



Brief overview of epidemiological research on the Tehran Lipids and Glucose Study(TLGS)

Samaneh Asgari, Ph.D

Assistant Professor

Research institute for Endocrine Sciences, Shahid Beheshti
university of Medical Sciences

Summary of Sample analysis

- Validity and reliability of questionnaires
- Prevalence studies (using baseline information only)
- Incidence based analysis (using time to first event)
- Longitudinal based analysis
 - Trend analysis
 - Trajectory analysis
- Association analysis
 - Survival analysis (e.g. Cox Regression)
 - Risk factor analysis
- Intervention based analysis
- Prediction model
 - Model development
 - Model Validation

Validity and reliability of questionnaires

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Reliability and relative validity of an FFQ for nutrients in the Tehran Lipid and Glucose Study

Parvin Mirmiran^{1,2,*}, Firoozeh Hosseini Esfahani¹, Yadollah Mehrabi³,
Mahdi Hedayati¹ and Fereidoon Azizi⁴

¹Obesity Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, PO Box 19395-4763, Tehran, Islamic Republic of Iran: ²Department of Human Nutrition, Faculty of Nutrition and Food Technology, National Nutrition and Food Technology Institute, Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran: ³School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran: ⁴Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran

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Abstract

Objective: To describe the relative validity and reliability of the FFQ used for assessing nutrient intakes of participants in the Tehran Lipid and Glucose Study (TLGS).

Design: A total of 132 subjects (sixty-one males and seventy-one females) were included in the study. Dietary data were collected monthly by means of twelve 24 h dietary recalls (24hDR). Subjects completed two, 168-item semi-quantitative FFQ. Blood and urine samples were taken every season for measurement of plasma biomarkers and urinary N and K.

Results: Mean age and BMI of the participants were 35.5 (sd 16.8) years and 25.5 (sd 5.2) kg/m², respectively. The mean energy-adjusted and deattenuated correlation coefficients for overall nutrient intake between the 24hDR and FFQ2 were 0.44 and 0.37 in ≤35-year-olds and >35-year-olds, respectively, and for individual nutrients ranged from 0.24 to 0.71 in men (mean $r = 0.53$) and from 0.11 to 0.60 in women (mean $r = 0.39$). The mean energy-adjusted reliability coefficients varied from 0.48 in ≤35-year-olds to 0.65 in >35-year-olds, and ranged from 0.41 to 0.79 in men (mean $r = 0.59$) and from 0.39 to 0.74 in women (mean $r = 0.60$). The FFQ2 and 24hDR produced exact agreement rates ranging between 39.6% and 68.3% in men and between 39.6% and 54.1% in women. The ranges of questionnaire validity coefficients, with the sample correlation between the questionnaires and biochemical marker as the lower limit and the estimate obtained by the method of triads as the upper limit, were 0.21–0.56 (protein) and 0.37–0.61 (K).

Conclusions: The FFQ developed for the TLGS has reasonable relative validity and reliability for nutrient intakes in Tehranian adults.

Keywords
Reliability and validity
Nutrition assessment
Questionnaire

Summary of Sample analysis

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- Intervention based analysis
- Prediction model
 - Model development
 - Model Validation

Prevalence based studies: first studies of TLGS

Fereidoun Azizi, Maziar Rahmani, Habib Emami, P. Mirmiran,
R. Hajipour, M. Madjid, J. Ghanbili, A. Ghanbarian, Y. Mehrabi,
N. Saadat, P. Salehi, N. Mortazavi, P. Heydarian, N. Sarbazi,
S. Allahverdian, N. Saadati, E. Ainy, S. Moeini

Section: International comparison of health determinants

Endocrine Research Center, Shaheed Beheshti University of Medical Sciences, Tehran

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Cardiovascular risk factors in an Iranian urban population: Tehran Lipid and Glucose Study (Phase 1)

Summary

Objectives: Coronary artery disease is becoming more prevalent in developing countries, particularly in urban areas. This study was conducted to determine the prevalence of cardio-

Keywords: Cardiovascular disease – Risk factor – Diabetes mellitus – Hypertension – Dyslipoproteinemia.

Coronary artery disease (CAD) is one of the most common causes of morbidity and mortality in different communities (Stamler et al. 1993; Stamler 1978; Murray et al. 1999).

ORIGINAL ARTICLE

Distribution of blood pressure and prevalence of hypertension in Tehran adult population: Tehran Lipid and Glucose Study (TLGS), 1999–2000

F Azizi, A Ghanbarian, M Madjid and M Rahmani
Endocrine Research Center, Shaheed Beheshti University of Medical Sciences, Tehran, Iran

The purpose of this study was to estimate the current prevalence and distribution of hypertension in an adult Tehranian population. Data were collected for 3343 men and 5148 women aged 20–69 years in the Tehran Lipid and Glucose Study (TLGS), which is a cross-sectional phase of a large epidemiologic study, first established in 1999. The study used the mean of two separate blood pressure (BP) measurements in each individual. Twenty-two percent (23% of women vs 20% of men, $P=0.01$) had hypertension according to 'JNC-VI' and 'WHO-ISH' criteria. The average systolic BP (SBP), diastolic BP (DBP) and pulse pressure of hypertensive participants were 31, 16, and 15 mm Hg higher than the corresponding value for normotensives, respectively. Thirty-six percent of participants with JNCVI-based hypertension were using antihypertensive medication (23% of men and 43% of women). Of these, 40% (45% of men and 39% of women) had normal BP. Hypertension awareness was 50% in these participants (57% in men vs 37% in women, $P<0.001$). Data for 3179 men and

4646 women aged 20–69 years with no antihypertensive treatment were used for analysis of BP measures. Of these, 15% (16% of men and 14% of women, $P=0.006$) had high and 85% (84% of men and 86% of women) normal or high-normal BP levels according to JNC-VI. Prevalence of optimal BP was 49% (47% of men and 51% of women). Mean SBP was 117.8 ± 16.6 and 116.4 ± 16.4 mm Hg in men and women, respectively ($P<0.001$). The equivalent values were 77.4 ± 10.7 and 77.3 ± 9.9 mm Hg for DBP ($P=0.5$) and 40.4 ± 12 and 39.1 ± 11.7 mm Hg for pulse pressure ($P<0.001$). A relatively high prevalence of JNC-VI/WHO-ISH defined hypertension was found in the TLGS adult population with 50% undiagnosed and 60% uncontrolled hypertension. These findings emphasise further considerations for detection and better management of hypertension in the urban population of Tehran.

Journal of Human Hypertension (2002) 16, 305–312. DOI: 10.1038/sj/jhh/1001399

1999–2000

Prevalence based studies



Available online at www.sciencedirect.com



Diabetes Research and Clinical Practice 61 (2003) 29–37

www.elsevier.com/locate/diabres

DIABETES RESEARCH
AND
CLINICAL PRACTICE

Prevalence of metabolic syndrome in an urban population: Tehran Lipid and Glucose Study

Fereidoun Azizi*, Payam Salehi, Arash Etemadi, Saleh Zahedi-Asl

Endocrine Research Center, Shaheed Beheshti University of Medical Sciences, P.O. Box 4763, Tehran 19395, Iran

Received 22 October 2002; received in revised form 19 February 2003; accepted 25 February 2003

*Age-standardized prevalence (Segi population)

* Age specific prevalence

> [East Mediterr Health J. Jan-Feb 2009;15\(1\):157-66.](#)

Prevalence of coronary heart disease among Tehran adults: Tehran Lipid and Glucose Study

F Hadaegh¹, H Harati, A Ghanbarian, F Azizi

Affiliations + expand

PMID: 19469439

[Free article](#)

Abstract

This study is the first report on the prevalence of coronary heart disease (CHD) and its associated risk factors in adult residents of Tehran. Standard supine ECG data were collected for 5984 men and women aged > or = 30 years and coded by Minnesota criteria. All major cardiovascular risk factors were also measured. Based on Rose angina, self-reported history of CHD or ECG-defined CHD, the aged-adjusted prevalence of CHD was 21.8% (22.3% in women and 18.8% in men). Variables independently associated with CHD were female sex, age, systolic blood pressure, 2-hour postprandial glucose, body mass index, waist-to-hip ratio and LDL/HDL cholesterol ratio.

*Crud prevalence (number of event/total population)

* Age-standardized prevalence (WHO population)

Check the association using binary logistic regression

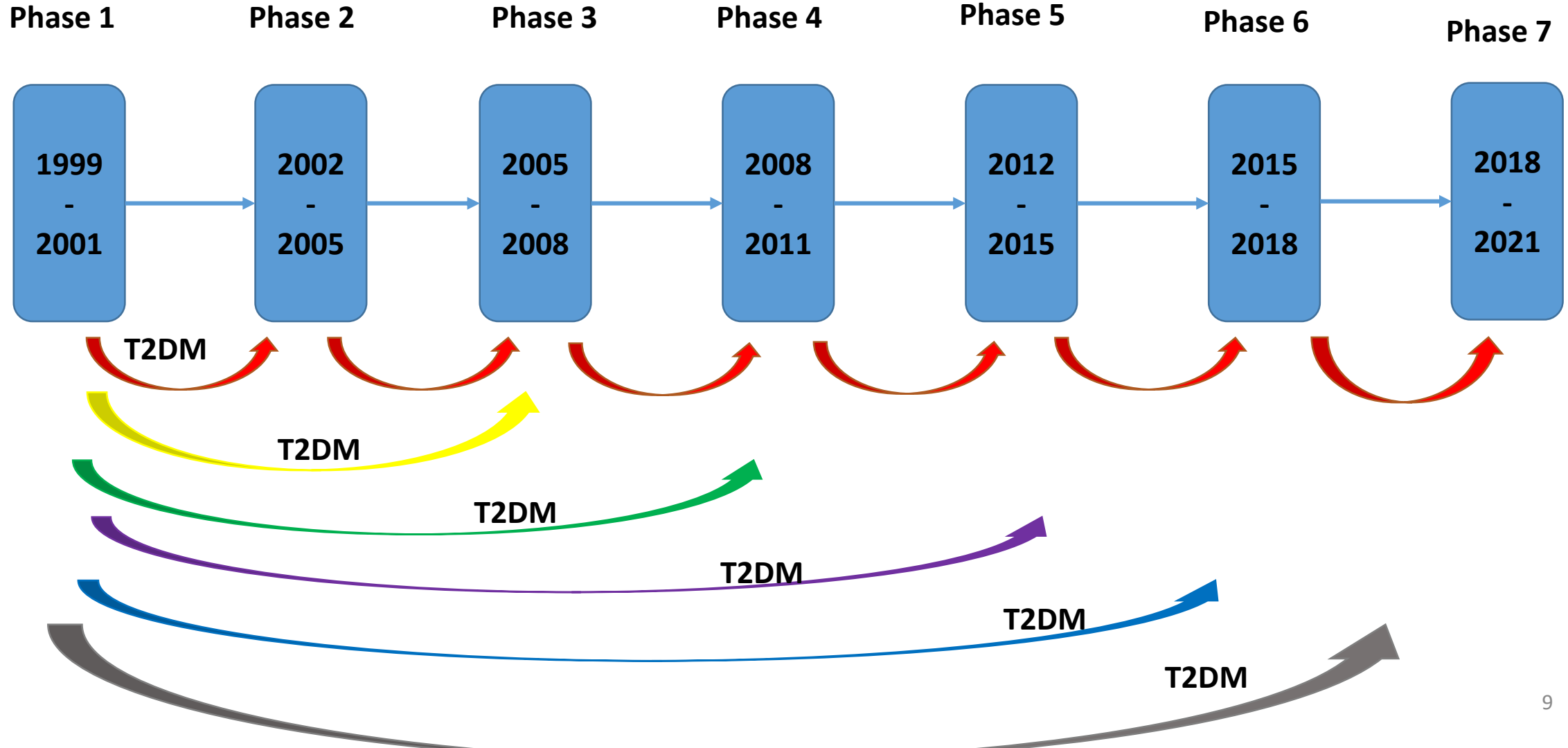
Summary of Sample analysis

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 - Model Validation

Outcomes without defined time: interval censored outcomes

(Diabetes, Hypertension, Hyperlipidemia, Metabolic Syndrome, ...)

A person may not participate in phases
=>
Increase the missing values



Incidence based studies

T2DM	CKD
Pre-DM	Hypothyroidism
GDM	Hyperthyroidism
HTN	Retinopathy
Pre-HTN	Thyroid autoimmunity
ISH/IDH	MetS

- Crude incidence
- Age-standardized incidence
- Cumulative incidence
- Incidence density
- Kaplan-Meier survival curve

Sex Specific Incidence Rates of Type 2 Diabetes and Its Risk Factors over 9 Years of Follow-Up: Tehran Lipid and Glucose Study



Arash Derakhshan¹, Mahsa Sardarinia¹, Davood Khalili¹, Amir Abbas Momenan¹, Fereidoun Azizi², Farzad Hadaegh^{1*}

¹ Prevention of metabolic disorders research center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran, ² Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Abstract

Objective: To investigate the population-based incidence of type 2 diabetes and its potential risk factors in a sex-split cohort of Iranian population.

Materials and Methods: A total of 8400 non-diabetic participants, aged ≥ 20 years (3620 men and 4780 women) entered the study. Crude and age standardized incidence rates per 1000 person-years were calculated for whole population and each sex separately. Cox proportional hazard models were used to evaluate hazard ratios (HR) and 95% confidence intervals for all potential risk factors in both uni-variable and multivariable models.

Results: During a median follow-up of 9.5 years, 736 new cases of diabetes were identified, including 433 women and 303 men. The annual crude and age-standardized incidence rates (95% CI) of diabetes in the total population were 10.6 (9.92–11.4) and 9.94 (7.39–13.6) per 1000 person-years of follow-up and the corresponding sex specific rates were 10.2 (9.13–11.4) and 9.36 (5.84–14.92) in men and 11.0 (9.99–12.0) and 10.1 (7.24–13.9) in women, respectively. In the multivariable model, the risk for incident diabetes was significantly associated with fasting and 2 hour post challenge plasma glucose as well as family history of diabetes in both men and women. However, among women, only the contribution of wrist circumference to incident diabetes achieved statistical significance [HR: 1.16 (1.03–1.31)] with waist/height ratio being marginally significant [HR: 1.02 (0.99–1.04)]; while among men, only body mass index was a significant predictor [HR: 1.12 (1.02–1.22)]. Additionally, low education level conferred a higher risk for incident diabetes only among men [HR: 1.80 (1.23–2.36); P for interaction with sex = 0.003].

Conclusion: Overall, sex did not significantly modify the impact of risk factors associated with diabetes among Iranian adults; however, among modifiable risk factors, the independent role of lower education and general adiposity in men and central adiposity in women might require different preventive strategies.

ORIGINAL RESEARCH

Sex-Specific Incidence Rates and Risk Factors for Hypertension During 13 Years of Follow-up: The Tehran Lipid and Glucose Study

Samaneh Asgari¹, Seyyed Saeed Moazzeni^{1,2}, Fereidoun Azizi³, Hengameh Abdi³, Davood Khalili^{1,4}, Monir Sadat Hakemi² and Farzad Hadaegh¹

¹ Metabolic Disorders Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR

² Nephrology Ward of Shariati Hospital, Tehran University of Medical Sciences, Tehran, IR

³ Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR

⁴ Department of Epidemiology and Biostatistics, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR

Corresponding author: Farzad Hadaegh, MD (fzhadaegh@endocrine.ac.ir)

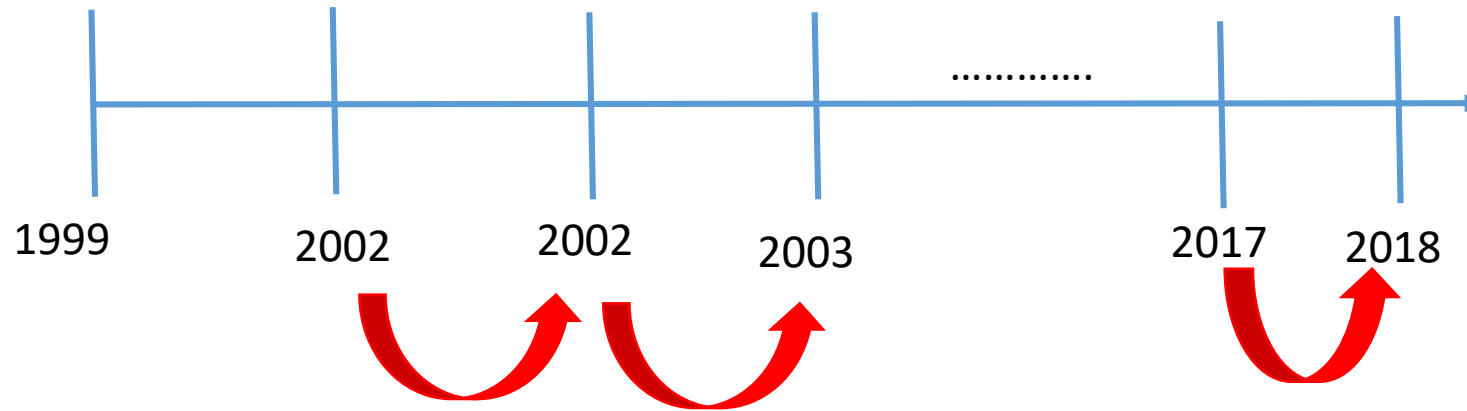
Samaneh Asgari and Seyyed Saeed Moazzeni contributed equally to this work and are co-first authors.

Background: Hypertension, with a prevalence of 25.6% is a serious public health concern in Iran. **Objective:** To investigate the population-based incidence of hypertension and its potential risk factors in Tehranian adults during a median follow-up of 13.1 years.

Methods: A total of 6,533 non-hypertensive participants (women = 3,639), aged ≥ 20 years participated in the study. Crude and age-standardized incidence rates per 1000 person-years were calculated for each sex, separately. Multivariable Cox proportional hazard models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CI) for all potential risk factors.

Results: The crude and age-standardized incidence rates (95% CI) of hypertension per 1000

Call-based outcomes with defined time (CVD, CHD, mortality)



CVD
Premature CVD
CHD
Stroke
Fractures
Cancer
CVD-mortality
Sudden cardiac death
All-cause mortality

(It's important to find First outcome)

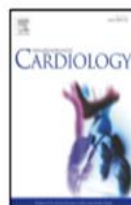
Within call-based outcomes, the probability of missing is lower compared with examination based outcomes and measurements



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Sex-specific incidence rates and risk factors of premature cardiovascular disease. A long term follow up of the Tehran Lipid and Glucose Study

Ali Eslami^{a,b,1}, Amirhossein Mozaffary^{b,1}, Arash Derakhshan^{b,1}, Fereidoun Azizi^{c,1}, Davood Khalili^{b,1}, Farzad Hadaegh^{b,*}

^a Student Research Committee, Prevention of Metabolic Disorders Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

^b Prevention of Metabolic Disorders Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

^c Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Science, Tehran, Iran

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Premature cardiovascular disease

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Population attributable fraction

ABSTRACT

Objectives: To investigate the risk factors for premature cardiovascular disease (CVD) and to quantify their population attributable fractions (PAFs) among an Iranian population during a median follow-up of 12 years.

Methods: A total of 2235 men and 3703 women, aged ≥ 30 years, free of CVD at baseline were entered into the study. Premature CVD was defined as having a history of CVD events before the age of 55 and 65 for men and women, respectively. Multivariate Cox proportional hazard regression models were used to determine the risk factors associated with premature CVD events.

Results: During the study, incident rates of premature CVD were 4.8 and 3.9 per 1000 person years for men and women, respectively. Low HDL-C [Hazard ratio: 1.74, 95% confidence interval: 1.11–2.74], hypercholesterolemia [3.01: 2.02–4.49], current smoker [1.68: 1.12–2.51], family history of premature CVD [2.04: 1.36–3.07], hypertension [1.65: 0.97–2.81, $P = 0.06$] and type 2 diabetes (T2D) [1.98: 1.16–3.40] were significant predictors among men; the corresponding PAFs were 32.7, 29.4, 19.4, 14.9, 8.7 and 7.9%, respectively. Among women, T2D [3.02: 2.08–4.39], hypercholesterolemia [1.65: 1.19–2.29], being overweight [1.79: 1.01–3.17], hypertension [1.54: 1.01–2.34], family history of premature CVD [1.65: 1.19–2.29], high physical activity [0.67: 0.46–0.96] and prediabetes [1.48: 1.00–2.18] were significant predictors; the corresponding PAFs were 25.4, 22.5, 18.5, 16.8, 11.4, –10.3 and 9.1%, respectively.

Conclusions: Considering the high burden imposed on health system by cardio-metabolic risk factors, dietary, behavioral and pharmacological interventions are needed to be initiated early to prevent premature CVD, taking into account the sex-related differences between risk factors.

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Original Research

All-cancer incidence in Tehranian adults: more than a decade of follow-up—results from the Tehran Lipid and Glucose Study

F. Hadaegh^{a,c}, S. Asgari^{a,c}, P. Hashemi^a, A. Baghbani-Oskouei^a, F. Eskandari^a, F. Azizi^b, M. Tohidi^{a,*}

^a Prevention of Metabolic Disorders Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

^b Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran



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Cancer

Malignancy

Incidence

Risk factor

ABSTRACT

Objectives: To investigate the incidence rates for different malignancies and assess the risk factors for all-cancer incidence in Tehran.

Study design: Cohort study.

Methods: This study consists of 8599 participants aged ≥ 30 years who were free of cancer (3935 men). Cancer diagnosis was based on pathology reports. Sex-stratified crude incidence rates and age-standardized incidence rates (ASRs) using Segi's method were calculated for all-cancers. Multivariate Poisson regression models were used to evaluate associations of potential risk factors, including sex, age, obesity status (body mass index [BMI]: 25–30 kg/m² as reference), education, smoking status, and diabetes mellitus with the incidence of cancers among the population. Incidence rate ratios (IRRs) with 95% confidence interval (CI) were also reported.

Results: During a median follow-up of 13.9 years, there were 130 and 129 incident cancers for men and women, respectively; the corresponding ASRs were 356.1 and 243.6 per 100,000 person-years, respectively. The three most incident cancers among men were gastrointestinal (GI) (ASR = 127.5), hematopoietic (ASR = 99.5), and reproductive system malignancies (ASR = 46.3). The most common incident cancers in women were breast cancer (ASR = 92.1), GI (ASR = 65.4), and reproductive system malignancies (ASR = 16.8). Among risk factors for cancer incidence, age (IRR [95% CI]: 1.05 [1.03–1.06]) and having a BMI < 25 kg/m² (IRR [95% CI]: 1.38 [1.01–1.90]) had a statistically significant association with incident cancer.

Conclusions: The high rates of cancers in Tehran during more than a decade of follow-up calls for a need to define risk factors as well as to implement programs for early screening.

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Summary of Sample analysis

- Validity and reliability of questionnaires
- Prevalence studies (using baseline information only)
- Incidence based analysis (using time to first event)
- Longitudinal based analysis
 - Trend analysis: The long-term patterns of disease incidence or prevalence of data over time (overall population).
 - Trajectory analysis: Trajectory analysis focuses on the individual-level patterns of health outcomes over time. It examines how specific populations or individuals progress through different health states or disease stages.
- Association analysis
 - Survival analysis (e.g. Cox Regression)
 - Risk factor analysis
- Intervention based analysis
- Prediction model
 - Model development
 - Model Validation

Trend analysis

(Prevention of metabolic disorders)

Longitudinal related analysis
-GEE

RESEARCH

Open Access

Secular trends in serum lipid levels of a Middle Eastern adult population; 10 years follow up in Tehran lipid and glucose study

Masoumeh Kheirandish¹, Samaneh Asgari¹, Mojtaba Lotfaliany¹, Mohammadreza Bozorgmanesh¹, Navid Saadat¹, Maryam Tohidi¹, Fereidoun Azizi² and Farzad Hadaegh^{1*}

Table 6 Proportions of participants in Lipid-related categories* by examination cycle in large sample

	<i>Male</i>					<i>Female</i>				
	<i>Exam 1 (1999–2001)</i>	<i>Exam 2 (2002–2005)</i>	<i>Exam 3 (2005–2008)</i>	<i>Exam 4 (2008–2011)</i>	<i>p-value for trend</i>	<i>Exam 1 (1999–2001)</i>	<i>Exam 2 (2002–2005)</i>	<i>Exam 3 (2005–2008)</i>	<i>Exam 4 (2008–2011)</i>	<i>p-value for trend</i>
<i>Age adjusted[†]</i>										
High cholesterol	18.3	14.9	11.7	9.2	<0.001	24.8	22.1	17.3	14.2	<0.001
Low HDL-C	72.2	66.4	60.8	54.6	<0.001	46.2	39.4	32.9	27.1	<0.001
High Triglycerides	33.1	30.1	27.8	25.4	<0.001	26.0	25.2	22.6	21.0	<0.001
High Non-HDL-C	20.3	15.8	11.9	9.0	<0.001	23.1	19.2	13.8	10.3	<0.001
High TG/HDL-C	40.2	44.3	38.4	25.4	<0.001	28.3	25.9	22.3	19.6	<0.001
High TC /HDL-C	37.6	42.5	30.3	14.7	<0.001	26.8	21.1	14.9	10.7	<0.001
Lipid drug (%)	1.4	2.9	5.0	8.8	<0.001	3.6	5.8	7.8	11.2	<0.001

RESEARCH ARTICLE

Trends in Cardiovascular Disease Risk Factors in People with and without Diabetes Mellitus: A Middle Eastern Cohort Study

Younes Jahangiri-Noudeh¹, Samaneh Akbarpour¹, Mojtaba Lotfaliany¹, Neda Zafari¹, Davood Khalili¹, Maryam Tohidi¹, Mohammad Ali Mansournia², Fereidoun Azizi³, Farzad Hadaegh^{1*}

1. Prevention of Metabolic Disorders Research Center, Research Institute for Endocrine Sciences (RIES), Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran, 2. Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran, 3. Endocrine Research Center, Research Institute for Endocrine Sciences (RIES) Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran

*fzhadaegh@endocrine.ac.ir



OPEN ACCESS

Citation: Jahangiri-Noudeh Y, Akbarpour S, Lotfaliany M, Zafari N, Khalili D, et al. (2014) Trends in Cardiovascular Disease Risk Factors in People with and without Diabetes

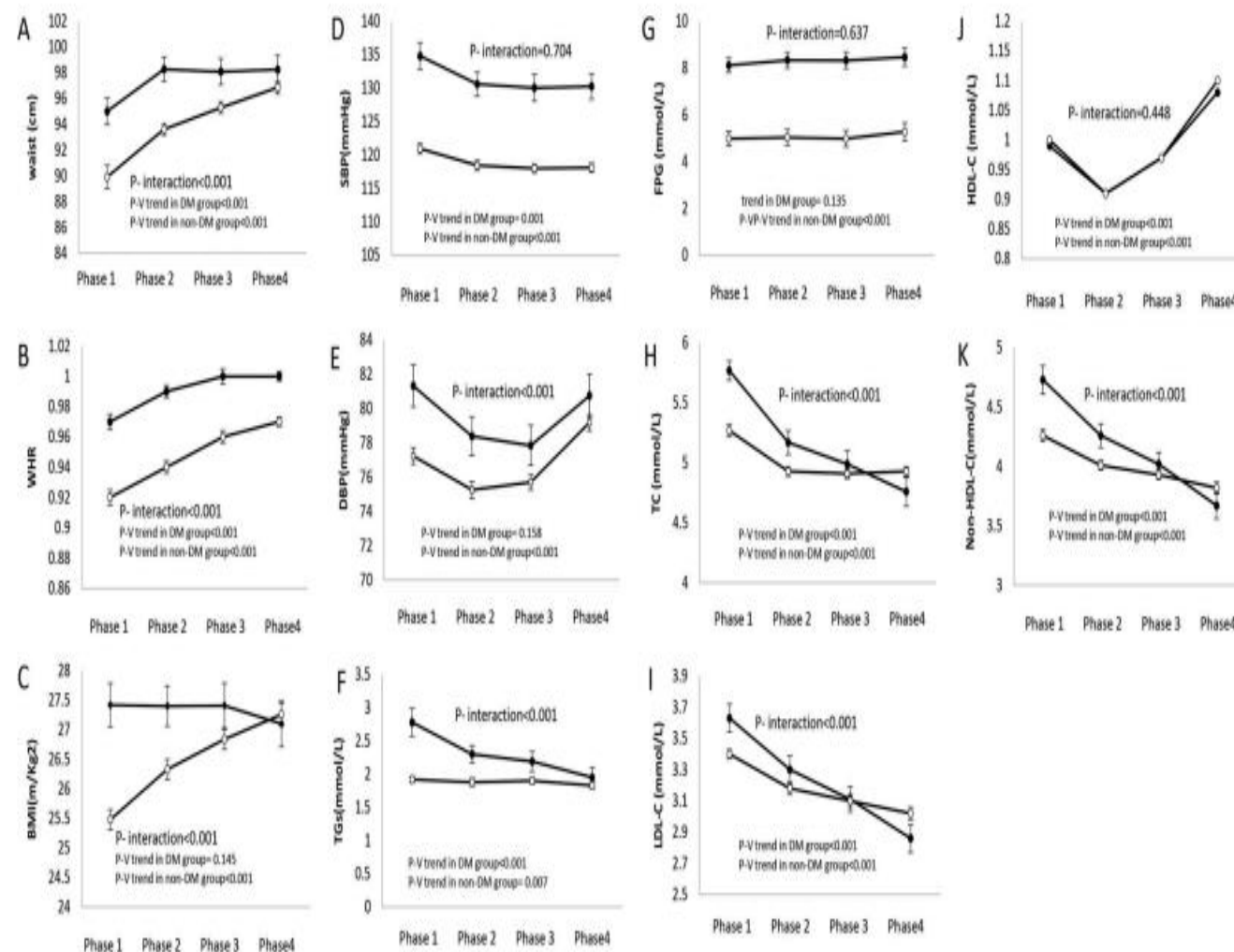


Figure 2. Age-adjusted mean levels of cardiovascular risk factors in each phase in male subjects. Mean levels of cardiovascular risk factors of diabetic and non-diabetic participants was calculated separately with adjustment of related participants' age in each phase while the interaction of diabetes status was assessed in a pooled model consisting both diabetic and non-diabetic participants. Black circles = diabetic group; white circles = non-diabetic group; DM, diabetes mellitus; WHR, waist to hip ratio; BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; TGs, triglycerides;

Trajectory analysis

Latent class growth (mixture) modeling
And
Cox regression

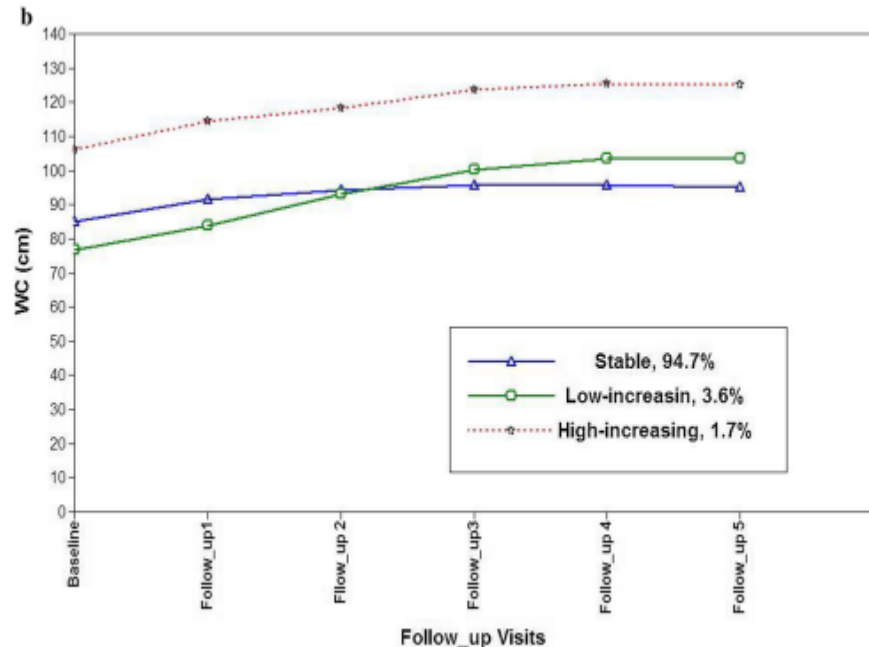


Fig. 1 Linear latent trajectory classes of waist circumference among women for incident hypertension. **b** latent trajectory classes of waist circumference among men for incident hypertension

RESEARCH

Open Access



Sex specific trajectories of central adiposity, lipid indices, and glucose level with incident hypertension: 12 years Follow-up in Tehran lipid and glucose study

Noushin Sadat Ahanchi¹, Seyed Saeed Tamehri Zadeh², Davood Khalili^{1,3}, Fereidoun Azizi⁴ and Farzad Hadaegh^{1*} 

RESEARCH Open Access

Trajectories of cardiovascular disease risk and their association with the incidence of cardiovascular events over 18 years of follow-up: The Tehran Lipid and Glucose study

Fatemeh Koohi^{1,2,3}, Nooshin Ahmadi³, Farzad Hadaegh³, Siavash Safiee⁴, Fereidoun Azizi⁵ and Davood Khalili^{2,3*}

Table 4 Associations of CVD risk score trajectories with incident hard CVD (n = 2619)

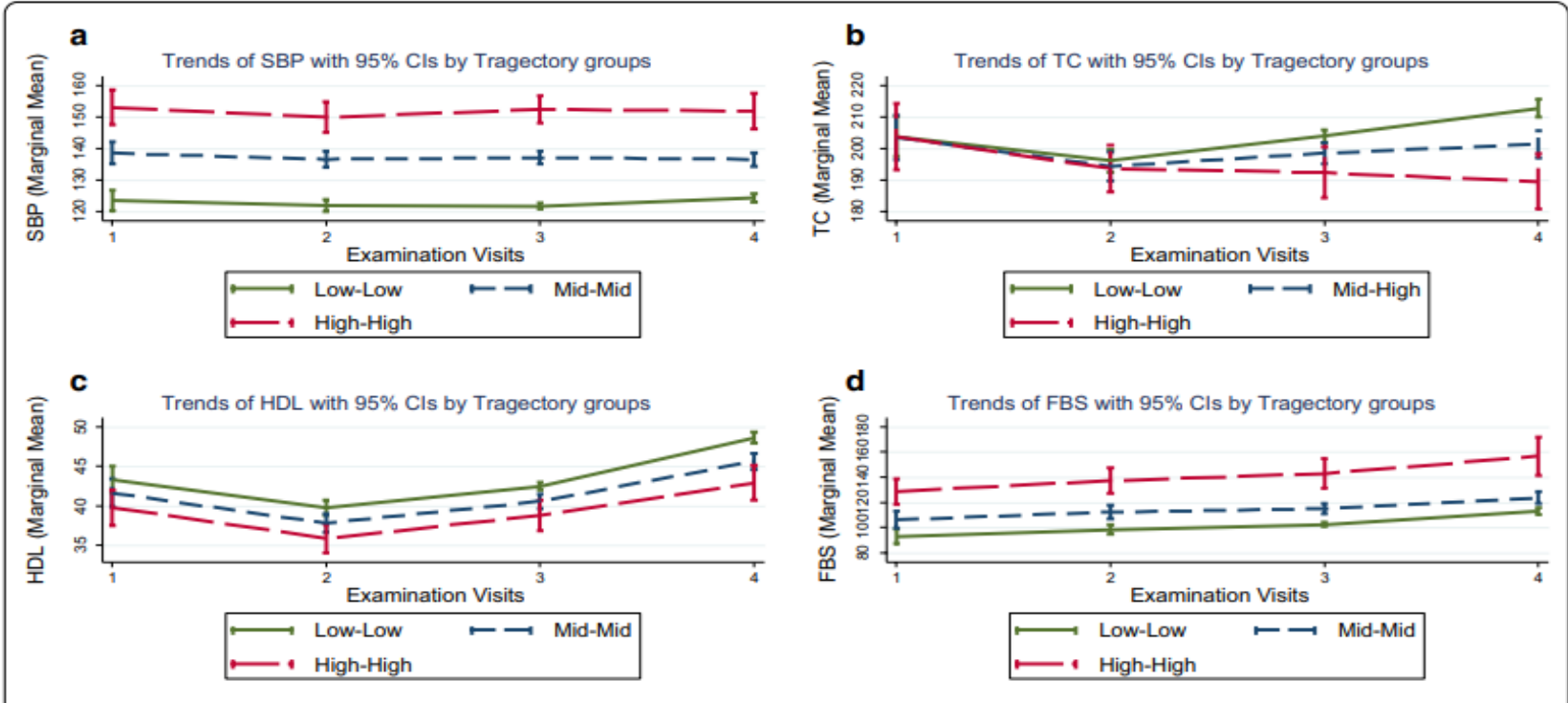
Events	Events/ n at risk (%)	Model 1*		Model 2†		Model 3‡	
		HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Low-Low	70/2004 (3.5)	1.00 (Reference)	-	1.00 (Reference)	-	1.00 (Reference)	-
Medium-Medium	63/458 (13.8)	4.51 (3.21–6.34)	< 0.001	2.40 (1.46–3.97)	0.001	2.14 (1.19–3.85)	0.011
High-High	13/60 (21.7)	8.58 (4.74–15.53)	< 0.001	3.46 (1.56–7.70)	0.002	3.14 (1.15–8.52)	0.025

CVD cardiovascular disease, HR hazard ratio, CI confidence interval

* Unadjusted model

† Model 2 was adjusted for age at examination cycle four

‡ Model 3 was adjusted for age, education, and family history CVD at examination cycle four



Summary of Sample analysis

- Validity and reliability of questionnaires
- Prevalence studies (using baseline information only)
- Incidence based analysis (using time to first event)
- Longitudinal based analysis
 - Trend analysis
 - Trajectory analysis
- Association analysis
 - Cross sectional studies
 - Case-control studies
 - Cohort studies
- Intervention based analysis
- Prediction model
 - Model development
 - Model Validation

Cross sectional Study



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Nutrition Research 22 (2002) 1365–1375

NUTRITION
RESEARCH

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Association of educational level and marital status with dietary intake and cardiovascular risk factors in Tehranian adults: Tehran Lipid and Glucose Study (TLGS)

Parvin Mirmiran, Fatemeh Mohammadi, Sima Allahverdian,
Fereidoun Azizi*

Endocrine Research Center, Shaheed Beheshti University of Medical Sciences, Tehran, I.R. Iran

Received 19 January 2002; accepted 4 July 2002

Abstract

This study was conducted to assess the association of educational level and marital status with dietary intake, obesity and other cardiovascular risk factors. 733 subjects, 408 women and 325 men, aged between 20–60 years, were randomly selected from the participants of the Tehran Lipid and Glucose Study. Data on educational level, and marital status were obtained by a questionnaire. Following measurement of weight, height, waist and hip according to standard protocol, body mass index (BMI) and waist to hip ratio (WHR) were calculated. Dietary intake was assessed by completing two 24-hour dietary recalls during face to face interviews. Serum cholesterol, triglycerides levels, and HDL cholesterol were measured after 12–14 hours fasting. Subjects were divided into four groups based on educational levels: illiterate or low literacy, intermediary school, high school and university graduates. Adjusted for age, increases in triglycerides levels in men with high educational levels were



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

Azra Ramezankhani^a, Fereidoun Azizi^b, Arash Ghanbarian^a,
Donna Parizadeh^a, Farzad Hadaegh^{a,*}

^a Prevention of Metabolic Disorders Research Center, Research Institute for Endocrine Science, Shahid Beheshti University of Medical Sciences, Tehran, Iran

^b Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

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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 m². 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.



Association Between HDL2-C and HDL3-C with Cardiovascular Disease: A Nested Case-Control Study in an Iranian Population

Abdolreza Chary^{1,2}, Maryam Tohidi ^{2,*}, Mitra Hasheminia², Melika Golmohammadi ², Reza Haji Hosseini ¹, Mehdi Hedayati ³, Fereidoun Azizi ⁴ and Farzad Hadaegh²

¹Department of Biology, Payame Noor University, Tehran, Iran

²Prevention of Metabolic Disorders Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

³Cellular and Molecular Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

*Corresponding author: Prevention of Metabolic Disorders Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: tohidi@endocrine.ac.ir

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Abstract

Background: The contribution of high-density lipoprotein cholesterol (HDL-C) subclasses to incident cardiovascular disease (CVD) and coronary heart disease (CHD) remains a subject of debate.

Objectives: The objective of this study was to investigate these associations in a population with a high prevalence of dyslipidemia and CVD.

Methods: In a nested case-control study, HDL-C and its subclasses (HDL2-C and HDL3-C) in 370 age and gender-matched case and control subjects were determined. This study employed multivariable-adjusted conditional logistic regression to calculate the odds ratios (ORs) for the associations between HDL-C, HDL2-C, HDL3-C, and HDL2-C/HDL3-C (both as continuous and categorical variables) with incident CVD and CHD. The present study models were adjusted for a comprehensive set of confounders, including body mass index, current smoking, hypertension, type 2 diabetes mellitus, use of lipid-lowering drugs, family history of premature CVD, non-HDL-C, and triglycerides.

Results: In multivariate analysis, when considering lipoprotein parameters as continuous variables, a 1-unit increase in HDL-C and HDL3-C was associated with a reduced risk of incident CVD and CHD. For CVD, the ORs (95% confidence intervals [CI]) were 0.95 (0.92 - 0.98) and 0.95 (0.93 - 0.98) for HDL-C and HDL3-C, respectively. The corresponding values for CHD were 0.94 (0.91 - 0.97) and 0.94 (0.91 - 0.97). In the categorical approach to lipoprotein parameters, higher quartiles of HDL-C and HDL3-C, compared to the first quartile, were significantly associated with a lower risk of incident CVD and CHD. The ORs (95% CI) for the fourth quartiles were 0.43 (0.25 - 0.74, P for trend = 0.003) and 0.46 (0.27 - 0.78, P for trend = 0.005) for HDL-C and HDL3-C regarding CVD and 0.32 (0.17 - 0.59) and 0.32 (0.18 - 0.59) (all P for trend = 0.001) regarding CHD, respectively. Paradoxically, across quartiles of HDL2-C/HDL3-C, this lipid

Sex Specific Incidence Rates of Type 2 Diabetes and Its Risk Factors over 9 Years of Follow-Up: Tehran Lipid and Glucose Study



Arash Derakhshan¹, Mahsa Sardarinia¹, Davood Khalili¹, Amir Abbas Momenan¹, Fereidoun Azizi², Farzad Hadaegh^{1*}

¹ Prevention of metabolic disorders research center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran, ² Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Abstract

Objective: To investigate the population-based incidence of type 2 diabetes and its potential risk factors in a sex-split cohort of Iranian population.

Materials and Methods: A total of 8400 non-diabetic participants, aged ≥ 20 years (3620 men and 4780 women) entered the study. Crude and age standardized incidence rates per 1000 person-years were calculated for whole population and each sex separately. Cox proportional hazard models were used to evaluate hazard ratios (HR) and 95% confidence intervals for all potential risk factors in both uni-variable and multivariable models.

Results: During a median follow-up of 9.5 years, 736 new cases of diabetes were identified, including 433 women and 303 men. The annual crude and age-standardized incidence rates (95% CI) of diabetes in the total population were 10.6 (9.92–11.4) and 9.94 (7.39–13.6) per 1000 person-years of follow-up and the corresponding sex specific rates were 10.2 (9.13–11.4) and 9.36 (5.84–14.92) in men and 11.0 (9.99–12.0) and 10.1 (7.24–13.9) in women, respectively. In the multivariable model, the risk for incident diabetes was significantly associated with fasting and 2 hour post challenge plasma glucose as well as family history of diabetes in both men and women. However, among women, only the contribution of wrist circumference to incident diabetes achieved statistical significance [HR: 1.16 (1.03–1.31)] with waist/height ratio being marginally significant [HR: 1.02 (0.99–1.04)]; while among men, only body mass index was a significant predictor [HR: 1.12 (1.02–1.22)]. Additionally, low education level conferred a higher risk for incident diabetes only among men [HR: 1.80 (1.23–2.36); P for interaction with sex = 0.003].

Conclusion: Overall, sex did not significantly modify the impact of risk factors associated with diabetes among Iranian adults; however, among modifiable risk factors, the independent role of lower education and general adiposity in men and central adiposity in women might require different preventive strategies.

ORIGINAL RESEARCH

Sex-Specific Incidence Rates and Risk Factors for Hypertension During 13 Years of Follow-up: The Tehran Lipid and Glucose Study

Samaneh Asgari¹, Seyyed Saeed Moazzeni^{1,2}, Fereidoun Azizi³, Hengameh Abdi³, Davood Khalili^{1,4}, Monir Sadat Hakemi² and Farzad Hadaegh¹

¹ Metabolic Disorders Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR

² Nephrology Ward of Shariati Hospital, Tehran University of Medical Sciences, Tehran, IR

³ Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR

⁴ Department of Epidemiology and Biostatistics, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR

Corresponding author: Farzad Hadaegh, MD (fzhadaegh@endocrine.ac.ir)

Samaneh Asgari and Seyyed Saeed Moazzeni contributed equally to this work and are co-first authors.

Background: Hypertension, with a prevalence of 25.6% is a serious public health concern in Iran. **Objective:** To investigate the population-based incidence of hypertension and its potential risk factors in Tehranian adults during a median follow-up of 13.1 years.

Methods: A total of 6,533 non-hypertensive participants (women = 3,639), aged ≥ 20 years participated in the study. Crude and age-standardized incidence rates per 1000 person-years were calculated for each sex, separately. Multivariable Cox proportional hazard models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CI) for all potential risk factors.

Results: The crude and age-standardized incidence rates (95% CI) of hypertension per 1000

Summary of Sample analysis

- Validity and reliability of questionnaires
- Prevalence studies (using baseline information only)
- Incidence based analysis (using time to first event)
- Longitudinal based analysis
 - Trend analysis
 - Trajectory analysis
- Association analysis
 - Survival analysis (e.g. Cox Regression)
 - Risk factor analysis
- Intervention based analysis
- Prediction model
 - Model development
 - Model Validation

Intervention studies

> Am J Prev Med. 2010 Jun;38(6):628-636.e1. doi: 10.1016/j.amepre.2010.03.003.

Reduction in incidence of type 2 diabetes by lifestyle intervention in a middle eastern community

Hadi Harati¹, Farzad Hadaegh, Amir Abbas Momenan, Laleh Ghanei,
Mohammad Reza Bozorgmanesh, Arash Ghanbarian, Parvin Mirmiran, Fereidoun Azizi

Affiliations + expand

PMID: 20494239 DOI: 10.1016/j.amepre.2010.03.003

Long-Term Effectiveness of a Lifestyle Intervention: A Pragmatic Community Trial to Prevent Metabolic Syndrome

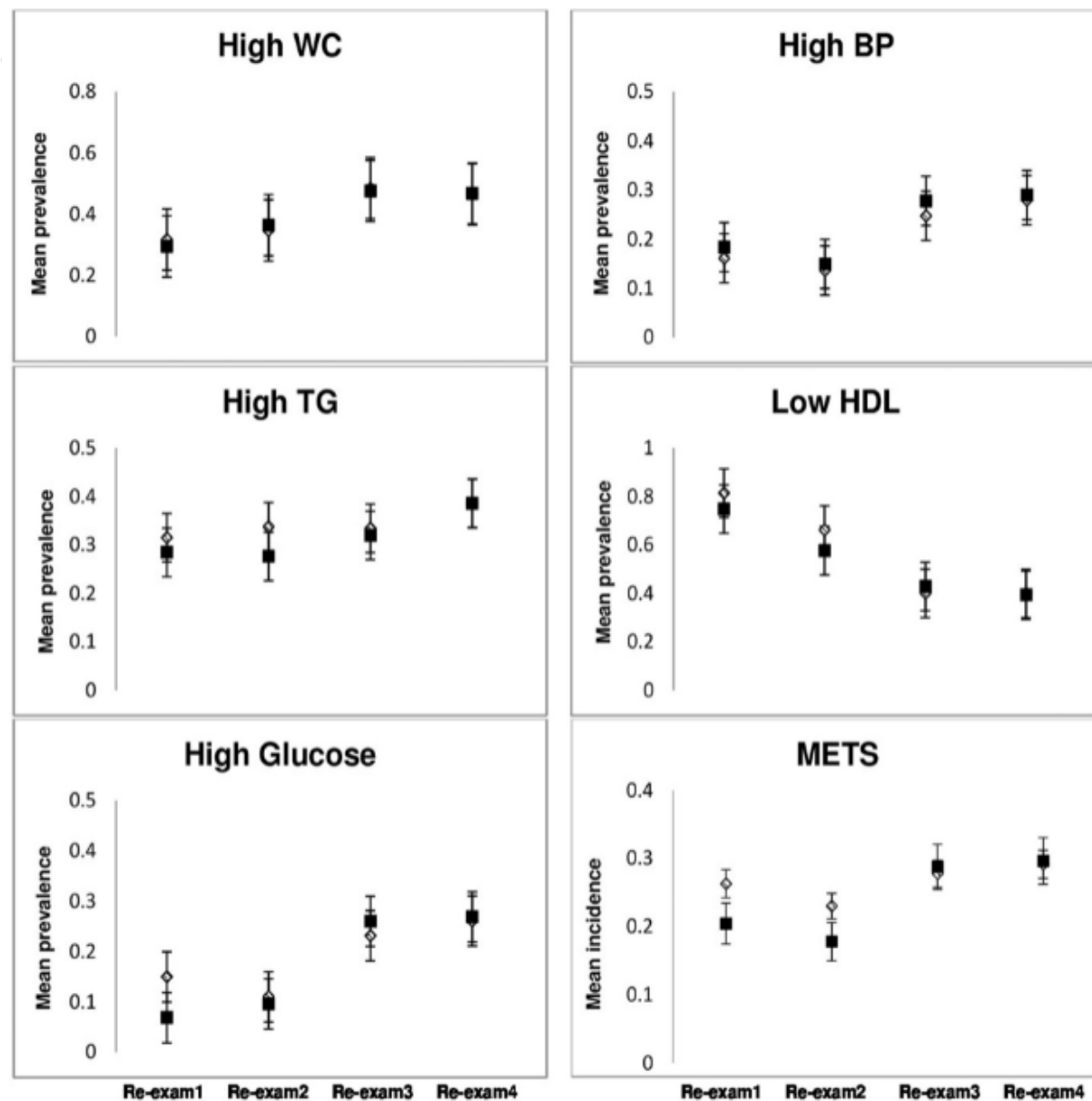
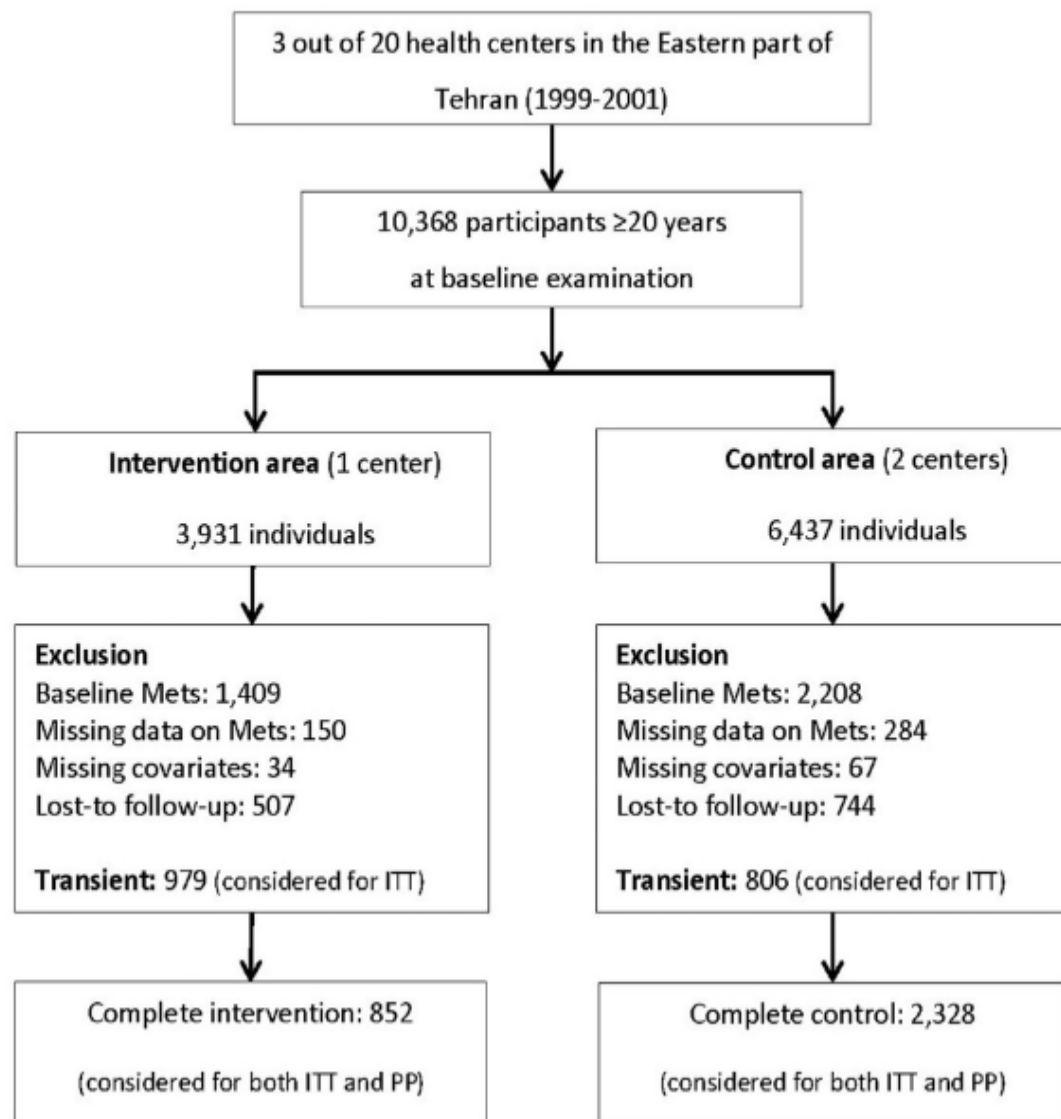
Davood Khalili, MD, MPH, PhD,^{1,2} Samaneh Asgari, MSc,^{1,2} Mojtaba Lotfaliany, MD,³
Neda Zafari, MD, MPH,¹ Farzad Hadaegh, MD,¹ Amir-Abbas Momenan, MD, MPH,¹
Armin Nowroozpoor, MD,¹ Firoozeh Hosseini-Esfahani, PhD,⁴ Parvin Mirmiran, PhD,^{4,5}
Parisa Amiri, PhD,⁶ Fereidoun Azizi, MD⁷

Introduction: The purpose of this study is to evaluate the long-term effectiveness of a community-based lifestyle education on primary prevention of metabolic syndrome in a middle-income country.

Study design: This study followed 3,180 individuals free of metabolic syndrome who were under the coverage of three health centers in Tehran from 1999 until 2015. They were undergoing triennial examinations resulting in four re-exams. People in one of three areas received interventions consisting of family-, school-, and community-based educational programs, including a face-to-face educational session at baseline. Data were analyzed considering the incidence of metabolic syndrome at each re-exam and also repeated-measure analysis including all re-exams together. Weighting was considered to correct selection bias because of loss to follow-up. Data were analyzed in 2017.

Results: After 3 years, 149 of 852 participants in the intervention and 471 of 2,328 people in control area developed metabolic syndrome at first re-exam resulting in a RR of 0.78 (95% CI=0.67, 0.92). The difference between groups remained unchanged up to the 6-year follow-up (RR=0.79, 95% CI=0.66, 0.93, at second re-exam), but disappeared during the third and fourth re-exams (RR=1.04, 95% CI=0.91, 1.18 and RR=1.03, 95% CI=0.91, 1.16, respectively). Marginal models for longitudinal data showed a significant interaction between intervention and time of re-exams. Further analyses showed that the effect of the intervention might have been rooted in improvement of lipid profile and glucose level.





Summary of Sample analysis

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- Longitudinal based analysis
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- Association analysis
 - Survival analysis (e.g. Cox Regression)
 - Risk factor analysis
- Intervention based analysis
- Prediction model
 - Model development
 - Model Validation

Modeling

(Prevention of metabolic disorders)

> Lancet Diabetes Endocrinol. 2015 May;3(5):339-55. doi: 10.1016/S2213-8587(15)00081-9. Epub 2015 Mar 26.

A novel risk score to predict cardiovascular disease risk in national populations (Globorisk): a pooled analysis of prospective cohorts and health examination surveys

Kaveh Hajifathalian ¹, Peter Ueda ², Yuan Lu ², Mark Woodward ³, Alireza Ahmadvand ⁴, Carlos A Aguilar-Salinas ⁵, Fereidoun Azizi ⁶, Renata Cifkova ⁷, Mariachiara Di Cesare ⁸, Louise Erikson ⁹, Farshad Farzadfar ¹⁰, Nayu Ikeda ¹¹, Davood Khalili ⁶, Young-Ho Khang ¹², Vera Lanska ¹³, Luz León-Muñoz ¹⁴, Dianna Magliano ¹⁵, Kelias P Msyamboza ¹⁶, Kyungwon Oh ¹⁷, Fernando Rodríguez-Artalejo ¹⁴, Rosalba Rojas-Martinez ¹⁸, Jonathan E Shaw ¹⁵, Gretchen A Stevens ¹⁹, Janne Tolstrup ⁷, Bin Zhou ⁸, Joshua A Salomon ², Majid Ezzati ⁸, Goodarz Danaei ²⁰

Affiliations + expand
PMID: 25819778 DOI: 10.1016/S2213-8587(15)00081-9

Data from eight prospective cohort studies

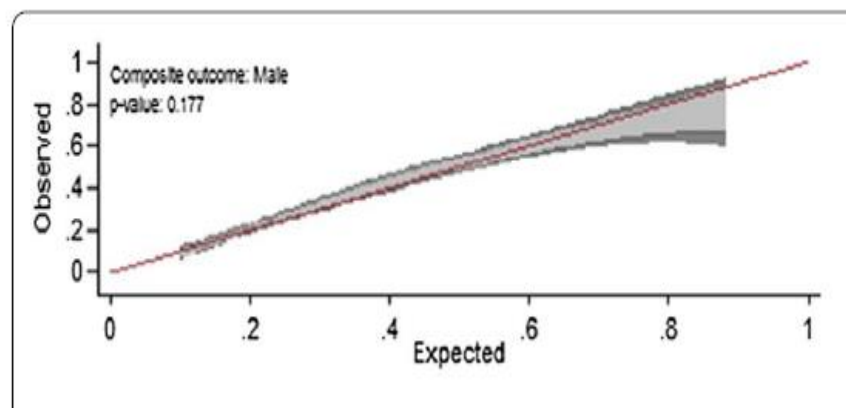
> Eur J Public Health. 2011 Oct;21(5):554-9. doi: 10.1093/eurpub/ckq074. Epub 2010 Jun 9.

A simple risk score effectively predicted type 2 diabetes in Iranian adult population: population-based cohort study

Mohammadreza Bozorgmanesh ¹, Farzad Hadaegh, Somayeh Ghaffari, Hadi Harati, Fereidoun Azizi

Affiliations + expand
PMID: 20534689 DOI: 10.1093/eurpub/ckq074

Factors	Points
SBP (mmHg)	
<120	0
120–140	3
≥140	7
Family history of diabetes	5
WtHR	
<0.54	0
0.54–0.59	6
≥0.59	11
TG/HDL-C	
<3.5	0
≥3.5	3
Fasting plasma glucose (mmol l ⁻¹)	
<5	0
5.0–5.5	12
5.6–6.9	33



> *Int J Cardiol.* 2015 Apr 1;184:587-594. doi: 10.1016/j.ijcard.2015.03.067. Epub 2015 Mar 5.

A new approach to test validity and clinical usefulness of the 2013 ACC/AHA guideline on statin therapy: A population-based study

Davood Khalili ¹, Samaneh Asgari ², Farzad Hadaegh ³, Ewout W Steyerberg ⁴, Kazem Rahimi ⁵, Noushin Fahimfar ⁶, Fereidoun Azizi ⁷

Affiliations + expand

PMID: 25769004 DOI: [10.1016/j.ijcard.2015.03.067](https://doi.org/10.1016/j.ijcard.2015.03.067)

Asgari et al. *J Transl Med* (2020) 18:267
<https://doi.org/10.1186/s12967-020-02434-5>

Journal of
Translational Medicine

**External validation of ACC/AHA
guideline using TLGS data**

RESEARCH

Open Access

External validation of the European risk assessment tool for chronic cardio-metabolic disorders in a Middle Eastern population



Samaneh Asgari^{1†}, Fatemeh Moosaie^{1,2†}, Davood Khalili^{1,3}, Fereidoun Azizi⁴ and Farzad Hadaegh^{1*}

Dynamic prediction models improved the risk classification of type 2 diabetes compared with classical static models

Samaneh Asgari ¹, Davood Khalili ², Farid Zayeri ³, Fereidoun Azizi ⁴, Farzad Hadaegh ¹

Affiliations + expand

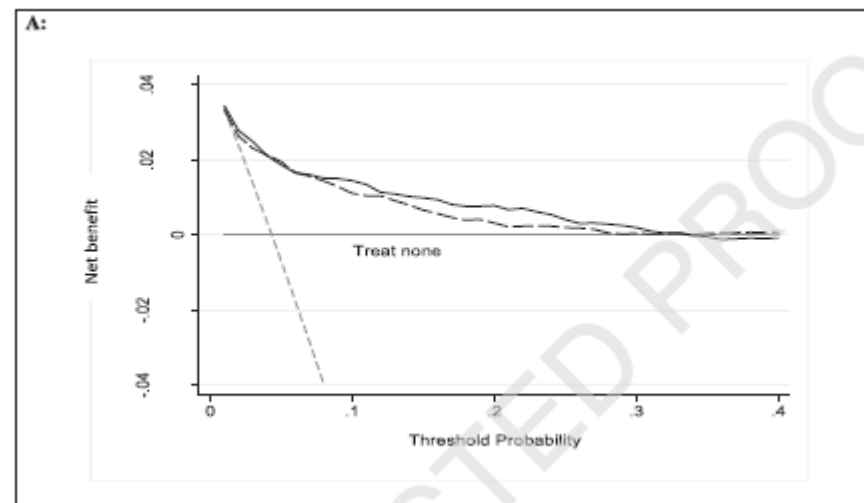
PMID: 34455032 DOI: 10.1016/j.jclinepi.2021.08.026

Abstract

Objective: Dynamic prediction models use the repeated measurements of predictors to estimate coefficients that link the longitudinal predictors to a static model (i.e. Cox regression). This study aimed to develop and validate a dynamic prediction for incident type 2 diabetes (T2DM) as the outcome.

Table 6. Different possibilities of the estimated predicted probabilities for incident T2DM: the hypothetical example

	FPG level, mg/dl	Trend over 6 years	Probability using baseline	Probability using 2 repeated measurements (within 3 years)	Probability using 3 repeated measurements (within 6 years)
Baseline	90	↓	3.6%		
3 years before baseline	95			4%	
6 years before baseline	100				3.4%
Baseline	100	→	8.2%		
3 years before baseline	100			10%	
6 years before baseline	100				9%
Baseline	100	↑	8.2%		
3 years before baseline	90			7.74%	
6 years before baseline	80				10%
Baseline	100	↑	8.2%		
3 years before baseline	95			8.6%	
6 years before baseline	90				9.3%
Baseline	100	↓	8.2%		
3 years before baseline	110			11.8%	
6 years before baseline	120				8.2%
Baseline	100	↓	8.2%		
3 years before baseline	105			10.6%	
6 years before baseline	110				8.6%
Baseline	110	→	18.3%		
3 years before baseline	110			23.8%	
6 years before baseline	110				21.5%
Baseline	110	↑	18.3%		
3 years before baseline	105			21.5%	
6 years before baseline	100				22.4%
Baseline	110	↑	18.3%		
3 years before baseline	95			17.6%	
6 years before baseline	90				20.3%
Baseline	110	↓	18.3%		
3 years before baseline	115			26.2%	
6 years before baseline	125				18.8%
Baseline	120	↑	38.25%		



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Any questions?

