Obesity Research & Clinical Practice (2016) xxx, xxx—xxx

ELSEVIER

The hypertriglyceridemic waist and waist-to-height ratio phenotypes and chronic kidney disease: Cross-sectional and prospective investigations

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Received 30 August 2016; received in revised form 26 October 2016; accepted 14 November 2016

KEYWORDS
Chronic kidney disease;
Waist circumference;
Waist to height;
Hypertriglyceridemia

Summary
Aims: We investigated the association between two hypertriglyceridemic waist (HW) and waist-to height ratio (HWHtR) phenotypes and chronic kidney disease (CKD) using cross sectional and prospective analysis.
Methods: Data of 12,012 individuals (44% men) of the Tehran Lipid and Glucose Study (TLGS) at two phases [(1999—2001) and (2002—2005)], were used for cross-sectional analysis. This population was followed until 2014 with median follow-up 12.4 years (95% confidence interval (CI): 11.8; 12.4). The data of 8225 individuals (45% men) were used for prospective analysis. The outcome was the development of CKD defined as estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m^2. The HW phenotype was defined as waist circumference (WC) >90 cm in men and >85 cm in women, along with TGs >2.0 mmol/L. The HWHtR phenotype was defined as waist-to-height ratio (WHtR) >0.5 and TGs >2 mmol/L. Multivariable logistic and Cox regression were used to statistical analysis.
Results: Cross sectional analysis showed that in women, both HW and HWHtR phenotypes were associated with CKD after controlling for confounders [(OR: 1.37, CI: 1.01—1.86, $p < 0.05$) and (OR: 1.58, CI: 1.03—2.41, $p < 0.05$)], respectively. Among men, HW and HWHtR were associated with prevalent CKD in unadjusted and age adjusted models; these associations were not significant after further adjustment for confounders. In prospective analysis, neither HW nor HWHtR phenotypes were significant predictor for CKD progression.

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http://dx.doi.org/10.1016/j.orcp.2016.11.003

Please cite this article in press as: Ramezankhani A, et al. The hypertriglyceridemic waist and waist-to-height ratio phenotypes and chronic kidney disease: Cross-sectional and prospective investigations. Obes Res Clin Pract (2016), http://dx.doi.org/10.1016/j.orcp.2016.11.003

Conclusion: HW and HWHtR phenotypes were associated with prevalent CKD in cross sectional setting. In prospective analysis HW and HWHtR did not show significant effect in prediction of CKD.

Introduction

Chronic kidney disease (CKD) is an important public health problem in developed countries [1]. It affects up to 10—15% of the adult population in the USA, 9—10% in Asian countries and 19% in Japan [2—4]. Recently we reported that more than 2% of individuals developed CKD each year in the Iranian population [5]. CKD is a major cause of morbidity and an independent risk factor for both cardiovascular disease (CVD) and all-cause mortality [2,3]. Therefore, identification of risk factors for CKD, diagnosis and treatment of CKD are important issues in preventing disease onset and progression to end stage renal disease (ESRD) [6,7].

Current studies have demonstrated an association between CVD [8], diabetes mellitus and hypertension with CKD [9]. The concept of hypertriglyceridemic waist (HW) phenotype has obtained attention increasingly as a simple and inexpensive screening approach to identify people at increased risk of CVD and type 2 diabetes [10,11].

The HW phenotype was proposed by Lemieux et al. in 2000; it was defined as an elevated waist circumference (WC) (>90 cm in men and >85 cm in women), along with an elevated plasma triglycerides (TGs) concentration (>2.0 mmol/L) [12]. Although several large studies have found an association between HW phenotype and CVD and type 2 diabetes, few studies have investigated the relation between the HW phenotype and CKD [13]. Additionally, several studies have demonstrated superiority of waist to height ratio (WHtR) to WC as an anthropometric index related to CKD [4,14]. A cross sectional study indicated that the HW phenotype may be a simple indicator for prevalent CKD [13]; however, no prospective studies have examined the relation between HW phenotype with CKD. Also, it is not known whether WHtR and TGs concentration [hypertriglyceridemic WHtR (HWHtR) phenotype], can be an alternative to WC in the HW phenotype.

Our objective is performing both the cross sectional and prospective analysis, for investigation of the association between HW and HWHtR phenotypes and CKD incident, during the 15 years follow-up in a large community-based prospective cohort of Iranian adults, the Tehran Lipid and Glucose Study (TLGS).

Methods

Study population

The design and rational of the TLGS have been described in detail previously [15]. In brief, The TLGS is an ongoing community-based cohort study being conducted on a representative sample of residents of district No. 13 of Tehran, to determine the prevalence and incidence of non-communicable diseases and related risk factors. TLGS has two main phases: a cross-sectional phase (1999—2001) and a prospective ongoing phase consisting of follow-up visits at 3-year intervals. Data collection is ongoing, designed to continue for at least 20 years. Using multistage stratified cluster random sampling technique, a total of 15,010 residents, aged >3 years, who were under the coverage of three medical health centres, were invited by telephone call for participation in the first phase and another 3551 residents were invited for the second phase. For this study we selected 12,808 people aged $\geq$20 years from first (n = 10,368) and second (n = 2440) phases as baseline population who were followed approximately 3 yearly intervals until the final survey in 2011—2014 (phase 5).

Study population for cross sectional analysis

From a total of 12,808 subjects, we excluded those with missing data on serum creatinine (Scr) level (n = 414), and subjects with missing data on WC or height or TGs at baseline (n = 382), leaving 12,012 cases (5265 men and 6747 women). Among this population, 1730 subjects had prevalent CKD (Fig. 1).

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