Predicting Factors in Identifying Cognitive Decline among Thai Adults

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Objective: *To evaluate the clinical factors that associated with cognitive decline among Thai adults.*
Material and Method: *The cross-sectional study was performed between March 2015 and September 2015 at The Princess of Naradhiwas Memorial Hospital. Three hundred ten Thai government officers received annual health check-ups according to standard government protocol. All subjects checked their cognitive performance focus in memory and calculation by physicians. The subjects were divided in two groups according to memory and calculation score, using the cutoff value at tenth percentile. The association between these scores and the clinical parameters were analyzed using Chi-square test for categorical data and t-test for continuous data.*
Results: *The average age of subjects was 42.93±10.8 years (range 21 to 61 years) with male (91%) predominated. The average of memory and calculation score was 5.72±2.2 (range 0 to 10). The cutoff score was 3.0 (tenth percentile), and 25 (8.1%) subjects were below the cut point score defined as cognitive declined group. The age, alcoholic consumption status, and body mass index greater than 30 were significantly associated with cognitive decline in Thai working aged adult.*
Conclusion: *The incidence of cognitive decline among Thai working aged adult was 8.1%. The clinical factors that significantly associated with cognitive decline were age, alcoholic consumption status, and body mass index greater than 30.*

Keywords: *Cognitive decline, Predicting factors*

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Cognitive performance has been overlooked in annual health check-ups. The cardiovascular disease, diabetic mellitus, and hypercholesterolemia have been the common concerned health problems, but cognitive performance has not assessed thoroughly. Even though functional performance on the job depends on the common health problems, cognitive performance has deep impact on functional performance too. In general, cognitive performance has been checked in elderly because of the dementia. Mild cognitive impairment has been recognized as an intermediate step on the way to dementia[1]. The prevalence of mild cognitive impairment range from 14 to 18%[1] in individuals aged 70 years and older. The progression rate to dementia, particularly Alzheimer disease by 10 to 15% per year[2]. The cognition in mid-life has not been clear studied. The cardiovascular risk factors and cognitive decline in middle-aged adults study[3] revealed hypertension and diabetic mellitus were positively associated with cognitive decline. However, other factors have not been study well.

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There are many tests to evaluate cognitive function such as Mini-Mental State Examination, that uses a cutoff score at the tenth percentile of the population[4]. Clock drawing test is popular in assessing patients for cognitive impairment. The test assesses on the patient's ability to properly draw the face of a clock by placing appropriately the numbers and the hands of the clock to a designated time. Its sensitivity was 92% with a specificity of 96%[4]. In the present study, the cognitive performance test was modified for assessing short-term memory and calculation ability. The aim of this study was to identify predicting factors that related to cognitive decline among Thai adults.

Material and Method

Subjects

A cross-sectional study was conducted to assess cognitive performance among Thai adults between March 2015 and August 2015. Three hundred ten government officers underwent an annual health check-up at The Princess of Naradhiwas Memorial Hospital (Ghunyadhi Vattana Kharun Hospital) according to standard government protocol and were enrolled in the present study. All subjects were asked to provide information about smoking status, alcoholic consumption habits, physical activity, and current

medications. The general physical examinations and the complete blood count were performed on all subjects. The officers, age from 35 years or more, were tested after an overnight fast for measurement of blood sugar, creatine, cholesterol, liver enzyme, and uric acid. All subjects were tested for cognitive performance by physicians. The cognitive test consisted of delayed memory (five objects recall after five minutes, without any clue, one point for correct objects and sequence, half point for correct objects but wrong sequence) and calculation (100-7 consecutive for five times, one point for correct answer and sequence, half point for correct answer, and wrong sequence).

Statistical analysis

The cognitive score have been presented inclusive of tenth and ninetieth percentile scores. The tenth percentile score was taken as the cutoff point for identifying the cognitive declined group. A case-control comparison was done between cognitive declined individuals and cognitive normal subjects. The potential categorical risk factors were compared in this univariate analysis by Chi-square test or Fisher's exact test as appropriate. The continuous variables were compared by t-test, a value of $p<0.05$ was considered to be significant for all analyses. The data were analyzed by SPSS software (version 23; IBM Corp., USA).

Ethical consideration was approved from the Ethical Committee of Faculty of Medicine, Princess of Naradhiwas University.

Results

In the 310 government officers that underwent the annual heath check-up, 28 (9%) were women. The minimal educational duration was 12 years (high school level). The cognitive score was summarized in Table 1. Twenty-five subjects (8.1%) had cognitive score below the tenth percentile and were classified as cognitive declined group. The average age of cognitive declined group was 50.04-year-old, and the average age of cognitive normal group was 42.3-year-old.

Table 1. The cognitive score of 310 individuals

Cognitive tests	Range	Mean score (SD)	10th percentile score	90th percentile score
Short-term memory (free recall)	0 to 5	2.58 (1.12)	1.5	4.0
Calculation	0 to 5	3.14 (1.58)	1.0	5.0
Total cognitive score	0 to 10	5.73 (2.19)	3.0	8.95

Table 2. Summary data and comparison of clinical parameters

Clinical parameters	Cognitive declined cases n = 25	Cognitive normal cases n = 285	*p*-value
Mean age (year)	50.04	42.3	0.00
Age <40 years (cases)	0	112	
Age from 40 years to age <50 years (cases)	11	72	
Age from 50 years (cases)	14	101	
Current treatment of hypertension (cases)	2	18	0.66
Current treatment of diabetic mellitus (cases)	1	13	1.00
Systolic blood pressure from 130 mmHg or more (cases)	11	123	1.00
Fasting blood sugar from 100 mg% or more (cases)	9	74	1.00
Body mass index (BMI) from 30 or more (cases)	7	34	0.03
Mean waist circumference (cm), [SD]	89.08 [11.71]	88.35 [9.00]	0.38
Total cholesterol from 200 mg% or more (cases)	18	145	1.00
Current smoking (cases)	6	99	0.38
Alcoholic consumption status (cases)			
Non-drinker	18	123	0.02
Irregular drinker (less than 3 times/week)	4	105	
Regular drinker (from 3 times/week or more)	3	57	
Incorrect the 1st answer of calculation test (cases)	8	8	0.00
Incorrect the 1st answer of memory test (cases)	15	52	0.00

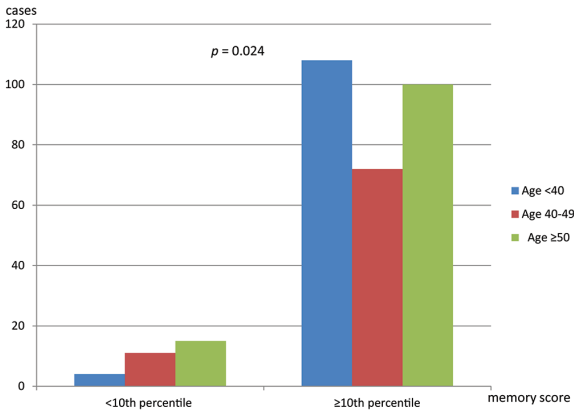

Fig. 1 The association between short-term memory score and age group.

Comparisons of clinical parameters between the cognitive declined and the cognitive normal group were presented in Table 2. In the univariate case-control analysis, risk factors for subjects with cognitive decline were age (p = 0.00), body mass index (BMI) from 30 or more (p = 0.03) and alcoholic drinking (p = 0.02). Another factor that associated with cognitive decline group was incorrect first answer of both calculation and short-term memory test (p<0.00 both). Focus on the memory test, the age is significantly different (p = 0.024) between memory declined group (short-term memory score less than tenth percentile) and memory normal group as shown in Fig. 1.

Discussion

Cognitive decline has been a concern in elderly because of its association with mild cognitive impairment (MCI) and Alzheimer disease (AD). The diagnostic criteria for MCI[1] are memory complaint (preferably corroborated by an informant), memory impairment documented according to appropriate reference values, normal performance in non-memory cognitive domains, generally preserved activities of daily living, and not demented. Therefore, MCI has been the earliest clinical diagnosis for pre-dementia phase of cognitive dysfunction. In contrast to elderly, there are few tests to evaluate cognitive performance in physical-well working aged population. So far, there is no standard protocol for screening cognitive performance of government officers. For comfortable and compliance reasons, this study used only memory and calculation tests to evaluate cognitive performance. In the present study, the incidence of cognitive declined in working age population was 8.1%. The cognitive declined group should not be overlooked as a benign and normal feature of aging. The cognitive declined elderly population who did not meet criteria for MCI had a 28.6% conversion rate to dementia over three years[5]. This population group was classified as age-associated cognitive decline (AACD), and criteria for AACD, according to established guidelines[6], is a decline of more than one standard deviation score in any area of cognitive functioning in comparison with age-matched control. Another study by Storandt et al[7] revealed pre-mild cognitive impairment (pre-MCI) in elderly subjects had ongoing decline of the psychometric score by 0.23 of standard deviation per year. The definition of pre-MCI was the subjects who were too minimally impaired of cognitive performance to meet criteria for MCI[7]. The age is a major predicting factor that significantly associated with cognitive decline. Plassman et al[8] compared elderly subjects between normal group and cognitive impaired group. The result revealed mean age of cognitive impaired group greater than normal cognitive group. According to the present study, the age was significantly different between cognitive normal and cognitive declined group. The other factor that significantly associated with cognitive decline was alcoholic consumption.

However, the result of Solfrizzi et al[9] found no significant associations between any levels of drinking and the incidence of mild cognitive impairment in non-cognitively impaired individuals vs. abstainers. Our study also found BMI greater than 30 significantly associated with cognitive declined group. This result was different with Robert et al[10] that in elderly subjects, the BMI greater than 30 was not significantly different between MCI and control group. In general well physical status subjects, the underlying diseases such as diabetes mellitus and hypertension are not significantly different between cognitive declined and normal group. In contrast, Knopland et al[3] reported hypertension and diabetic mellitus were positively associated with cognitive decline.

Focus on the detail of the cognitive test. The present study found that the incorrect first answer of the short-term memory test or calculation test were significantly associated with cognitive decline. Memory decline is a part of normal aging, but the primary or short-term memory are relatively resistant to change with age[11]. In contrast, Petersen et al[12] demonstrated that in normal elderly age between 62 and 100, the short-term memory or free recall declined significantly with increasing age[12]. Small et al[13] found relative decline in memory performance in elderly with time. However, the other domains of cognitive

performance such as language, visuospatial ability, and abstract reasoning[13] were stable. This decline was constrained by a ceiling effect[12]. It was apparent that the use of cues augmented the short-term memory to near maximum point[12]. The result of our study in working aged subjects revealed the age also significantly associated with short-term memory declined group (smaller than the tenth percentile of short-term memory score) as shown in Fig. 1. When compared to Indian population[14], the calculation score of our study was markedly low. The calculation test of subjects in Kolkata[14] found that the mean calculation score was 4.48 (full point was 5), the tenth percentile score was 3, and the ninetieth percentile score was 5. In contrast, the mean calculation score of our study was 3.14, the tenth percentile score was 1, and the ninetieth percentile score was 5. The explanation for this phenomenon needed further investigation.

So far, there is no evidence to support further progression to MCI or AD among cognitive declined working aged adult. Is there any impact on job performance? It is questionable. There is not any plan for routine yearly cognitive performance checking program of government officers. The possibility of consequence problems may be poor job performance or high progression rate to dementia or short survival. However, further study is required to prove this hypothesis.

What is already known in this topic?

In general middle age population, the cardiovascular risk factors and cognitive decline in middle-aged adults study[3] revealed hypertension and diabetic mellitus were positively associated with cognitive decline.

What this study adds?

In well-educated working aged adults and general well physical condition, the factors that associated with cognitive decline are age, alcoholic consumption status, and BMI greater than 30.

Potential conflicts of interest

None.

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ปัจจัยที่บ่งชี้การถดถอยของความสามารถในการคิดคำนวณและความจำของคนไทยวัยทำงาน

จงเจษฎ์ ยั้งสกุล, ซาร่าห์ โต๊ะนากายอ

วัตถุประสงค์: *เพื่อศึกษาปัจจัยทางสุขภาพที่มีความสัมพันธ์กับการถดถอยของความสามารถในการคิดคำนวณและความจำของคนไทยวัยทำงาน*

วัสดุและวิธีการ: *การศึกษาแบบตัดขวาง ข้าราชการจำนวน 310 คน ซึ่งเข้ารับการตรวจสุขภาพประจำปีตามระเบียบกรมบัญชีกลาง ณ โรงพยาบาลกัลยานิวัฒนาการุณย์ คณะแพทยศาสตร์มหาวิทยาลัยนราธิวาสราชนครินทร์ ระหว่าง เดือนมีนาคม พ.ศ. 2558 ถึงกันยายน พ.ศ. 2558 ได้รับการคัดเลือกให้เข้ารับการตรวจความสามารถในการคิดคำนวณและความจำระยะสั้น ผลการตรวจรวมเป็นคะแนนความสามารถในการคิดคำนวณและความจำ กลุ่มตัวอย่างถูกแบ่งออกเป็น 2 กลุ่ม ตามผลคะแนนรวมโดยจุดตัด คือ ค่าเปอร์เซ็นต์ไทล์ที่ 10 ผู้นิพนธ์นำผลการตรวจสุขภาพมาเปรียบเทียบระหว่างกลุ่มตัวอย่างทั้งสองเพื่อหาปัจจัยบ่งชี้ทางคลินิกที่มีความสัมพันธ์กับการถดถอยของความสามารถในการคิดคำนวณและความจำของคนไทยในวัยทำงาน*

ผลการศึกษา: *อายุเฉลี่ยของกลุ่มตัวอย่าง คือ 42.93±10.8 ปี เพศชายร้อยละ 91 ค่าเฉลี่ยของคะแนนการคำนวณและความจำระยะสั้นคือ 5.72±2.2 คะแนนที่เป็นจุดตัดคือ 3 คะแนน (เปอร์เซ็นต์ไทล์ที่ 10) มีกลุ่มตัวอย่าง 25 คน (ร้อยละ 8.1) ที่ได้คะแนนต่ำกว่า 3 คะแนน ซึ่งจัดเป็นกลุ่มตัวอย่างที่มีการถดถอยของความสามารถในการคิดคำนวณและความจำ ปัจจัยที่มีความสัมพันธ์กับกลุ่มตัวอย่างที่มีการถดถอยของความสามารถในการคิดคำนวณและความจำ คือ อายุ การดื่มสุรา และดัชนีมวลกายสูงตั้งแต่ 30 เป็นต้นไป*

สรุป: *อุบัติการณ์การถดถอยของความสามารถในการคิดคำนวณและความจำในคนวัยทำงาน คือ ร้อยละ 8.1 ปัจจัยที่มีความสัมพันธ์กับความถดถอยคืออายุ การดื่มสุรา และดัชนีมวลกายสูงตั้งแต่ 30 เป็นต้นไป*
