PP-PP-048-KKU

ความแตกต่างทางเพศในการคัดกรองกลุ่มอาการทางเมแทบอลิก ด้วยดัชนีความเสี่ยงต่อเบาหวานของไทยรูปแบบประยุกต์

บทคัดย่อ

บทนำ: ดัชนีความเสี่ยงต่อเบาหวานเป็นเครื่องมือแนวแบบสอบถามที่สามารถนำมาใช้เป็นเครื่องมือในการคัดกรองกลุ่มอาการทางเมแทบอลิกได้ในเวชปฏิบัติ การศึกษานี้มีวัตถุประสงค์เพื่อทดสอบการคัดกรองกลุ่มอาการทางเมแทบอลิกด้วยดัชนีความเสี่ยงต่อเบาหวานของไทยรูปแบบประยุกต์ในเพศชายและหญิง **วิธีการศึกษา:** เป็นการศึกษาวิเคราะห์เชิงภาคตัดขวาง วิเคราะห์ข้อมูลจากฐานข้อมูลคอมพิวเตอร์ของห้องตรวจสุขภาพพิเศษ โรงพยาบาลศรีนครินทร์ จังหวัดขอนแก่น ระหว่างเดือนมกราคม พ.ศ. 2550 ถึง ธันวาคม พ.ศ. 2552 ของผู้มารับบริการที่มีอายุระหว่าง 35-75 ปี เก็บข้อมูลเฉพาะผลการตรวจสุขภาพของผู้เข้ารับบริการครั้งแรกเพียงครั้งเดียวที่มีการบันทึกข้อมูลอายุ เพศ ความยาวเส้นรอบเอว ดัชนีมวลกาย ความดันโลหิต ระดับน้ำตาลในเลือดหลังอดอาหารอย่างน้อย 8 ชม. ระดับไขมันไตรกลีเซอไรด์และระดับไขมันเอชดีแอลคอเลสเตอรอล ครบถ้วน คัดผู้ที่มีการบันทึกข้อมูลดังกล่าวไม่ครบถ้วนหรือได้รับการวินิจฉัยว่ามีภาวะไขมันในเลือดผิดปกติออกจากการศึกษา การสุ่มตัวอย่างใช้โปรแกรมสำเร็จรูปทางสถิติ SPSS for Windows version 16.0 ทดสอบความสามารถในการคัดกรองกลุ่มอาการทางเมแทบอลิกด้วยดัชนีความเสี่ยงต่อเบาหวานของไทยรูปแบบประยุกต์ โดยการวิเคราะห์พื้นที่ใต้โค้ง receiver operating characteristic (ROC) ของดัชนีความเสี่ยงต่อเบาหวานของไทยรูปแบบประยุกต์ในเพศชายและหญิง และหาจุดตัดคะแนนความเสี่ยงที่เหมาะสมในการคัดกรองทั้งเพศชายและหญิง โดยใช้โปรแกรมสำเร็จรูปทางสถิติ STATA version 12.0 **ผลการศึกษา:** พบว่าพื้นที่ใต้โค้ง receiver operating characteristic (ROC) ของดัชนีความเสี่ยงต่อเบาหวานของไทยรูปแบบประยุกต์ในเพศชายและหญิงไม่แตกต่างกัน ดังนั้นคะแนนความเสี่ยงที่เหมาะสมในการคัดกรองกลุ่มอาการทางเมแทบอลิกของดัชนีความเสี่ยงต่อเบาหวานของไทยรูปแบบประยุกต์ในเพศชายและหญิงเท่ากับ 6 จากช่วงคะแนน 0 ถึง 13 คะแนนซึ่งมีค่าความไวร้อยละ 83.8 ความจำเพาะร้อยละ 73.1 อัตราผลบวกลวงร้อยละ 26.9 อัตราผลลบลวงร้อยละ 16.2 ค่าพยากรณ์ผลบวกร้อยละ 47.7 ค่าพยากรณ์ผลลบร้อยละ 93.3 และจำนวนผู้ที่ต้องตรวจเพิ่มเติมเพื่อยืนยันการวินิจฉัยร้อยละ 39.8

คำสำคัญ: เพศ, กลุ่มอาการทางเมแทบอลิก, ดัชนีความเสี่ยงต่อเบาหวาน

Abstract

Gender differences in the metabolic syndrome screening using modified Thai Diabetes Risk Score

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Abstract

Introduction: Diabetes risk score is a questionnaire which can be used for metabolic syndrome screening in clinical practice. This study aimed to test metabolic syndrome screening with the modified Thai Diabetes Risk Score in male and female. **Materials and methods**: This study was designed as a cross sectional analytical and analysed from computer database of special medical examination room, Srinagarind hospital, Khon Kaen between January 2007 and December 2009,

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aged 35-75 years. The data collection was performed only the first result and completed data of individuals attending checkup clinic included age, gender, waist circumference, body mass index, blood pressure, fasting blood glucose, triglyceride, and high density lipoprotein. The exclusion was done on incomplete data or previously diagnosed with dyslipidemia. The randomization of sample used statistical software SPSS for Windows version 16.0. The test of metabolic syndrome screening with the modified Thai Diabetes Risk Score was analyzed by receiver operating characteristic (ROC) of the modified Thai Diabetes Risk Score in male and female. The optimal cutoff point for metabolic syndrome screening in male and female was analyzed by statistical software STATA version 12.0. **Results**: The area under the ROC of the modified Thai Diabetes Risk Score in male and female were not different. Hence, the optimal cutoff point for metabolic syndrome screening in male and female were the same point (cutoff = 6 based on the score ranged from 0 to 13) with sensitivity 83.8 (95% CI 79.2-87.6), specificity of 73.1(95% CI 70.3-75.8), false positive rate of 26.9 (95% CI 24.2-29.7), false negative rate of 16.2 (95%CI 12.4-20.8), PPV of 47.7 (95% CI 43.4-52.0), NPV of 93.3 (95% CI 92.0-95.4). 39.8% of patients need subsequent test to confirm diagnosis.

Keywords: gender, metabolic syndrome, diabetes risk score

Introduction

The metabolic syndrome is a complex of interrelated risk factors for cardiovascular disease and diabetes (Alberti *et al.*, 2009). Diabetes Risk Score has been promoted as a method for identifying high-risk individuals for cardiovascular disease and type 2 diabetes and it can be used as a simple clinical tool for identifying high-risk subjects predisposed to cardiovascular disease and type 2 diabetes (Wannamethee *et al.*, 2005). Meanwhile type 2 diabetes is an important risk factor in diagnostic criteria of metabolic syndrome in many organizations (Alberti *et al.*, 2009, Alberti, Zimmet, 1998, Balkau, Charles, 1999, Grundy *et al.*, 2004). At the present time, many diabetes risk scores are used for identification individuals with current diabetes and prediction new cases of diabetes. Some are also be used for screening of metabolic syndrome (Saaristo *et al.*, 2005) including the simple model of Thai Diabetes Risk Score developed by Aekplakorn et al (Lin *et al.*, 2009). In Thailand, Siwakorn et al (Porntrakulphiphat S *et al.*, 2011) evaluated the reliability and the predictive power of the modified Thai Diabetes Risk Score (modified from simple model of Thai Diabetes Risk Score developed by Aekplakorn et al) for identification individuals at high-risk for metabolic syndrome in people attending checkup clinic at Srinagarind Hospital, Faculty of Medicine, Khon Kaen University, Khon Kaen and found that the modified Thai Diabetes Risk Score is a simple tool for metabolic syndrome screening based on the information about age, gender, body mass index (BMI), waist circumference and blood pressure (BP). All of these factors can be acquired with no need to do blood chemistry testing and convenient for using in clinical practice. However, multivariate analysis revealed that male gender had more risk to develop metabolic syndrome than female which is in line with other studies (Tsai *et al.*, 2011). Then the question is whether the optimal cutoff point of the modified Thai Diabetes Risk Score for identification individuals at high-risk for metabolic syndrome in men differs from women or not. The objectives of this study were to determine the area under the receiver operating characteristic (ROC) curve and the optimal cutoff point of the modified Thai Diabetes Risk Score for identification individuals at high-risk for metabolic syndrome among gender.

Methods

This study used data based on a hospital-based survey including 1,287 individuals (Porntrakulphiphat S *et al.*, 2011). In brief, the study was designed as a cross-sectional analytical study. Data were collected from the computer database of the people aged 35-75 years who attended clinic for checkup in Srinagarind hospital during January 2007-December 2009. The completed medical

record data of gender, age, waist circumference, BMI, BP, fasting plasma glucose (FPG), triglyceride (TG) and high density lipoprotein C (HDL-C) in computer database of the first visit of participants were enrolled and sampling. The people attending checkup clinic with previously diagnosed dyslipidemia were excluded due to lacking of record of lipid lowering medication which may cause the problem of interpretation of TG level and HDL-C level in blood. The sample size were calculated for the determination of prevalence of the metabolic syndrome and sensitivity of the modified Thai Diabetes Risk Score for metabolic syndrome screening (95% Confidence Interval (CI), prevalence of metabolic syndrome 0.23, allowable error in estimating prevalence $\pm$ 10.0% of prevalence, sensitivity of simple model of Thai Diabetes Risk Score 77.0%). The sample size was 1,287 cases and taken from the computer database using simple random sampling by statistical software (SPSS for Windows version 16.0). The gold standard test for metabolic syndrome diagnosis used the criteria developed by IDF and AHA/NHLBI representatives (Alberti *et al.*, 2009). The modified Thai Diabetes Risk Score was modified from the simple model of Thai Diabetes Risk Score developed by Aekplakorn et al (Aekplakorn *et al.*, 2006) based on a history taking and physical examination without blood chemistry testing. Input data for calculating the modified Thai Diabetes Risk Score included: gender, age, BMI, waist circumference, previously diagnosed hypertension or BP $\geq$ 140/90 mmHg or current prescription of BP-lowering treatment and history of diabetes either in parents or sibling. Data of current prescription of BP-lowering treatment and history of diabetes either in parents or sibling were not taken into consideration. The scoring system was made the same as the scoring in simple model of Thai Diabetes Risk Score with the overall score would be between 0 to 13 points as presented in table 1.

Table 1 The scoring in the modified Thai Diabetes Risk Score was modified from the simple model of Thai Diabetes Risk Score developed by Aekplakorn et al (Aekplakorn *et al.*, 2006)

Risk factor		**B-Coefficient**	**Diabetes risk score**
Age, years			
	35 – 39		
	40 – 44	-0.07	0
	45 – 49	0.27	1
	$\geq$50	0.60	2
Gender			
	Women		
	Men	0.44	2
BMI (kg/m^2)			
	<23		0
	23 - <27.5	0.69	3
	$\geq$27.5	1.24	5
Waist circumference (cm)			
	<90 in men, <80 in women		0
	$\geq$90 in men, $\geq$80 in women	0.56	2
Hypertension (BP $\geq$ 140/90 mmHg or diagnosed or currently treated hypertension)			
	No		0
	Yes	0.64	2

Data analysis

The reliability and the predictive power of the modified Thai Diabetes Risk Score for identification individuals at high-risk for metabolic syndrome according to gender were analyzed by statistical software (STATA version 12.0) and were reported as a sensitivity, specificity, false positive rate, false negative rate, positive predictive value (PPV), negative predictive value (NPV), a percentage of need subsequent test, area under the receiver operating characteristic (ROC) curve and the optimal cutoff point of the modified Thai Diabetes Risk Score for metabolic syndrome screening according to gender.

Results

The area under the receiver operating characteristic (ROC) curve of the modified Thai Diabetes Risk Score for identification individuals at high-risk for metabolic syndrome according to gender revealed different without statistically significance (p =0.652). The area under the curve of ROC of the modified Thai Diabetes Risk Score for metabolic syndrome screening in men and women were 0.843 (95%CI 0.809–0.877) and 0.854 (95%CI 0.823–0.885), respectively as shown in figure 1. This means that the optimal cutoff points for metabolic syndrome screening of the modified Thai Diabetes Risk Score in both genders were not different. Hence, the optimal cutoff point in both genders was 6 with sensitivity of 83.8 (95% CI 79.2-87.6), specificity of 73.1(95% CI 70.3-75.8), false positive rate of 26.9 (95% CI 24.2-29.7), false negative rate of 16.2 (95%CI 12.4-20.8), PPV of 47.7 (95% CI 43.4-52.0), NPV of 93.3 (95% CI 92.0-95.4), respectively as shown in table 2. 39.8% of patients need subsequent test to confirm diagnosis.

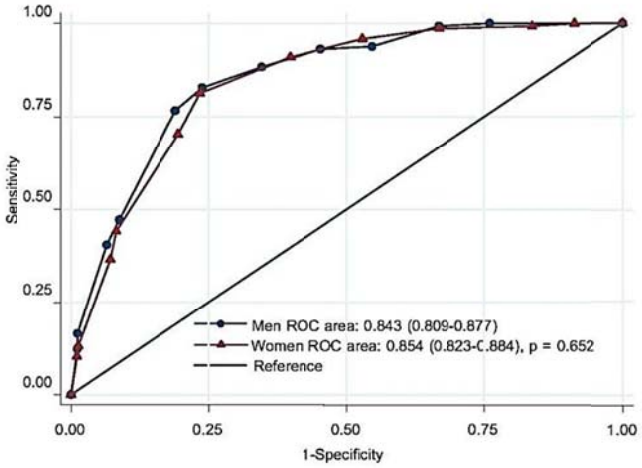

Figure 1 Comparison between the area under the ROC curves for the modified Thai Diabetes Risk Score of screen-detected metabolic syndrome according to gender

Table 2 Characteristics of modified model of Thai Diabetes Risk Score using different cutoff values for screen-detected metabolic syndrome

Cutoff value	Sensitivity	Specificity	False positive rate	False negative rate	PPV	NPV	%Need subsequent test
1	99.7 (98.1-99.9)	20.6 (18.2-23.2)	79.4 (76.8-81.8)	0.3 (0.1-1.9)	26.8 (24.3-29.5)	99.5 (97.3-99.9)	84.0
2	96.9 (94.2-98.4)	31.3 (28.5-34.3)	68.7 (65.7-71.5)	3.1 (1.6-5.8)	29.2 (26.4-32.1)	97.2 (94.8-98.5)	75.1
3	96.2 (93.4-97.9)	40.1 (37.1-43.1)	59.9 (56.9-62.9)	3.8 (2.1-6.6)	31.9 (28.9-35.1)	97.3 (95.3-98.5)	68.1
4	93.5 (90.0-95.8)	53.1 (50.0-56.2)	46.9 (43.8-50.0)	6.5 (4.2-10.0)	36.8 (33.4-40.3)	96.5 (94.6-97.8)	57.4
5	89.3 (85.3-92.4)	65.1 (62.0-68.0)	34.5 (32.0-38.0)	10.7 (7.6-14.7)	42.8 (38.9-46.7)	95.4 (93.6-96.8)	47.2

6	83.8 (79.2-87.6)	73.1 (70.3-75.8)	26.9 (24.2-29.7)	16.2 (12.4-20.8)	47.7 (43.4-52.0)	93.9 (92.0-95.4)	39.8
7	64.3 (58.6-69.5)	85.6 (83.3-87.7)	14.4 (12.3-16.7)	35.7 (30.5-41.4)	56.7 (51.3-61.9)	89.1 (87.0-91.0)	25.6
8	55.3 (49.6-60.9)	88.6 (86.4-90.4)	11.4 (9.6-13.6)	44.7 (29.1-50.4)	58.5 (52.6-64.2)	87.2 (85.0-89.0)	21.4
9	30.2 (25.2-35.7)	96.2 (94.8-97.2)	3.8 (2.8-5.2)	69.8 (64.3-74.8)	69.8 (61.3-77.2)	82.5 (80.2-84.6)	9.8
10	24.4 (19.8-29.6)	96.6 (95.3-97.5)	3.4 (2.5-4.7)	75.6 (70.4-80.2)	67.6 (58.2-75.8)	81.4 (79.1-83.5)	8.2
11	6.5 (4.2-10.0)	99.5 (98.8-99.8)	0.5 (0.2-1.2)	93.5 (90.0-95.8)	79.2 (59.5-90.8)	78.5 (76.1-80.6)	1.9
12	5.2 (3.1-8.3)	99.6 (99.0-99.8)	0.4 (0.2-1.0)	94.8 (91.7-96.9)	78.9 (56.7-91.5)	78.2 (75.9-80.4)	1.5

Data shown in percentage (95%CI), PPV = positive predictive value, NPV = negative predictive value, %Need subsequent test = percentage of proportion of individuals who have a score above the selected cutoff value in the risk score.

Discussion

The area under the ROC curve of the modified Thai Diabetes Risk Score in men was slightly differed from women without statistically significance (p = 0.652) thus the optimal cutoff point for metabolic syndrome screening in men and women should be the same point. Saaristo et al (Saaristo *et al.*, 2005) reported that the ROC curve for metabolic syndrome screening in men was slight differed from women which similar to this study. There is unclear explanation about this and further study should be done.

Acknowledgements

We would like to thank the Graduate school and Faculty of Pharmaceutical Sciences, Khon Kaen University for financial support.

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