

ORIGINAL ARTICLE

# The prevalence of dyslipidemia in obese patients

Saeed Abdulrheem Alamri, Mohammed Dakhilallah Almalki\*, Waleed Nasser Alotaibi, Sulaiman Awadh Althobaiti

## ABSTRACT

**Background:** Obesity is a chronic health problem that is associated with several diseases and conditions including dyslipidemia. Dyslipidemia is the disruption of body lipids, which in turn is associated with the development of several diseases including cardiovascular diseases. Obesity prevalence is increasing and as a result dyslipidemia is rising. This study was done to assess the prevalence of dyslipidemia among obese patients.

**Methodology:** This present study included 250 individuals, 150 of them were obese and 10 were non-obese in September 2018 to November 2018. The parameters of dyslipidemia were investigated for all participants.

**Results:** The present study included two groups of participants, 40% were non-obese individuals, and 60% were obese patients. There were significant differences ( $p$ -value < 0.05) regarding total cholesterol, low density lipoproteins (LDL), high density lipoproteins (HDL), and triglycerides between the two groups. Also, there were significant differences between the two groups regarding different types of dyslipidemia.

**Conclusion:** The prevalence of dyslipidemia was high among obese patients and the most common type of dyslipidemia was hypercholesterolemia.

**Keywords:** Dyslipidemia, prevalence, obese patients, types of dyslipidemia.

## Introduction

Obesity is an independent risk factor for several diseases including type 2 diabetes mellitus, dyslipidemia, and coronary artery diseases [1]. Body mass index (BMI) is the most beneficial measurement of obesity, normal weight individuals has BMI of range of 18.5–24.9, overweight individuals have BMI of 25–30, whereas obese individuals have BMI above 30 [1]. The prevalence of obesity in several Saudi studies was reported to be in the range of 13%–50% [2–6]. Dyslipidemia is lipids disruption [7], it acts as a risk factor for several chronic diseases which results in morbidity and mortality around the world [8–10], such as type 2 diabetes [11,12], stroke development [13], and atherosclerosis [14]. Dyslipidemia prevalence differs according to cultural characteristics of the population, socioeconomics, and ethnicity [15]. The prevalence of dyslipidemia is raising globally. Hyperdyslipidemia is the dyslipidemia that involves increase in the level of cholesterol and/or triglycerides, or low levels of HDL [16–18]. The global prevalence of dyslipidemia was estimated to range from 2.7% to 51.9% [19–21]. Recently, dyslipidemia became apparent in Saudi Arabia as result of changes in lifestyle, dietary, and sociodemographics [22]. The prevalence in Saudi Arabia was reported to range from 20% to 44% [15]. The

present study was conducted to assess the prevalence of dyslipidemia among obese individuals.

## Subjects and Methods

The study was conducted between the period of September 2018 and November 2018. This study included two groups of individuals, 100 healthy individuals, and 150 obese patients. Exclusion criteria of obese patients included suffering from renal or thyroid diseases, being on steroid therapy, alcoholic, and smokers, as well as postmenopausal women. Routine physical examinations were performed for all the participants and several parameters were assessed including, total cholesterol, low density lipoproteins (LDL), high density lipoproteins (HDL), and triglycerides.

**Correspondence to:** Mohammed Dakhilallah Almalki  
\*College of Medicine, Taif University, Taif, Saudi Arabia.  
Email: dr.mda15@gmail.com

*Full list of author information is available at the end of the article.*

**Received:** 11 December 2018 | **Accepted:** 20 December 2018

SPSS program version 16.0 was used to analyze the data. Results were represented as frequencies and percent for qualitative data and standard deviation for quantitative data.  $p$ -value at  $<0.05$  was considered statistically significant.

## Results

The present study included 250 participants, who were divided into two groups as the non-obese group and obese group, non-obese group included 100 (40%) individuals, while obese group included 150 (60%) patients (Figure 1), there was equal ratio of males and females in this study 1:1. The age range of participants was 30–65 years old. Total cholesterol, LDL, HDL, and triglycerides were assessed in individuals in this study, the mean  $\pm$  SD of each parameter is shown in Table 1. The mean  $\pm$  SD of total cholesterol in non-obese participants was  $190 \pm 15.2$  mg/dl, while in obese individuals it was  $245 \pm 16.5$  mg/dl ( $p$ -value = 0.02). The mean  $\pm$  SD of LDL in non-obese persons and obese patients was  $115.7 \pm 6.4$  mg/dl and  $170.3 \pm 9.7$  mg/dl, respectively ( $p$ -value = 0.01). The mean  $\pm$  SD of HDL level for non-obese individuals was  $112.9 \pm 4.2$  mg/dl and for obese patients was  $162.7 \pm 4.8$  mg/dl ( $p$ -value = 0.014). The mean  $\pm$  SD of triglycerides for non-obese and obese participants was  $110 \pm 4.2$  mg/dl and  $160 \pm 5.6$  mg/dl, respectively

( $p$ -value = 0.021). The distribution of participants in both groups regarding the four parameters according to dyslipidemia prevalence is shown in Table 2. There were significant differences between the two groups regarding the prevalence of dyslipidemia according to the four different parameters levels.

## Discussion

In the current study, the prevalence of obesity was 60% among 250 participants. This percent was in agreement with that reported in a previous Saudi study [23], while another Saudi study [5] reported lower percent where the prevalence ranged from 34% to 40%. The prevalence of obesity among Kuwaiti students was found to be 19.8% [7]. In this study, the mean levels of total cholesterol, LDL, HDL, and triglycerides were significantly higher in obese patients than in non-obese individuals. These findings were in agreement with several previous studies; one Saudi study [23] reported that the mean levels of cholesterol, LDL, and triglycerides were higher in obese patients than normal persons; another study [24] reported the increase in cholesterol and LDL in obese patients than non-obese ones. Two previous studies [1,25] reported increase in the triglycerides level among obese patients than non-obese individuals. There are several types of dyslipidemia, hypercholesterolemia which involves the

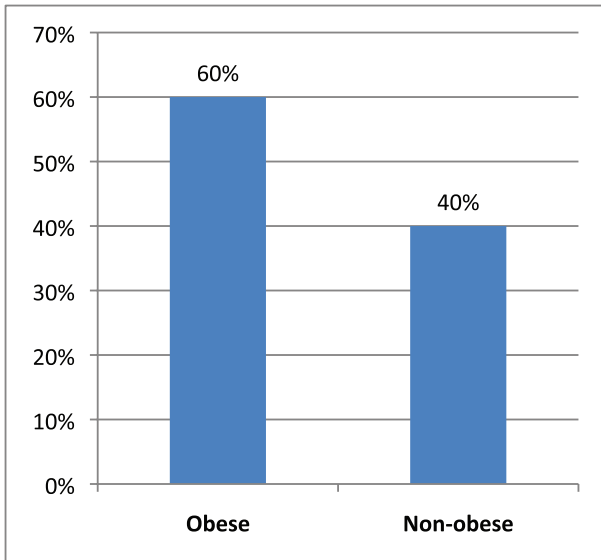
**Table 1.** The mean values of different parameters in participants.

Parameters	Non-obese Mean $\pm$ SD	Obese Mean $\pm$ SD	$p$ -value
Total cholesterol (mg/dl)	$190 \pm 15.2$	$245 \pm 16.5$	0.02
LDL (mg/dl)	$115.7 \pm 6.4$	$170.3 \pm 9.7$	0.01
HDL (mg/dl)	$112.9 \pm 4.2$	$162.7 \pm 4.8$	0.014
Triglycerids (mg/dl)	$110 \pm 4.2$	$160 \pm 5.6$	0.021

**Table 2.** Distribution of participants regarding the level of the 4 parameters in the two groups according to prevalence of dyslipidemia.

Variables	Obese (150) N (%)	Non-obese (100) N (%)	$p$ -value
Total cholesterol (TC)			
<200 mg/dl	30 (20%)	60 (60%)	0.01
>200 mg/dl	120 (80%)	40 (40%)	
LDL			
<100 mg/dl	28 (18.7%)	56 (56%)	0.02
>100 mg/dl	122 (81.3%)	44 (44%)	
*HDL			
Low	90 (60%)	66 (66%)	0.01
Normal/ High	60 (30%)	34 (34%)	
Triglyceride			
<150 mg/dl	40 (26.7%)	75 (75%)	0.01
>150 mg/dl	110 (73.3%)	25 (25%)	

\*HDL considered low in case of <40 mg/dl in men and <50 mg/dl in women.



**Figure 1.** Prevalence of obesity among participants.

elevation of cholesterol level more than 200 mg/dl or elevation of LDL level more than 100 mg/dl, whereas the other type called hypertriglyceridemia involves the elevation of triglycerides level more than 150 mg/dl and low HDL level which is referred when HDL level is less than 50 mg/dl in females and 40 mg/dl in males. The presence of more than one abnormal lipid component refers to mixed hyperdyslipidemia [26]. In the current study, there were significant differences between the two groups regarding the levels of cholesterol > 200mg/dl, LDL > 100 mg/dl, triglycerides > 150mg/dl, as well as low HDL. The prevalence of dyslipidemia ranged from 60% to 81.3%. The present study showed that the most common type of dyslipidemia was hypercholesterolemia among obese patients, where there were 80% and 81.3% of obese patients had total cholesterol level > 200 mg/dl and LDL level >100 mg/dl, respectively, which refers presence of hypercholesterolemia. Moreover, the study showed that in obese patients there were increases in total cholesterol, LDL, and triglycerides, whereas the lower HDL was more common in non-obese individuals. In a previous Saudi study [23], the prevalence of dyslipidemia among obese individuals ranged from 55.6% to 77.78% showing lower prevalence than this study, with higher prevalence of hypertriglyceridemia which was in contrast to our findings, but the author reported that total cholesterol, LDL, and triglyceride elevation was more associated with obese patients, whereas low HDL was associated with non-obese individuals which was in agreement with the present results. Chinese study [27] reported higher prevalence of hypertriglyceridemia and low HDL, whereas in Kuwaiti study [28], it was found that 75% of adults attending the lipid clinics were suffering from either hyperlipidemia or hypertriglyceridemia. A study from India [29], it was found that total cholesterol, LDL, and triglycerides were significantly higher among individuals with high BMI than those with normal BMI

which was in agreement with the present study, whereas in contrast to the present findings, the previous Indian study [29] showed that HDL did not differ significantly between the two groups.

## Conclusion

The prevalence of dyslipidemia among obese individuals was high. All types of dyslipidemia were associated with obesity, whereas low HDL was associated with normal individuals, the most common type of dyslipidemia was hypercholesterolemia.

## List of Abbreviations

BMI	Body mass index
HDL	High density lipoproteins
LDL	Low density lipoproteins

## Funding:

None.

## Consent for publication

Informed consent was obtained from all participants

## Declaration of conflicting interests:

None.

## Ethical approval

Not applicable.

## Author details

Saeed Abdulrheem Alamri, Mohammed Dakhilallah Almalki, Waleed Nasser Alotaibi, Sulaiman Awadh Althobaiti  
College of Medicine, Taif University, Taif, Saudi Arabia

## References

- Jacob BS, Balachandran J, Paul B. A study on prevalence of dyslipidemia in obese patients in a teaching hospital in Kerala. *Scholars J Appl Med Sci.* 2014;2(2b): 642–6.
- Al-Nozha MM, Al-Mazrou YY, Al-Maatouq MA, Arafah MR, Khalil MZ, Khan NB, et al. Obesity in Saudi Arabia. *Saudi Med J.* 2005;26(5):824–9.
- Hazzaa HM. Rising trends in BMI of Saudi adolescents: evidence from three cross sectional studies. *Asia Pac J Clin Nutr.* 2007;16:462–6.
- Alhyas L, McKay A, Balasanthiran A, Majedd A. Prevalences of overweight, obesity, hyperglycemia, hypertension and dyslipidemia in the Gulf: systematic review. *JRSM Short Rep.* 2011;2(7):5. <https://doi.org/10.1258/shorts.2011.011019>
- Saeed AA. Anthropometric predictors of dyslipidemia among adults in Saudi Arabia. *Epidemiol Biostat Public Health.* 2013;10(1):e8733-1-11.
- James PT, Rigby N, Leach R, International Obesity Task Force. The obesity epidemic, metabolic syndrome and future prevention strategies. *Eur J Cardiovasc Prev Rehabil.* 2004;11(1):3–8. <https://doi.org/10.1097/01.hjr.0000114707.27531.48>
- AlMajed HT, AlAttar AT, Sadek AA, AlMuaili TA, AlMutairi OA, Shaghoul AS, et al. Prevalence of dyslipidemia and

- obesity among college students in Kuwait. *Alexandria J Med.* 2011;47(1):67–1. <https://doi.org/10.1016/j.ajme.2010.12.003>
8. World Health Organization. Quantifying selected major risks to health. Geneva, Switzerland: World Health Organization; 2002.
  9. Smith G. Epidemiology of dyslipidemia and economic burden on the healthcare system. *Am J Manag Care.* 2007;13(3):S68–71.
  10. Stamler J, Daviglus ML, Garside DB, Dyer AR, Greenland P, Neaton JD. Relationship of baseline serum cholesterol levels in 3 large cohorts of younger men to long-term coronary, cardiovascular, and all-cause mortality and to longevity. *JAMA.* 2000;284(3):311–8. <https://doi.org/10.1001/jama.284.3.311>
  11. Jayarama N, Lakshmaiah MR. Prevalence and pattern of dyslipidemia in type 2 diabetes mellitus patients in a rural tertiary care centre, southern India. *Glob. J. Med. Public Health.* 2012;1:24–7.
  12. Zhou X, Zhang W, Liu X, Li Y. Interrelationship between diabetes and periodontitis: role of hyperlipidemia. *Arch Oral Biol.* 2014;60:667–74. <https://doi.org/10.1016/j.archoralbio.2014.11.008>
  13. Djelilovic-Vranic J, Alajbegovic A, Zelija-Asimi V, Niksic M, Tiric-Campara M, Salcic S. Predilection role diabetes mellitus and dyslipidemia in the onset of ischemic stroke. *Med Arch.* 2013;67:120–3. <https://doi.org/10.5455/medarh.2013.67.120-123>
  14. Snehalatha C, Nanditha A, Shetty AS, Ramachandran A. Hyper-triglyceridaemia either in isolation or in combination with abdominal obesity is strongly associated with atherogenic dyslipidaemia in Asian Indians. *Diabetes Res Clin Pract.* 2011;94:140–5. <https://doi.org/10.1016/j.diabres.2011.07.016>
  15. Al-Kaabba A, Al-Hamdan NA, El Tahir A, Abdalla AM, Saeed AA, Hamza MA. Prevalence and correlates of dyslipidemia among adults in Saudi Arabia: results from a national survey. *Open J Endocr Metab Dis.* 2012;2(04):89. <https://doi.org/10.4236/ojemd.2012.24014>
  16. Gundogan K, Bayram F, Capak M, Tanriverdi F, Karaman A, Ozturk A, et al. Prevalence of metabolic syndrome in the Mediterranean region of Turkey: evaluation of hypertension, diabetes mellitus, obesity and dyslipidemia. *Metab Syndr Relat Disord.* 2009;7(5):427–34. <https://doi.org/10.1089/met.2008.0068>
  17. Halpern A, Mancini MC, Magalhães ME, Fisberg M, Radominski MC, Bertolami MC, et al. Metabolic syndrome, dyslipidemia, hypertension and type 2 diabetes in youth: from diagnosis to treatment. *Diabetol Metab Syndr.* 2010;18(2):55–9. <https://doi.org/10.1186/1758-5996-2-55>
  18. Tailor AM, Peeters PH, Norat T, Vineis P, Romaguera D. An update on the prevalence of the metabolic syndrome in children and adolescents. *Int J Pediatr Obes.* 2010;5(3):202–13. <https://doi.org/10.3109/17477160903281079>
  19. Saadi H, Carruthers SG, Nagelkerke N, Al-Maskari F, Afandi B, Reed R, et al. Prevalence of diabetes mellitus and its complications in a population-based sample in Al-Ain, United Arab Emirates. *Diabetes Res Clin Pract.* 2007;78(3):369–77. <https://doi.org/10.1016/j.diabres.2007.04.008>
  20. Al-Moosa S, Allin S, Jemai N, Al-Lawati J, Mossialos E. Diabetes and urbanization in the Omani population: an analysis of national survey data. *Popul Health Metr.* 2006;4(5):5. <https://doi.org/10.1186/1478-7954-4-5>
  21. Grabauskas V, Miseviciene I, Klumbiene J, Petke-viciene J, Milasauskiene Z, Plieskiene A, et al. Prevalence of dyslipidemias among Lithuanian rural population (CINDI Program). *Medicina (Kaunas).* 2009;39(12):1215–22.
  22. WHO. Country cooperation strategy for WHO and Saudi Arabia 2006–2011; 2012. [http://www.who.int/countryfocus/cooperation\\_strategy/ccs\\_sau\\_en.pdf](http://www.who.int/countryfocus/cooperation_strategy/ccs_sau_en.pdf)
  23. Algayed HK, Alharbi FM, Almutairi TS, Alaskar MS, Rammal AF, Alrahili MM. Prevalence of dyslipidemia in obese patients in Saudi Arabia. *Egypt J Hospital Med.* 2017;69(8):3054–7. <https://doi.org/10.12816/0042855>
  24. James PT, Rigby N, Leach R. International Obesity Task Force. The obesity epidemic, metabolic syndrome and future prevention strategies. *Eur J Cardiovasc Prev Rehabil.* 2004;11(1):3–8. <https://doi.org/10.1097/01.hjr.0000114707.27531.48>
  25. Lemieux I, Almeras N, Mauriege P, Blanchet C, Dewailly E, Bergeron J, et al. Prevalence of hypertriglyceridemic waist in Quebec Health Survey: association with atherogenic risk factors. *Can J Cardiol.* 2002;18(7):725–32.
  26. Sangsawang T, Sriwijitkamol A. Type of dyslipidemia and achievement of the LDL-cholesterol goal in chronic kidney disease patients at the University Hospital. *Vasc Health Risk Manag.* 2015;11:563–7.
  27. Qi L, Ding X, Tang W, Li Q, Mao D, Wang Y. Prevalence and risk factors associated with dyslipidemia in Chongqing, China. *Int J Environ Res Public Health.* 2015;12(10):13455–65. <https://doi.org/10.3390/ijerph121013455>
  28. Akanji AO. Diabetic dyslipidaemia in Kuwait. *Med Princ Pract.* 2002;11(Suppl. 2):47–55. <https://doi.org/10.1159/000066409>
  29. Ranganathan S, Krishnan TU, Radhakrishnan S. Comparison of dyslipidemia among the normal-BMI and high-BMI group of people of rural Tamil Nadu. *Med J Dr. DY Patil Univ.* 2015;8(2):149. <https://doi.org/10.4103/0975-2870.153140>