Research Article

# Prevalence of dyslipidemia and its associated factors among employees of primary health care centers, Jeddah, Saudi Arabia

Khadija basheikh[1], Alla Hussni Felemban[2], Mehad Hussni Felemban[2], Rajaa Mohammed Al-Raddadi[3], Eman Al-nuqali[4], Bahaa A Abaalkhail[5], Khalid Mohammed Alshareef[6]

[1]Alhamrah primary health center, Ministry of Health, Makkah, Saudi Arabia.
[2]Umm Alqura University, Makkah, Saudi Arabia.
[3]Department of Preventive Medicine, Ministry of Health, Jeddah, Saudi Arabia.
[4]King Abdul-Aziz University, Jeddah, Saudi Arabia.
[5]Department of Family and Community Medicine, College of Medicine, King Abdul-Aziz University, Jeddah, Saudi Arabia.
[6]Public Health Administration, Ministry of Health, Jeddah, Saudi Arabia.
Correspondence to: Khadija Basheikh, E-mail: k_basheikh@yahoo.com

Received January 22, 2016. Accepted February 3, 2016

## Abstract

**Background:** The prevalence of dyslipidemia is high and increasing in many developing countries, including Saudi Arabia because of the westernization of diet and other lifestyle changes.

**Objective:** To estimate the prevalence and to identify the associated factors of dyslipidemia among Saudi employees in primary health care in Jeddah City.

**Materials and Methods:** A retrospective cross-sectional study was conducted among primary health care employees in Jeddah. Seven primary health care centers were randomly selected. Sample of 461 Saudi employees' medical files were taken in to consideration. Their age ranged from 20 to 60 years. Data were collected over a period of 3 months from June 2014 to August 2014. It included demographic characteristics of the patients' height, weight, lipid profile results, and blood glucose levels. Anthropometric measurements, including weight and height were obtained and body mass index was calculated.

**Result:** This study included 461 employees; 145 (34.9%) men and 271(65.1%) women. The mean age was 38.1 ± 9.3 years. The prevalence of dyslipidemia was 78%. The prevalence of high total cholesterol was 38.7% whereas those of high low-density lipoprotein, low high-density lipoprotein, and high triglycerides were 43.5%, 45.2%, and 17.4%, respectively. The prevalence of hypertension was 20% whereas those of prediabetes and diabetes were 18.6% and 22.1%, respectively. Multivariate logistic regression analysis revealed that patients with hypertension were almost at an 11-fold risk to have dyslipidemia compared with those with normal blood pressure (crude odds ratio [OR] = 10.85; 95% confidence interval [CI]: 2.32–26.31, $p = 0.024$). Patients with diabetes were almost at a ninefold risk to develop dyslipidemia compared with those who were without diabetes (crude OR = 9.27; 95% CI: 1.68–52.19, $p = 0.019$).

**Conclusion:** This study reports one of the highest prevalence rates of dyslipidemia reported in Saudi Arabia. Patients who were hypertensive and diabetic were more likely to develop dyslipidemia compared with others.

**KEY WORDS:** Dyslipidemias, diabetes mellitus, hypertension, prevalence, risk factors

| Access this article online | |
|---|---|
| Website: http://www.ijmsph.com | Quick Response Code: |
| DOI: 10.5455/ijmsph.2016.22012016333 | |

## Introduction

Dyslipidemias are disorders of lipoprotein metabolism, including lipoprotein overproduction or deficiency. These disorders may be manifested by elevation of the serum total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and triglyceride concentrations, and a decrease in the high-density lipoprotein cholesterol (HDL-C) concentration. It is the major risk

factor for coronary heart disease (CHD), the leading cause of deaths worldwide.[1]

Treatment with cholesterol-lowering drugs appears to be accompanied by a reduction in the lipid content of atherosclerotic plaques, thereby making them more stable and less prone to rupture,[2] it can also reduce the risk of heart disease by 30% over a 5-year period.[3] Although the benefits of lipid-lowering therapy have been demonstrated most conclusively in patients with cardiovascular disease, lipid-lowering therapy is effective even in patients without clinically apparent cardiovascular disease.[4]

The World Health Organization (WHO) estimates that dyslipidemia is associated with more than half of the global cause of ischemic heart diseases.[5] A meta-analysis of 38 primary and secondary prevention trials showed that for every 10% reduction in plasma TC, CHD mortality is reduced by 15% and total mortality risk by 11%.[6]

The prevalence of dyslipidemia is high and increasing in most developed countries[7] as well as in many developing countries because of the westernization of diet and other lifestyle changes.[8]

A study carried out in Saudi Arabia reported that an overall prevalence of dyslipidemia ranged from approximately 20% to 40%. The highest prevalence was for triglycerides where approximately 44% of all participants were affected. About a fifth of the participants had high level of TC. Men had significantly higher prevalence of all types of dyslipidemia than women except LDL-C and TC.[9]

This study was carried out to estimate the prevalence and to identify the associated factors of dyslipidemia among Saudi employees in the primary health care in Jeddah City.

## Materials and Methods

A retrospective cross-sectional study was conducted among primary health care employees in Jeddah, Saudi Arabia. According to the geographic distribution, seven primary health care centers were randomly selected. Sample of 416 employees' medical files were taken in to consideration. This study is limited to the Saudi employees whose age ranged from 20 to 60 years.

Data were collected over a period of 3 months from June 2014 to August 2014. Extracted data were recorded on the data collection sheet developed by the researcher. The data sheet was designed to collect demographic characteristics of the patients such as age, gender, height, weight, lipid profile results, and blood glucose levels.

Anthropometric measurements, including weight and height were obtained. Weight was measured by using Detecto Physician Medical Body Weight Scale - 400 lb. Capacity with Height Rod was measured to the nearest centimeter using a stadiometer with the shoulder in a relaxed position and the arms hanging freely. Body mass index (BMI) was calculated as the ratio of weight (kilograms) to the square of height (meters).

For laboratory analysis and all biochemical measurements, two sets of fasting blood samples were drawn from a cannula inserted into the antecubital vein, one to the sodium fluoride potassium oxalate tubes for glucose tests and the other to lithium heparin vacuum tubes for lipid tests. Fasting plasma glucose was measured by the glucose oxidase method with the help of a Cobas Analyzer (Roche) USA. TC, HDL-C, LDL-C, and triglycerides were assayed by the automated spectrophotometer and enzymatic colorimetric method with the help of Cobas Integra (Roche).

### Operational Definitions

BMI: It is classified according to the following WHO criteria[10]: normal when BMI is 24.9≤kg/m$^2$, overweight when BMI is 25–29.9 kg/m$^2$, and obese when BMI is ≥30 kg/m$^2$.

Blood pressure: Hypertension was defined if the patient was already on antihypertensive drugs, or if the blood pressure was higher than 140 mm Hg systolic and/or higher than 90 mm Hg diastolic.[11]

Dyslipidemia: It was defined according to the NCEP ATPIII: National Cholesterol Education Program's Adult Treatment Panel criteria 2003,[12] if one or more of the following are found: total serum cholesterol >200 mg/dL, serum LDL >130 mg/dL in patients with diabetes. LDL >100 mg/dL, serum triglyceride >150 mg/dL, and serum HDL <40 mg/dL in men, and <50 mg/dL in women. The patients were also diagnosed to have dyslipidemia if they were on medication for any of the above conditions.

Smoking: According to WHO guidelines,[13] current smoker is defined as a person who smokes cigarettes daily or occasionally, past-smoker is a person who was formerly a daily or occasional smoker, but currently does not smoke at all, and nonsmoker is a person who has never smoked before or has smoked very little in the past.

Prediabetes[14]: It was defined when Fasting blood sugar (FBS) (≥100 and <126 mg/dL). Fasting is defined as no caloric intake for at least 8 hours overnight.

Diabetes[14]: It was defined when FBS (≥126 mg/dL).

### Statistical Analysis

The statistical program SPSS version 22 was used for data collection and statistical analysis. In univariate analysis, continuous variables will be analyzed as mean ± standard deviation and categorical variables as frequencies and percentages. Crude odds ratio (OR) and related 95% confidence interval (CI) were used and results were considered significant at a *p*-value of <0.05. Multivariate analysis using binary logistic regression analysis was applied to determine risk factors after controlling for confounders.

## Result

This study included 416 employees, 145 (34.9%) men and 271(65.1%) women. The mean age was 38.1 ± 9.3 years. The prevalence of smoking was 24.5%. The prevalence of

overweight and obesity was 35.0% and 30.7%, respectively. Slightly more than one-third of them (37.9%) were at least university graduated [Table 1].

As shown in Table 2, the prevalence of dyslipidemia was 78%. The prevalence of high TC was 38.7%. The prevalence of high LDL and low HDL was 43.5% and 45.2%, respectively. The prevalence of high triglyceride was 17.4%. The prevalence of hypertension was 20% whereas the prevalence of Diabetes mellitus (DM) was 22.1%. The prevalence of pre-DM was 18.6%.

Participants aged 40 years or older were more likely to have dyslipidemia compared with those younger than 40 years (crude OR = 13.44; 95% CI: 2.96–61.11). Patients who were hypertensive were almost at an eightfold risk to have dyslipidemia compared with those with normal blood pressure (crude OR = 8.09; 95% CI: 2.62–24.95). Patients with diabetes were almost at a tenfold risk to develop dyslipidemia compared with nondiabetics (crude OR = 10.73; 95% CI: 1.94–77.84). Patients with ischemic heart diseases were at higher risk to develop dyslipidemia as opposed to those without such history (crude OR = 11.0; 95% CI: 2.01–60.23).

**Table 1:** Demographic, anthropometric, and relevant characteristics of the employees in primary care, Jeddah

| Characteristics | *N* | % |
|---|---|---|
| Gender | | |
| Male | 145 | 34.9 |
| Female | 271 | 65.1 |
| Total | 416 | 100 |
| Age (years) | | |
| <40 | 244 | 67.0 |
| ≥40 | 120 | 33.0 |
| Total | 364 | 100 |
| Age (years), mean ± SD | 38.1 ± 9.3 | |
| Smoking | | |
| Nonsmoker | 259 | 71.2 |
| Current smoker | 89 | 24.5 |
| Ex-smoker | 16 | 4.3 |
| Total | 364 | 100 |
| BMI (kg/m$^2$) | | |
| Normal <25 | 115 | 34.3 |
| Overweight 25–29.9 | 117 | 35.0 |
| Obese ≥30 | 103 | 30.7 |
| Total | 335 | 100 |
| Education | | |
| Illiterate/primary school | 23 | 6.3 |
| Intermediate/secondary school | 39 | 10.6 |
| Diploma | 166 | 45.2 |
| University and above | 139 | 37.9 |
| Total | 367 | 100 |

BMI, body mass index; SD, standard deviation.

**Table 2:** Clinical characteristics of the employees in primary care, Jeddah

| Characteristics | | *N* | % |
|---|---|---|---|
| Hypertension | Yes | 72 | 20.0 |
| | No | 288 | 80.0 |
| | Total | 360 | 100 |
| Dyslipidemia | Yes | 227 | 22.0 |
| | No | 64 | 78.0 |
| | Total | 291 | 100 |
| FBS | Normal | 140 | 59.3 |
| | Prediabetes | 44 | 18.6 |
| | Diabetes | 52 | 22.1 |
| | Total | 236 | 100 |
| Total cholesterol (mg/dL) | <200 | 187 | 61.3 |
| | ≥200 | 118 | 38.7 |
| | Total | 305 | 100 |
| LDL cholesterol (mg/dL) | <130* | 148 | 56.5 |
| | ≥130* | 114 | 43.5 |
| | Total | 262 | 100 |
| HDL cholesterol (mg/dL) | F > 50, M > 40 | 160 | 54.8 |
| | F ≤ 50, M ≤ 40 | 132 | 45.2 |
| | Total | 292 | 100 |
| Triglycerides (mg/dL) | <150 | 252 | 82.6 |
| | ≥150 | 53 | 17.4 |
| | Total | 305 | 100 |

FBS, Fasting blood sugar; HDL, high-density lipoprotein; LDL, low-density lipoprotein.
*<100 and ≥100 for diabetics.

Other factors (age, gender, smoking, BMI, education, and family history of hypertension, diabetes mellitus, and ischemic heart disease) were not significant risk factors for dyslipidemia [Table 3].

Multivariate logistic regression analysis revealed that patients with hypertension were almost at an 11-fold risk to have dyslipidemia compared with those with normal blood pressure (crude OR = 10.85; 95% CI: 2.32–26.31, $p = 0.024$). Patients with diabetes were almost at a ninefold risk to develop dyslipidemia compared with nondiabetics (crude OR = 9.27; 95% CI: 1.68–52.19, $p = 0.019$). Age and history of ischemic heart diseases were not proved to be predictors of dyslipidemia.

## Discussion

The prevalence of dyslipidemia is rising over time in developing countries.[15]

It is one of the confirmed potential risk factors for cardiovascular diseases in the same category with other high-risk factors, such as diabetes, hypertension, and cigarette smoking.

As documented in this study, the prevalence of dyslipidemia among primary health care employees in Jeddah,

**Table 3:** Factors associated with dyslipidemia among employees in primary care, Jeddah: bivariate analysis

| | Dyslipidemia | | Crude OR | 95% CI |
|---|---|---|---|---|
| | No | Yes | | |
| | *N* (%) | N (%) | | |
| Age (years) | | | | |
| <40 (*n* = 244)[a] | 242 (99.2) | 2 (0.8) | 1.0 | — |
| ≥40 (*n* = 120) | 108 (90.0) | 12 (10.0) | 13.44 | 2.96–61.11 |
| Gender | | | | |
| Male (*n* = 145)[a] | 143 (98.6) | 2 (1.4) | 1.0 | — |
| Female (*n* = 271) | 250 (95.6) | 12 (4.4) | 3.31 | 0.73–15.01 |
| Educational level | | | | |
| Illiterate/primary (*n* = 23)[a] | 21 (91.3) | 2 (8.7) | 1.0 | — |
| Intermediate/secondary (*n* = 39) | 38 (97.4) | 1 (2.6) | 0.28 | 0.01–4.26 |
| Diploma (*n* = 166) | 161 (97.0) | 5 (3.0) | 0.33 | 0.05–2.61 |
| University (*n* = 139) | 136 (97.8) | 3 (2.2) | 0.23 | 0.03–2.13 |
| Smoking history | | | | |
| Never (*n* = 259)[a] | 252 (97.3) | 7 (2.7) | 1.0 | — |
| Current smoker (*n* = 89) | 87 (97.8) | 2 (2.2) | 0.83 | 0.12–4.45 |
| Ex-smoker (*n* = 16) | 15 (93.8) | 1 (6.2) | 2.40 | 0.28–20.79 |
| Body mass index | | | | |
| Normal (*n* = 115)[a] | 113 (98.3) | 2 (1.7) | 1.0 | — |
| Overweight (*n* = 117) | 115 (98.3) | 2 (1.7) | 0.98 | 0.10–9.95 |
| Obesity (*n* = 103) | 97 (94.2) | 6 (5.8) | 3.49 | 0.62–25.63 |
| Hypertension (HTN) | | | | |
| No (*n* = 288) [(a)] | 283 (98.3) | 5 (1.7) | 1.0 | — |
| Yes (*n* = 72) | 63 (87.5) | 9 (12.5) | 8.09 | 2.62–24.95 |
| Fasting blood sugar | | | | |
| Normal (*n* = 140)[a] | 138 (98.6) | 2 (1.4) | 1.0 | — |
| Prediabetes (*n* = 44) | 42 (95.5) | 2 (4.5) | 3.29 | 0.32–33.91 |
| Diabetes (*n* = 52) | 45 (86.5) | 7 (13.5) | 10.73 | 1.94–77.84 |
| Ischemic heart disease | | | | |
| No (*n* = 408)[a] | 396 (97.1) | 12 (2.9) | 1.0 | — |
| Yes (*n* = 8) | 6 (75.0) | 2 (25.0) | 11.0 | 2.01–60.23 |
| Family history of HTN | | | | |
| No (*n* = 192)[a] | 188 (97.9) | 4 (2.1) | 1.0 | — |
| Yes (*n* = 223) | 213 (95.5) | 10 (4.5) | 2.21 | 0.68–7.15 |
| Family history of DM | | | | |
| No (*n* = 163)[a] | 161 (98.8) | 2 (1.2) | 1.0 | — |
| Yes (*n* = 249) | 237 (95.2) | 12 (4.8) | 4.08 | 0.90–18.46 |
| Family history of IHD | | | | |
| No (*n* = 375)[a] | 362 (96.5) | 13 (3.5) | 1.0 | — |
| Yes (*n* = 38) | 37 (97.4) | 1 (2.6) | 0.75 | 0.096–5.92 |

OR, Odds ratio; CI: Confidence interval; DM, Diabetes mellitus; IHD, Ischemic heart disease.
[a]Reference category.

**Table 4:** Predictors of dyslipidemia among employees in primary care, Jeddah: multivariate logistic regression analysis

| | Adjusted OR | 95% CI | *p*-Value |
|---|---|---|---|
| Hypertension (HTN) | | | |
| No (*n* = 288)[a] | 1.0 | — | |
| Yes (*n* = 72) | 10.85 | 2.32–26.31 | 0.024 |
| Fasting blood sugar | | | |
| Normal (*n* = 140)[a] | 1.0 | — | |
| Prediabetes (*n* = 44) | 1.99 | 0.57–29.71 | 0.257 |
| Diabetes (*n* = 52) | 9.27 | 1.68–52.19 | 0.019 |

OR: Odds ratio; CI: Confidence interval.
[a]Reference category.
Terms of age and history of ischemic heart diseases were removed from the final model.

Saudi Arabia was very high (78%). Our finding is considered very high compared with other findings. In another study conducted in Saudi Arabia,[16] the overall prevalence of all types of dyslipidemia was ranged from approximately 20% to 44%. The highest prevalence was for triglycerides, where approximately 44% of all participants were affected. Even lower rates have been reported by others.[17–20] Several studies worldwide reported that the rates of dyslipidemia ranged from 2.7% to 51.9%.[21–30] This relatively large range in recent years may be due to socioeconomic status, genetic races, or differences in definitions, methodologies, and study populations.

In this study, patients with hypertension were more prone to dyslipidemias compared with those who were normotensives. This finding is in accordance with those reported by others.[31–33]

It has been documented that an increase in dyslipidemia may contribute to other complications of hypertension and may also cause higher mortality because of CVD.[31]

Several studies demonstrated significant association between dyslipidemia and BMI.[31,34] In disagreement with those studies, this study did not confirm a significant association between BMI and dyslipidemia.

The metabolic disturbances including disturbed glucose, dyslipidemia, and hypertension are often concurrent and are strongly associated with the subsequent development of CVD,[30] with insulin resistance being the most important common mechanisms.[35] In this survey, diabetes was a significant risk factor for dyslipidemia.

Among limitations of this study is the non inclusion of dietary factors as possible associated factors with dyslipidemia. Another important limitation is cross-sectional design in our study, which could only reflect associations between dyslipidemia and risk factors and not causality. Finally, we depended on BMI only for definition of obesity, thus abdominal obesity was not considered.

## Conclusion

Conclusively, this study demonstrated a very high prevalence of dyslipidemia, which showed an alarming rise since the publication of our previous study and other similar studies around the world. In the light of our study results, we recommended conduction of screening studies of dyslipidemia in all primary care health employees in Jeddah.

## References


1. American Heart Association. *Heart Disease and Stroke Statistics—2004 Update*. Dallas, TX: American Heart Association, 2003.
2. Levine GN, Keaney JF Jr, Vita JA. Cholesterol reduction in cardiovascular disease. Clinical benefits and possible mechanisms. N Engl J Med 1995;332(8):512–21.
3. Murray CJ, Lopez AD. Mortality by cause for eight regions of the world: Global Burden of Disease Study. Lancet 1997;349(9061): 1269–76.
4. Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, et al. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines. J Am Coll Cardiol 2004;44(3):720–32.
5. World Health Organization. Quantifying selected major risks to health. In: *The World Health Reports 2002—Reducing Risks, Promoting Health Life*. Geneva, Switzerland: World Health Organization, 2002. pp. 47–97.
6. Gould AL, Rossouw JE, Santanello NC, Heyse JF, Furberg CD. Cholesterol reduction yields clinical benefit: impact of statin trials. Circulation 1998;97(10):946–54.
7. Wietlisbach V, Paccaud F, Rickenbach M, Gutzwiller F. Trends in cardiovascular risk factors (1984–1993) in a Swiss region: results of three population surveys. Prev Med 1997;26(4):523–33.
8. Yamada M, Wong LF, Kodama K, Sasaki H, Shimaoka K, Yamakido M. Longitudinal trends in total serum cholesterol levels in a Japanese cohort, 1958–1986. J Clin Epidemiol 1997; 50(4):425–34.
9. Al-Kaabba AF, 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;2:89–97.
10. World Health organization. Physical status: the use and interpretation of anthropometry: report of WHO expert committee. Technical Report Series 854. Geneva, Switzerland: WHO, 1995.
11. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). JAMA 2014; 311(5):507–20.
12. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). JAMA 2001;285(19):2486–97.
13. World Health Organization. *Guideline for Controlling and Monitoring the Tobacco Epidemic*. Geneva, Switzerland: World Health Organization, 1998.
14. American Diabetes Association. Standards of medical care in diabetes–2014. Diabetes Care 2014;37(Suppl 1):S14–80.
15. Fuentes R, Uusitalo T, Puska P, Tuomilehto J, Nissinen A. Blood cholesterol level and prevalence of hypercholesterolaemia in developing countries: a review of population-based studies carried out from 1979 to 2002. Eur J Cardiovasc Prev Rehabil 2003;10(6):411–9.

16. Al-Nozha MM, Arafah MR, Al-Maatouq MA, Khalil MZ, Khan NB, Al-Marzouki K, et al. Hyperlipidemia in Saudi Arabia. Saudi Med J 2008;29(2):282–7.
17. Ogbeide DO, Karim A, Al-Khalifa IM, Siddique S. Population based study of serum lipid levels in Al-Kharj Health Center, Saudi Arabia. Saudi Med J 2004;25(12):1855–7.
18. Al-Shehri SN, Saleh ZA, Salama MM, Hassan YM. Prevalence of hyperlipidemia among Saudi school children in Riyadh. Ann Saudi Med 2004;24(1):6–8.
19. Abalkhail BA, Shawky S, Ghabrah TM, Milaat WA. Hypercholesterolemia and 5-year risk of development of coronary heart disease among university and school workers in Jeddah, Saudi Arabia. Prev Med 2000;31(4):390–5.
20. 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.
21. Jackson RT, Al-Mousa Z, Al-Raqua M, Prakash P, Muhanna AN. Multiple coronary risk factors in healthy older Kuwaiti males. Eur J Clin Nutr 2002;56(8):709–14.
22. Al-Moosa S, Allin S, Jemiai 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.
23. Bener A, Zirie M, Janahi IM, Al-Hamaq OA, Musallam M. Prevalence of diagnosed and undiagnosed diabetes mellitus and its risk factors in a population-based study of Qatar. Diabetes Res Clin Pract 2009;84(1):99–106.
24. Khader YS, Batieha A, El-Khateeb M, Al Omari M, Ajlouni K. Prevalence of dyslipidemia and its associated factors among Jordanian adults. J Clin Lipidol 2010;4(1):53–8.
25. Pongchaiyakul C, Hongsprabhas P, Pisprasert V, Pongchaiyakul C. Rural-urban difference in lipid levels and prevalence of dyslipidemia: a population-based study in Khon Kaen province, Thailand. J Med Assoc Thailand 2006;89(11):1835–44.
26. Zhao WH, Zhang J, Zhai Y, You Y, Man QQ, Wang CR, et al. Blood lipid profile and prevalence of dyslipidemia in Chinese adults. Biomed Environ Sci 2007;20(4):329–35.
27. Kang WM, Zhang JS, Liu XX, Wang MS, Zhao ML. Prevalence of abnormity of blood lipid and associated factors in health examination population in Beijing. Chinese Med Sci J 2009;24(3):142–6.
28. Erem C, Hacihasanoglu A, Deger O, Kocak M, Topbas M. Prevalence of dyslipidemia and associated risk factors among Turkish adults: Trabzon lipid study. Endocrine 2008;34(1–3):36–51.
29. Azizi F, Rahmani M, Ghanbarian A, Emami H, Salehi P, Mirmiran P, et al. Serum lipid levels in an Iranian adults population: Tehran Lipid and Glucose Study. Eur J Epidemiol 2003;18(4):311–9.
30. Grabauskas V, Miseviciene I, Klumbiene J, Petkeviciene J, Milasauskiene Z, Plieskiene A, et al. Prevalence of dyslipidemias among Lithuanian rural population (CINDI Program). Medicina (Kaunas) 2003;39(12):1215–22.
31. Sun GZ, Li Z, Guo L, Zhou Y, Yang HM, Sun YX. High prevalence of dyslipidemia and associated risk factors among rural Chinese adults. Lipids Health Dis 2014;13:189.
32. Zhang X, Sun Z, Zheng L, Li J, Liu S, Xu C, et al. Prevalence of dyslipidemia and associated factors among the hypertensive rural chinese population. Arch Med Res 2007;38(4):432–9.
33. Cai L, Zhang L, Liu A, Li S, Wang P. Prevalence, awareness, treatment, and control of dyslipidemia among adults in Beijing, China. J Atheroscler Thromb 2012;19(2):159–68.
34. Wang B, Wei D, Wang C, Zhang J, Pan L, Ma M, et al. Prevalence of dyslipidemia and associated factors in the Yi farmers and migrants of Southwestern China. Atherosclerosis.2012; 223(2):512–8.
35. Houston MC, Basile J, Bestermann WH, Egan B, Lackland D, Hawkins RG, et al. Addressing the global cardiovascular risk of hypertension, dyslipidemia, and insulin resistance in the southeastern United States. Am J Med Sci 2005;329(6):276–291.

**How to cite this article:** Basheikh K, Felemban AH, Felemban MH, Al-Raddadi RM, Al-nuqali E, Abaalkhail BA, et al. Prevalence of dyslipidemia and its associated factors among employees of primary health care centers, Jeddah, Saudi Arabia. Int J Med Sci Public Health 2016;5:946-951

**Source of Support:** Nil, **Conflict of Interest:** None declared.