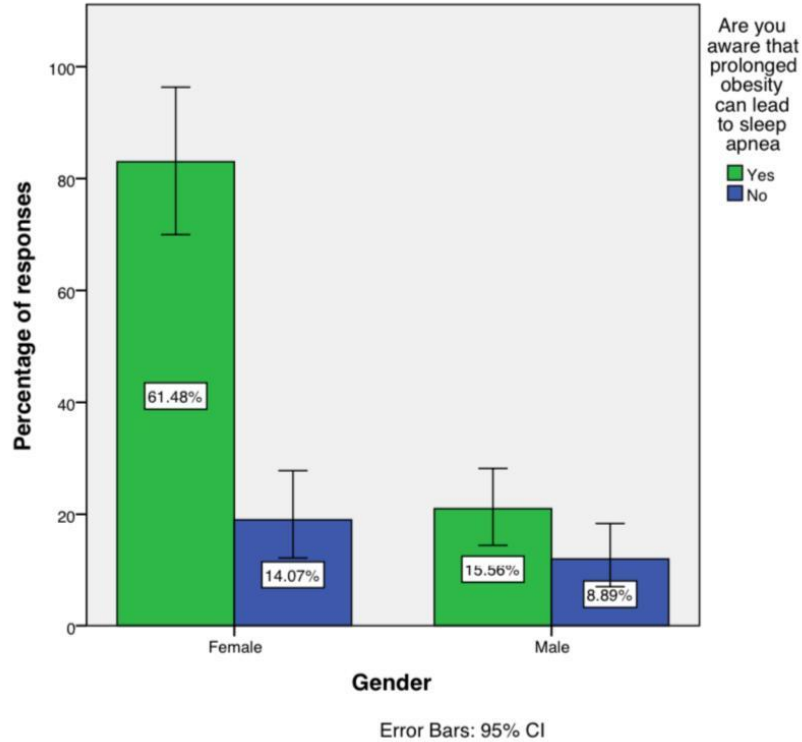


Figure 8 : The bar graph represents the association between gender and the percentage of participants. The X-axis represents the gender and Y-axis represents the percentage of responses. Chi-square test was performed and the association was not significant (p -value = 0.34 was obtained (p -value >0.13) showing statistically not significant. Most of the participants believe that prolonged obesity can lead to sleep apnea

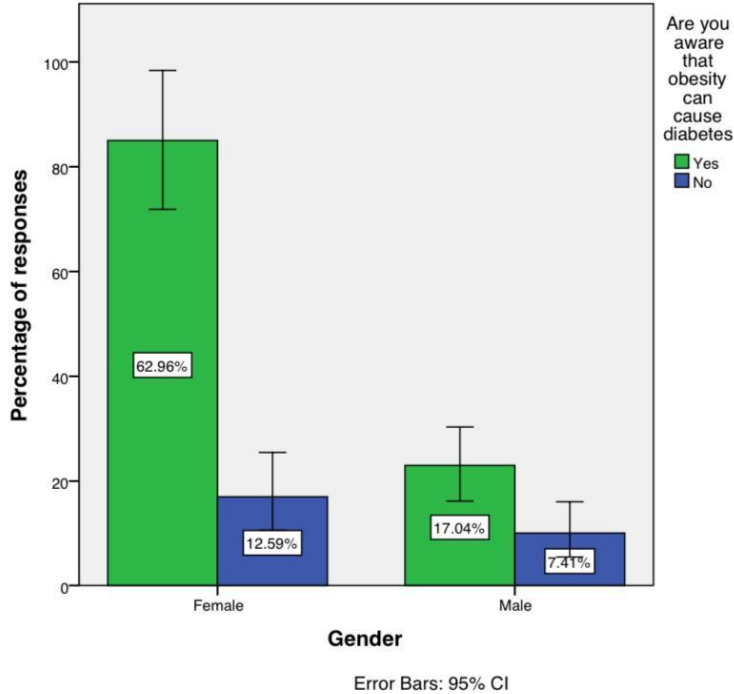


Figure 9 : The bar graph represents the association between gender and the percentage of participants. The X-axis represents the gender and Y-axis represents the percentage of responses. Chi-square test was performed and the association was not significant (p -value = 0.25 was obtained (p -value >0.11) showing statistically not significant. Most of the participants believe obesity can cause diabetes.

DISCUSSION

The responses of the participants about the awareness of prenatal depression among men and women which is depicted in the (figure 1-9). The study evaluates the awareness about prenatal depression among men and women. The total number of participants involved in this study was 100 among the study sample; the results obtained 52.3% of the people think that BMI greater than 30 is considered obese and 47.7% of the people think that a BMI greater than 20 is considered obese.(figure 1) 75.8% of the people who are aware that obesity can lead to sleep apnoea and 24.2% of the people are not aware that prolonged obesity can lead to sleep apnea. (figure 2). 78.9% of the people who are aware that obesity can cause diabetes whereas 21.2% of the people are not aware that obesity can cause diabetes.(figure 3) The people who are aware that obesity can lead to gastrointestinal disturbances are 80.5% and 19.5% of the people (figure 4) are not aware. 78.9% of the people who are aware that obesity can lead to respiratory disorders and lowered immunity whereas 21.2% of the people are not aware.(figure 5) the people are aware that obese people showed a lower recovery rate on contacting the COVID-19 infection are

77.3% whereas 22.7% of the people were not aware.(figure 6) Chi-square test was performed and the association was not significant (p-value = 0.45 was obtained (p-value >0.16)(figure 7) showing statistically not significant. Most of the participants believe that a BMI greater than 20 is considered obese. (p-value = 0.34 was obtained (p-value >0.13)(figure 8) showing statistically not significant. Most of the participants believe that prolonged obesity can lead to sleep apnea. Most of the participants believe obesity can cause diabetes. (p-value = 0.25) was obtained (p-value >0.11) (figure 9)showing statistically not significant. Since 2006, the increase in obesity in developed countries has slowed down. In the USA, the rate of adult obesity remained steady at 35% between 2003 and 2004 and 2011 and 2012, although rates of morbid obesity (BMI > 40) continued to rise. As rates of obesity rise, so has interest in its associated complications and there is greater understanding of the role it plays in many diseases. This has led to fears that obesity-related complications such as diabetes, heart disease, dementia and cancer threaten to slow or even reverse the improvements in life expectancy seen in the past several decades.(3,43)

CONCLUSION

Obesity is mostly caused by eating too much and moving too little. If a person consumes high amounts of energy, particularly fat and sugars, but does not burn off the energy through exercise and physical activity, much of the surplus energy will be stored by the body as fat. On analysing the results obtained , it can be concluded that the awareness levels about the comorbidities of obesity is high among dental students . Management of obesity includes lifestyle changes, medications, or surgery. The main treatment for obesity consists of weight loss through dieting and physical exercise. Diet programs can produce weight loss over the short term and long-term, combining with exercise and counseling provide greater results.

AUTHOR CONTRIBUTION

Sreshtha has done literature search, data collection, analysis, manuscript writing. Dr. R Gayathri helped in data verification, manuscript drafting. Dr. V Vishnu Priya contributed to the title discussion. All the authors have equally contributed in developing the manuscript.

CONFLICT OF INTEREST : The author declares that there were no conflict of interest.

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COMPETING INTERESTS DISCLAIMER:

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REFERENCES

1. Consortium D of HPHR, Department of Health Public Health Research Consortium, Law C, Power C, Graham H, Merrick D. Obesity and health inequalities [Internet]. Vol. 8, Obesity Reviews. 2007. p. 19–22. Available from: <http://dx.doi.org/10.1111/j.1467-789x.2007.00312.x>
2. Lean M. Health consequences of overweight and obesity in adults [Internet]. Obesity Epidemiology. 2010. p. 43–58. Available from: <http://dx.doi.org/10.1093/acprof:oso/9780199571512.003.0004>
3. World Health Organization. Regional Office for Europe. The Challenge of Obesity in the WHO European Region and the Strategies for Response: Summary. World Health Organization; 2007. 60 p.
4. World Health Organization. Obesity: Preventing and Managing the Global Epidemic. World Health Organization; 2000. 253 p.
5. Shekar M, Popkin B. Obesity: Health and Economic Consequences of an Impending Global Challenge. Human Development Perspectives; 2020. 234 p.
6. Townsend N, Scriven A. The health consequences of obesity [Internet]. Public Health Mini-Guides: Obesity. 2014. p. 48–66. Available from: <http://dx.doi.org/10.1016/b978-0-7020-4634-6.00003-0>
7. Kiwanuka E. The health impact of obesity [Internet]. Obesity. 2020. p. 73–83. Available from: <http://dx.doi.org/10.1016/b978-0-12-818839-2.00006-5>

8. Moini J, Ahangari R, Miller C, Samsam M. Global Health Complications of Obesity. Elsevier; 2020. 480 p.
9. Tappia PS, Ramjiawan B, Dhalla NS. Pathophysiology of Obesity-Induced Health Complications. Springer Nature; 2020. 345 p.
10. Andrew CA. Identifying Comorbidities of Obesity [Internet]. Obesity Management. 2019. p. 11–8. Available from: http://dx.doi.org/10.1007/978-3-030-01039-3_2
11. Nutritional Pathophysiology of Obesity and its Comorbidities [Internet]. 2017. Available from: <http://dx.doi.org/10.1016/c2014-0-04074-9>
12. Buhociu E. Diet And Physiotherapy In The Treatment Of Obesity And Its Comorbidities [Internet]. 2018. Available from: <http://dx.doi.org/10.15405/epsbs.2018.06.02.15>
13. Gordeladze J. Adiposity: Epidemiology and Treatment Modalities. BoD – Books on Demand; 2017. 252 p.
14. Berger M. Disease risks of obesity [Internet]. Weight Control. 1995. p. 1–7. Available from: http://dx.doi.org/10.1007/978-94-011-0583-5_1
15. Corporation R, RAND Corporation. The Health Risks of Obesity [Internet]. PsycEXTRA Dataset. 2002. Available from: <http://dx.doi.org/10.1037/e418972005-001>
16. Aronne LJ. Classification of Obesity and Assessment of Obesity-Related Health Risks [Internet]. Vol. 10, Obesity Research. 2002. p. 105S – 115S. Available from: <http://dx.doi.org/10.1038/oby.2002.203>
17. Yuen MAM. Obesity and cardiovascular risks : a systematic review of current evidence [Internet]. Available from: http://dx.doi.org/10.5353/th_991043984188803414
18. Kopelman P. Health risks associated with overweight and obesity [Internet]. Vol. 8, Obesity Reviews. 2007. p. 13–7. Available from: <http://dx.doi.org/10.1111/j.1467-789x.2007.00311.x>
19. Cuschieri S, Grech S. Obesity population at risk of COVID-19 complications. Glob Health Epidemiol Genom. 2020 Nov 6;5:e6.
20. Milano W, Capasso A. Diseases and health risks associated with obesity [Internet]. Vol. 4, Integrative Obesity and Diabetes. 2018. Available from: <http://dx.doi.org/10.15761/iod.1000200>
21. Okoli A, Hanlon EC, Brady MJ. The Relationship between Sleep, Obesity, and Metabolic Health in Adolescents - a Review. Curr Opin Endocr Metab Res. 2021 Apr;17:15–9.
22. Spaeth AM. Insufficient sleep and obesity [Internet]. Sleep and Health. 2019. p. 189–201. Available from: <http://dx.doi.org/10.1016/b978-0-12-815373-4.00015-0>

23. Wu F, Zhu J, Li G, Wang J, Veeraraghavan VP, Krishna Mohan S, et al. Biologically synthesized green gold nanoparticles from Siberian ginseng induce growth-inhibitory effect on melanoma cells (B16). *Artif Cells Nanomed Biotechnol.* 2019 Dec;47(1):3297–305.
24. Chen F, Tang Y, Sun Y, Veeraraghavan VP, Mohan SK, Cui C. 6-shogaol, a active constituents of ginger prevents UVB radiation mediated inflammation and oxidative stress through modulating Nrf2 signaling in human epidermal keratinocytes (HaCaT cells). *J Photochem Photobiol B.* 2019 Aug;197:111518.
25. Li Z, Veeraraghavan VP, Mohan SK, Bolla SR, Lakshmanan H, Kumaran S, et al. Apoptotic induction and anti-metastatic activity of eugenol encapsulated chitosan nanopolymer on rat glioma C6 cells via alleviating the MMP signaling pathway [Internet]. Vol. 203, *Journal of Photochemistry and Photobiology B: Biology.* 2020. p. 111773. Available from: <http://dx.doi.org/10.1016/j.jphotobiol.2019.111773>
26. Babu S, Jayaraman S. An update on β -sitosterol: A potential herbal nutraceutical for diabetic management. *Biomed Pharmacother.* 2020 Nov;131:110702.
27. Malaikolundhan H, Mookkan G, Krishnamoorthi G, Matheswaran N, Alsawalha M, Veeraraghavan VP, et al. Anticarcinogenic effect of gold nanoparticles synthesized from *Albizia lebbek* on HCT-116 colon cancer cell lines. *Artif Cells Nanomed Biotechnol.* 2020 Dec;48(1):1206–13.
28. Han X, Jiang X, Guo L, Wang Y, Veeraraghavan VP, Krishna Mohan S, et al. Anticarcinogenic potential of gold nanoparticles synthesized from *Trichosanthes kirilowii* in colon cancer cells through the induction of apoptotic pathway. *Artif Cells Nanomed Biotechnol.* 2019 Dec;47(1):3577–84.
29. Gothai S, Muniandy K, Gnanaraj C, Ibrahim IAA, Shahzad N, Al-Ghamdi SS, et al. Pharmacological insights into antioxidants against colorectal cancer: A detailed review of the possible mechanisms. *Biomed Pharmacother.* 2018 Nov;107:1514–22.
30. Veeraraghavan VP, Hussain S, Balakrishna JP, Dhawale L, Kullappan M, Ambrose JM, et al. A Comprehensive and Critical Review on Ethnopharmacological Importance of Desert Truffles: *Terfezia claveryi*, *Terfezia boudieri*, and *Tirmania nivea* [Internet]. *Food Reviews International.* 2021. p. 1–20. Available from: <http://dx.doi.org/10.1080/87559129.2021.1889581>
31. Sathya S, Ragul V, Veeraraghavan VP, Singh L, Niyas Ahamed MI. An in vitro study on hexavalent chromium [Cr(VI)] remediation using iron oxide nanoparticles based beads. *Environmental Nanotechnology, Monitoring & Management.* 2020 Dec 1;14:100333.
32. Yang Z, Pu M, Dong X, Ji F, Priya Veeraraghavan V, Yang H. Piperine loaded zinc oxide nanocomposite inhibits the PI3K/AKT/mTOR signaling pathway via attenuating the development of gastric carcinoma: In vitro and in vivo studies. *Arabian Journal of Chemistry.* 2020 May 1;13(5):5501–16.
33. Rajendran P, Alzahrani AM, Rengarajan T, Veeraraghavan VP, Krishna Mohan S.

Consumption of reused vegetable oil intensifies BRCA1 mutations. *Crit Rev Food Sci Nutr*. 2020 Oct 27;1–8.

34. Barma MD, Muthupandiyan I, Samuel SR, Amaechi BT. Inhibition of *Streptococcus mutans*, antioxidant property and cytotoxicity of novel nano-zinc oxide varnish. *Arch Oral Biol*. 2021 Jun;126:105132.
35. Samuel SR. Can 5-year-olds sensibly self-report the impact of developmental enamel defects on their quality of life? *Int J Paediatr Dent*. 2021 Mar;31(2):285–6.
36. Samuel SR, Kuduruthullah S, Khair AMB, Shayeb MA, Elkaseh A, Varma SR. Dental pain, parental SARS-CoV-2 fear and distress on quality of life of 2 to 6 year-old children during COVID-19. *Int J Paediatr Dent*. 2021 May;31(3):436–41.
37. Tang Y, Rajendran P, Veeraraghavan VP, Hussain S, Balakrishna JP, Chinnathambi A, et al. Osteogenic differentiation and mineralization potential of zinc oxide nanoparticles from *Scutellaria baicalensis* on human osteoblast-like MG-63 cells [Internet]. Vol. 119, *Materials Science and Engineering: C*. 2021. p. 111656. Available from: <http://dx.doi.org/10.1016/j.msec.2020.111656>
38. Yin Z, Yang Y, Guo T, Veeraraghavan VP, Wang X. Potential chemotherapeutic effect of betalain against human non-small cell lung cancer through PI3K/Akt/mTOR signaling pathway. *Environ Toxicol*. 2021 Jun;36(6):1011–20.
39. Veeraraghavan VP, Periadurai ND, Karunakaran T, Hussain S, Surapaneni KM, Jiao X. Green synthesis of silver nanoparticles from aqueous extract of *Scutellaria barbata* and coating on the cotton fabric for antimicrobial applications and wound healing activity in fibroblast cells (L929). *Saudi J Biol Sci*. 2021 Jul;28(7):3633–40.
40. Mickymaray S, Alfaiz FA, Paramasivam A, Veeraraghavan VP, Periadurai ND, Surapaneni KM, et al. Rhaponticin suppresses osteosarcoma through the inhibition of PI3K-Akt-mTOR pathway. *Saudi J Biol Sci*. 2021 Jul;28(7):3641–9.
41. Teja KV, Ramesh S. Is a filled lateral canal – A sign of superiority? [Internet]. Vol. 15, *Journal of Dental Sciences*. 2020. p. 562–3. Available from: <http://dx.doi.org/10.1016/j.jds.2020.02.009>
42. Theertha M, Sanju S, Priya VV, Jain P, Varma PK, Mony U. Innate lymphoid cells: Potent early mediators of the host immune response during sepsis. *Cell Mol Immunol*. 2020 Oct;17(10):1114–6.
43. Ainsworth BE. Health impacts of the global increase in overweight and obesity—a cause for concern [Internet]. Vol. 1, *Journal of Public Health and Emergency*. 2017. p. 82–82. Available from: <http://dx.doi.org/10.21037/jphe.2017.10.02>