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Assessment of outcomes of health checkups at Mobile Health Checkup Unit, King Chulalongkorn Memorial Hospital

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Objective : *To assess the outcomes of health checkups at Mobile Health Checkup Unit of King Chulalongkorn Memorial Hospital*

Design : *Descriptive study.*

Methods : *The study was conducted in August to December 2001 by measuring heights, weights and blood pressures, recording physical and laboratory outcomes, interviewing health - checkup clients' characteristics. Data were analyzed for the percentage of abnormal findings and tested for association by Chi-square test.*

Results : *The results showed that 2230 health - checkup clients were : 924 males (41.4 %) and 1306 females (58.6 %); 97.4 % were 25 - 59 years old. 96.6 % were Buddhist; 74.1 % had bachelor degree education or higher; 9.8 % were smokers; 27.3 % were alcohol drinkers; and 53.9 % had no regular exercise. Their physical and laboratory results showed that 5.0 % of the clients were obese; 22.6 % were hypertensive; 3.1 % were diabetic mellitus; 49.6 % and 4.6 % had high blood cholesterol at 221-299 mg % and higher than 300 mg %, respectively; 4.7% and 14.8 % were anemic in males and in females respectively. The associations between BMI and cholesterol, fasting blood sugar and hypertension were statistically significant ($p < 0.001$).*

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Conclusion : *Obesity, hypertension, hyperlipidemia and anemia were major health problems of health - checkup clients.*

Key words : *Health examination, Assessment.*

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วัตถุประสงค์ : *เพื่อประเมินผลการตรวจสุขภาพของผู้มารับการตรวจสุขภาพที่หน่วยตรวจสุขภาพนอกสถานที่*

รูปแบบการวิจัย : *การศึกษาเชิงพรรณนา*

วิธีการศึกษา : *การศึกษานี้ได้ดำเนินการตั้งแต่เดือนสิงหาคมถึงธันวาคม 2544 โดยการวัดส่วนสูง ชั่งน้ำหนัก วัดความดันโลหิต บันทึกผลการตรวจร่างกายและการตรวจทางห้องปฏิบัติการ สัมภาษณ์ข้อมูลทั่วไปของผู้มารับการตรวจสุขภาพวิเคราะห์ข้อมูลหาร้อยละของความผิดปกติและทดสอบหาความสัมพันธ์ระหว่างตัวแปรโดยการทดสอบไคสแคว์*

ผลการศึกษา : *ผลการศึกษาพบว่าผู้มารับการตรวจสุขภาพ 2230 ราย เป็นเพศชาย 924 คน (ร้อยละ 41.4) เพศหญิง 1306 คน (ร้อยละ 58.6) อายุระหว่าง 25-59 ปี ร้อยละ 97.4 นับถือศาสนาพุทธร้อยละ 96.6 จบการศึกษาระดับปริญญาตรีและสูงกว่าร้อยละ 74.1 สูบบุหรี่ร้อยละ 9.8 ดื่มเหล้าร้อยละ 27.3 ไม่ออกกำลังกายร้อยละ 53.9 ผลการตรวจสุขภาพพบมีดัชนีมวลกายอยู่ในเกณฑ์อ้วน ร้อยละ 5.0 ความดันโลหิตสูง ร้อยละ 22.6 ตรวจเลือดพบเป็นโรค เบาหวาน ร้อยละ 3.1 มีไขมันคลอเลสเตอรอลอยู่ในเกณฑ์สูงระดับ 221-299 มก. % ร้อยละ 49.6 และมากกว่า 300 มก.% ขึ้นไปร้อยละ 4.6 มีภาวะโลหิตจางในเพศชายร้อยละ 4.7 เพศหญิงร้อยละ 14.8 พบมีความสัมพันธ์ทางสถิติใน เชิงบวกระหว่างตัวแปรดัชนีมวลกายและอาหารที่มีไขมันสูง น้ำตาลในเลือดและความดันโลหิตสูงอย่างมีนัยสำคัญทางสถิติ*

สรุป : *ความอ้วน ความดันโลหิตสูง ไขมันในเลือดสูง และ ภาวะโลหิตจางเป็นปัญหาสุขภาพอนามัยที่สำคัญของผู้มารับการตรวจสุขภาพ*

Health checkup is a procedural examination run by a physician which usually includes taking of medical history and current physical condition, a complete physical examination, and selected laboratory or special tests. Physical examination may be conducted annually, or in some situations, timely selective (i.e., periodic health examination). The latter is a precautious procedure for the detection of asymptomatic pathology, in seemingly healthy persons with its objective to establish a medical database, i.e., aiming to detect a disease in its early asymptomatic state. It is also undertaken to determine the risks of subsequent development of a disease.[1-4]

Interest in annual or periodic health examination programs is increasing in Thailand. The annual and periodic health examination programs outside hospital have been performed by Mobile Health Checkup Units, King Chulalongkorn Memorial Hospital for a number of years. So far there has not been any assessment of the general outcomes of the health checkup service. In order to achieve the goal of productive health examination programs, there should be a higher level of competent health practices and the development of research in health checkup-services .

The purpose of the study was to assess the overall outcome of health examination run at Mobile Health Checkup Unit of King Chulalongkorn Memorial Hospital.

Materials and Methods

The research design in this study was a descriptive study. The study population was health-checkup clients at the Mobile Health Checkup Unit, aged 20 years and over in August to December 2001. Total sampling size was 2,230 clients from government officials. All health-checkup clients were measured for height, body weight and blood pressure. Their physical and their results of laboratory examinations were recorded. The health-checkup clients were interviewed for their general health behavior: age, sex, marital status, religion and education. The data were analyzed by SPSS for Window for percentage of abnormal findings, and tested for association by Chi-square test. The body mass index was calculated by body weight per body surface area.

$$BMI = Weight/height^2 \ (Kg/m^2)$$

The body mass index was classified by WHO criterion:[5,6]

1. Underweight	BMI less than 20.00
2. Normal	BMI 20.00 - 24.99
3. Overweight	BMI 25.00 - 29.99
4. Obesity	BMI 30.00 and over

The blood pressure records were classified according to The Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC V) :[7,8]

	Systolic BP mm Hg	Diastolic BP mm Hg
1. Normal	<140	<90
2. Mild hypertension	140-159	90-99
3. Moderate hypertension	160-179	100-109
4. Severe hypertension	180-209	110-119
5. Very severe hypertension	210 and over	120 and over

Results

The results showed that the general characteristics of the 2230 clients, aged between 25 to 59 years (97.4 %), 924 males (41.4 %) and 1306

females (58.6 %), as shown in Table 1. 64.4 % were married. 96.6 % were Buddhists; and 74.1 % had bachelor degree education or higher. The health behaviors of the health-checkup clients were shown in Table; 2. 9.8 % were smokers; 27.3 % were alcohol drinkers and 53.9 % had no regular exercise. Their physical and laboratory results showed that 5.0 % were obese. The obesity in females (4.6 %) was lower than in males (5.5 %), and the overweight (BMI 25-29.99) in females (17.2 %) was also lower than in males (34.5 %) (Table 3). Hypertension increased with aging; 22.6 % were hypertensive. The mild and moderate hypertensions were 16.6% and 5.6 %, respectively (Table 4). The abnormal fasting blood sugar level (FBS) 126 mg/dl and higher was 3.1 %. The abnormal FBS was increasing in the age group of 50-54 years and higher, as shown in Table 5. The abnormal Cr>2 mg/dl were only 0.3 % (6 persons). This suggested possibilities of renal pathology (Table 6). The abnormal uric acid level (>7.0 mg %) was higher in males (33.7 %) than in females (2.7 %), as shown in Table 7. The abnormal serum cholesterol (221-299 mg/dl) was 49.6 %, while the abnormal serum cholesterol 300 mg/dl and higher was 4.6 % (Table 8). The abnormal triglyceride level (156-299 mg/dl) was 17.0 % while the abnormal level (300 mg/dl and over) was 3.8 % (Table 9). The HDL-Cholesterol ≥ 50 mg/dl was higher in females

Table 1. General characteristics of health checkup clients at Mobile Health Checkup Unit .

General characteristics	Number	Percent
1. Sex (n = 2230)		
Male	924	41.4
Female	1306	58.6
2. Age group (n = 2230)		
20-24 Yr.	37	1.7
25-29 Yr.	145	6.5
30-34 Yr.	264	11.8
35-3 Yr.	443	19.9
40-44 Yr.	430	19.3
45-49 Yr.	412	18.5
50-54 Yr.	291	13.0
55-59 Yr.	188	8.4
≥ 60 Yr.	20	0.9
3. Marital status (n = 2220)		
Single	673	30.3
Married	1430	64.4
Widowed	117	5.2
4. Religion (n = 2175)		
Buddhist	2102	96.6
Other	73	3.4
5. Education (n = 2200)		
Lower than Bachelor degree	569	25.9
Bachelor degree	1156	52.5
Master degree and higher	475	21.6

Table 2. Number and percent of health behavior of health checkup clients.

Health behavior	Number	Percent
Smoking behavior		
Non-smoking	1989	90.2
Smoking	215	9.8
Total	220	100.0
Alcoholic drinking behavior		
Non-drinking	1597	72.7
Drinking	599	27.3
Total	2196	100.0
Exercise behavior		
Non-Exercise	1190	53.9
Exercise	1019	46.1
Total	2209	100.0

(81.7 %) than males (49.4 %), as shown in Table 10. The distribution of SGPT level by age was shown in Table 11. There was no definite variation found with aging. The one-fold abnormal level (39-76) was 14.1 %; and the two-fold abnormal level (>76) was 3.5 %. The association between SGPT and Alcohol consumption was statistically significant ($p < 0.001$) as shown in Table 12. Anemia in females (Hb < 12 g/dl) was 14.8 %, which was higher than in males (4.7 %) (Table 13). Associations between BMI and cholesterol, fasting blood sugar and hypertension were statistically significant ($p < 0.001$) as shown in Table 14, Table 15 and Table 16.

Table 3. Number and percent of health checkup clients' body mass index by sex.

Sex	Body Mass Index				Total
	Underweight	Normal	Overweight	Obesity	
Male	65	489	319	51	924
	7.0 %	52.9 %	34.5 %	5.5 %	100.0 %
Female	311	711	224	60	1306
	23.8 %	54.4 %	17.2 %	4.6 %	100.0 %
Total	376	1200	543	111	2230
	16.9 %	53.8 %	24.3 %	5.0 %	100.0 %

$\chi^2 = 158.8, p < 0.001$

Table 4. Number and percent of health checkup clients' blood pressure by age.

Age group	Levels of blood pressure				Total
	Normal (SBP<140 and DBP<90	Mild Hypertension (SBP 140-159 or DBP 90-99)	Moderate hypertension (SBP 160-179 or DBP 100-109)	Severe hypertension (SBP 180-209 or DBP 110-119)	
20-24 Yr.	91.9%	5.4%	2.7%	0.0%	100.0% (37)
25-29 Yr.	96.6%	3.4%	0.0%	0.0%	100.0% (145)
30-34 Yr.	84.1%	13.3%	2.3%	0.4%	100.0% (264)
35-39 Yr.	84.7%	12.4%	2.9%	0.0%	100.0% (443)
40-44 Yr.	79.8%	16.3%	3.3%	0.7%	100.0% (430)
45-49 Yr.	72.1%	19.4%	8.0%	0.5%	100.0% (412)
50-54 Yr.	65.6%	24.7%	9.3%	0.3%	100.0% (291)
55-59 Yr.	59.6%	25.5%	13.8%	1.0%	100.0% (188)
≥ 60 Yr.	60.0%	15.0%	25.0%	0.0%	100.0% (20)
Total	77.4%	16.6%	5.6%	0.4%	100.0% (2230)

Table 5. Percent of health checkup clients' Fasting blood sugar (FBS) mg/dl by age and sex.

Age Group	Levels of Fasting blood sugar (mg/dl)											
	Male				Female				Total			
	Normal (<110)	IFG (110-125)	≥126	Total (n)	Normal (<110)	IFG (110-125)	≥126	Total (n)	Normal (<110)	IFG (110-125)	≥126	Total (n)
20-24 Yr.	100.0 %	0.0 %	0.0 %	100.0 % (13)	100.0 %	0.0 %	0.0 %	100.0 % (23)	100.0 %	0.0 %	0.0 %	100.0 % (36)
25-29 Yr.	100.0 %	0.0 %	0.0 %	100.0 % (56)	98.8 %	1.2 %	0.0 %	100.0 % (81)	99.3 %	0.7 %	0.0 %	100.0 % (137)
30-34 Yr.	95.2 %	3.2 %	1.6 %	100.0 % (125)	99.2 %	0.0 %	0.8 %	100.0 % (128)	97.2 %	1.6 %	1.2 %	100.0 % (253)
35-39 Yr.	96.9 %	2.6 %	0.5 %	100.0 % (194)	99.6 %	0.0 %	0.4 %	100.0 % (249)	98.4 %	1.1 %	0.5 %	100.0 % (443)
40-44 Yr.	90.2 %	6.0 %	3.8 %	100.0 % (184)	95.1 %	2.0 %	2.8 %	100.0 % (246)	93.0 %	3.7 %	3.3 %	100.0 % (430)
45-49 Yr.	87.2 %	5.4 %	7.4 %	100.0 % (148)	98.1 %	1.5 %	0.4 %	100.0 % (262)	94.1 %	2.9 %	2.9 %	100.0 % (410)
50-54 Yr.	85.8 %	7.1%	7.1 %	100.0 % (113)	90.4 %	6.7 %	2.8 %	100.0 % (178)	88.7 %	6.9 %	4.5 %	100.0 % (291)
55-59 Yr.	81.1 %	4.1%	14.9 %	100.0 % (74)	84.2 %	7.0 %	8.8 %	100.0 % (114)	83.0 %	5.9 %	11.2 %	100.0 % (188)
≥ 60 Yr.	66.7 %	22.2%	11.1 %	100.0 % (9)	81.8 %	0.0 %	18.2 %	100.0 % (11)	75.0 %	10.0 %	15.0 %	100.0 % (20)
Total	91.0 %	4.5%	4.5 %	100.0 % (916)	95.6 %	2.3 %	2.1 %	100.0 % (1292)	93.7 %	3.2 %	3.1 %	100.0 % (2208)

Table 6. Percent of health checkup clients' creatinine (Cr) by age and sex.

Age group	Levels of Creatinine (mg/dl)											
	Male				Female				Total			
	< 1.5	1.5-2.0	> 2.0	Total (n)	< 1.5	1.5-2.0	> 2.0	Total (n)	< 1.5	1.5-2.0	> 2.0	Total (n)
20-24 Yr.	92.3 %	0.0 %	7.7 %	100.0 % (13)	100.0 %	0.0 %	0.0 %	100.0 % (21)	97.1 %	0.0 %	2.9 %	100.0 % (34)
25-29 Yr.	100.0 %	0.0 %	0.0 %	100.0 % (51)	98.7 %	0.0 %	1.3 %	100.0 % (78)	99.2 %	0.0 %	0.8 %	100.0 % (129)
30-34 Yr.	100.0 %	0.0 %	0.0 %	100.0 % (54)	100.0 %	0.0 %	0.0 %	100.0 % (80)	100.0 %	0.0 %	0.0 %	100.0 % (134)
35-39 Yr.	100.0 %	0.0 %	0.0 %	100.0 % (129)	100.0 %	0.0 %	0.0 %	100.0 % (204)	100.0 %	0.0 %	0.0 %	100.0 % (333)
40-44 Yr.	99.5 %	0.5 %	0.0 %	100.0 % (184)	99.2 %	0.4 %	0.4 %	100.0 % (246)	99.3 %	0.5 %	0.2 %	100.0 % (430)
45-49 Yr.	97.3 %	2.0 %	0.7 %	100.0 % (150)	99.2 %	0.8 %	0.0 %	100.0 % (262)	98.5 %	1.2 %	0.2 %	100.0 % (412)
50-54 Yr.	100.0 %	0.0 %	0.0 %	100.0 % (113)	99.4 %	0.0 %	0.6 %	100.0 % (178)	99.7 %	0.0 %	0.3 %	100.0 % (291)
55-59 Yr.	97.3 %	2.7 %	0.0 %	100.0 % (74)	100.0 %	0.0 %	0.0 %	100.0 % (114)	98.9 %	1.1 %	0.0 %	100.0 % (188)
≥ 60 Yr.	100.0 %	0.0 %	0.0 %	100.0 % (9)	100.0 %	0.0 %	0.0 %	100.0 % (11)	100.0 %	0.0 %	0.0 %	100.0 % (20)
Total	99.0 %	0.8 %	0.3 %	100.0 % (777)	99.5 %	0.3%	0.3 %	100.0 % (1194)	99.3 %	0.5 %	0.3 %	100.0 % (1971)

Table 7. Percent of health checkup clients' uric acid (mg/dl) by age and sex.

Age group	Levels of Uric acid (mg/dl)											
	Male				Female				Total			
	< 7.0	7.0-10.0	> 10.0	Total (n)	< 7.0	7.0-10.0	> 10.0	Total (n)	< 7.0	7.0-10.0	> 10.0	Total (n)
20-24 Yr.	76.9 %	23.1 %	0.0 %	100.0 % (13)	100.0 %	0.0 %	0.0 %	100.0 % (19)	90.6 %	9.4 %	0.0 %	100.0 % (32)
25-29 Yr.	78.3 %	21.7 %	0.0 %	100.0 % (46)	100.0 %	0.0 %	0.0 %	100.0 % (68)	91.2 %	8.8 %	0.0 %	100.0 % (114)
30-34 Yr.	69.2 %	30.8 %	0.0 %	100.0 % (52)	100.0 %	0.0 %	0.0 %	100.0 % (66)	86.4 %	13.6 %	0.0 %	100.0 % (118)
35-39 Yr.	62.3 %	36.9 %	0.8 %	100.0 % (130)	99.0 %	1.0 %	0.0 %	100.0 % (203)	84.7 %	15.0 %	0.3 %	100.0 % (333)
40-44 Yr.	67.9 %	29.9 %	2.2 %	100.0 % (184)	98.4 %	1.6 %	0.0 %	100.0 % (246)	85.3 %	13.7 %	0.9 %	100.0 % (430)
45-49 Yr.	61.7 %	36.2 %	2.0 %	100.0 % (149)	97.7 %	2.3 %	0.0 %	100.0 % (262)	84.7 %	14.6 %	0.7 %	100.0 % (411)
50-54 Yr.	67.3 %	31.0 %	1.8 %	100.0 % (113)	94.9 %	3.9 %	1.1 %	100.0 % (178)	84.2 %	14.4 %	1.4 %	100.0 % (291)
55-59 Yr.	66.2 %	31.1 %	2.7 %	100.0 % (74)	91.2 %	7.0 %	1.8 %	100.0 % (114)	81.4 %	16.5 %	2.1 %	100.0 % (188)
≥ 60 Yr.	66.7 %	33.3 %	0.0 %	100.0 % (9)	90.9 %	9.1 %	0.0 %	100.0 % (11)	80.0 %	20.0 %	0.0 %	100.0 % (20)
Total	66.4 %	32.1 %	1.6 %	100.0 % (770)	97.3 %	2.4 %	0.3 %	100.0 % (1167)	85.0 %	14.2 %	0.8 %	100.0 % (1937)

Table 8. Percent of health checkup clients' Cholesterol mg/dl by age and sex.

Age group	Levels of Cholesterol (mg/dl)											
	Male				Female				Total			
	Normal (≤ 220)	221-299	≥ 300	Total (n)	Normal (≤ 220)	221-299	≥ 300	Total (n)	Normal (≤ 220)	221-299	≥ 300	Total (n)
20-24 Yr.	61.5 %	38.5 %	0.0%	100.0 % (13)	68.2 %	31.8 %	0.0 %	100.0 % (22)	65.7 %	34.3 %	0.0 %	100.0% (35)
25-29 Yr.	55.6 %	40.7 %	3.7%	100.0 % (54)	66.7 %	32.1 %	1.2 %	100.0 % (84)	62.3 %	35.5 %	2.2 %	100.0% (138)
30-34 Yr.	50.4 %	42.5 %	7.1%	100.0 % (127)	70.2 %	29.0 %	0.8 %	100.0 % (131)	60.5 %	35.7 %	3.9 %	100.0% (258)
35-39 Yr.	47.9 %	49.0 %	3.1%	100.0 % (194)	59.0 %	39.0 %	2.0 %	100.0 % (249)	54.2 %	43.3 %	2.5 %	100.0% (443)
40-44 Yr.	41.3 %	52.7 %	6.0%	100.0 % (184)	50.0 %	44.7 %	5.3 %	100.0 % (246)	46.3 %	48.1 %	5.6 %	100.0% (430)
45-49 Yr.	37.6 %	55.7 %	6.7%	100.0 % (149)	38.9 %	57.6 %	3.4 %	100.0 % (262)	38.4 %	56.9 %	4.6 %	100.0% (411)
50-54 Yr.	25.7 %	67.3 %	7.1%	100.0 % (113)	28.1 %	65.2 %	6.7 %	100.0 % (178)	27.1%	66.0 %	6.9 %	100.0% (291)
55-59 Yr.	35.1 %	60.8 %	4.1%	100.0 % (74)	36.0 %	53.5 %	10.5 %	100.0 % (114)	35.6 %	56.4 %	8.0 %	100.0% (188)
≥ 60 Yr.	33.3 %	66.7 %	0.0%	100.0 % (9)	27.3 %	72.7 %	0.0 %	100.0 % (11)	30.0 %	70.0 %	0.0 %	100.0% (20)
Total	42.0 %	52.7 %	5.3%	100.0 % (917)	48.5 %	47.4 %	4.1%	100.0 % (1297)	45.8 %	49.6 %	4.6 %	100.0% (2214)

Table 9. Percent of health checkup clients' triglyceride mg/dl by age and sex.

Age group	Levels of Triglyceride (mg/dl)														
	Male					Female					Total				
	Normal (≤ 155)	156-299	≥ 300	Total	(n)	Normal (≤ 155)	156-299	≥ 300	Total	(n)	Normal (≤ 155)	156-299	≥ 300	Total	(n)
20-24 Yr.	92.3 %	7.7 %	0.0 %	100.0 %	(13)	100.0 %	0.0 %	0.0 %	100.0 %	(22)	97.1 %	2.9 %	0.0 %	100.0 %	(35)
25-29 Yr.	87.0 %	9.3 %	3.7 %	100.0 %	(54)	95.1 %	4.9 %	0.0 %	100.0 %	(82)	91.9 %	6.6 %	1.5 %	100.0 %	(136)
30-34 Yr.	68.5 %	25.2 %	6.3 %	100.0 %	(127)	94.6 %	5.4 %	0.0 %	100.0 %	(130)	81.7 %	15.2 %	3.1 %	100.0 %	(257)
35-39 Yr.	68.6 %	22.2 %	9.3 %	100.0 %	(194)	92.8 %	6.4 %	0.8 %	100.0 %	(249)	82.2 %	13.3 %	4.5 %	100.0 %	(443)
40-44 Yr.	59.2 %	33.7 %	7.1 %	100.0 %	(184)	91.9 %	7.7 %	0.4 %	100.0 %	(246)	77.9 %	18.8 %	3.3 %	100.0 %	(430)
45-49 Yr.	55.0 %	36.9 %	8.1 %	100.0 %	(149)	87.4 %	11.8 %	0.8 %	100.0 %	(262)	75.7 %	20.9 %	3.4 %	100.0 %	(411)
50-54 Yr.	68.1 %	25.7 %	6.2 %	100.0 %	(113)	83.7 %	11.8 %	4.5 %	100.0 %	(178)	77.7 %	17.2 %	5.2 %	100.0 %	(291)
55-59 Yr.	59.5 %	32.4 %	8.1 %	100.0 %	(74)	77.0 %	20.4 %	2.7 %	100.0 %	(113)	70.1 %	25.1 %	4.8 %	100.0 %	(187)
≥ 60 Yr.	66.7 %	22.2 %	11.1 %	100.0 %	(9)	81.8 %	18.2 %	0.0 %	100.0 %	(11)	75.0 %	20.0 %	5.0 %	100.0 %	(20)
Total	65.1 %	27.6 %	7.3 %	100.0 %	(917)	89.2 %	9.5 %	1.2 %	100.0 %	(1293)	79.2 %	17.0 %	3.8 %	100.0 %	(2210)

Table 10. Percent of health checkup clients' HDL-Cholesterol mg/dl by age and sex.

Age group	Levels of HDL-Cholesterol (mg/dl)														
	Male					Female					Total				
	< 35	35-49	≥ 50	Total	(n)	< 35	35-49	≥ 50	Total	(n)	< 35	35-49	≥ 50	Total	(n)
20-24 Yr.	0.0 %	36.4 %	63.6 %	100.0 %	(11)	0.0 %	5.3 %	94.7%	100.0 %	(19)	0.0 %	16.7 %	83.3 %	100.0 %	(30)
25-29 Yr.	3.8 %	36.5 %	59.6 %	100.0 %	(52)	1.7 %	11.9 %	86.4%	100.0 %	(59)	2.7 %	23.4 %	73.9 %	100.0 %	(111)
30-34 Yr.	1.8 %	42.1 %	56.1 %	100.0 %	(57)	0.0 %	12.9 %	87.1%	100.0 %	(62)	0.8 %	26.9 %	72.3 %	100.0 %	(119)
35-39 Yr.	5.2 %	43.3 %	51.5 %	100.0 %	(97)	0.0 %	18.2 %	81.8%	100.0 %	(143)	2.1 %	28.3 %	69.6 %	100.0 %	(240)
40-44 Yr.	4.6 %	47.7 %	47.7 %	100.0 %	(109)	2.4 %	18.9 %	78.7%	100.0 %	(164)	3.3 %	30.4 %	66.3 %	100.0 %	(273)
45-49 Yr.	2.9 %	61.8 %	35.3 %	100.0 %	(102)	0.6 %	16.9 %	82.5%	100.0 %	(177)	1.4 %	33.3 %	65.2 %	100.0 %	(279)
50-54 Yr.	1.5 %	40.0 %	58.5 %	100.0 %	(65)	0.9 %	19.0 %	80.2%	100.0 %	(116)	1.1 %	26.5 %	72.4 %	100.0 %	(181)
55-59 Yr.	10.0 %	47.5 %	42.5 %	100.0 %	(40)	1.4 %	18.8 %	79.7%	100.0 %	(69)	4.6 %	29.4 %	66.1 %	100.0 %	(109)
≥ 60 Yr.	0.0 %	42.9 %	57.1 %	100.0 %	(7)	0.0 %	42.9 %	57.1%	100.0 %	(7)	0.0 %	42.9 %	57.1 %	100.0 %	(14)
Total	3.9 %	46.7 %	49.4 %	100.0 %	(540)	1.0 %	17.3 %	81.7%	100.0 %	(816)	2.1 %	29.0 %	68.9 %	100.0 %	(1356)

Table 11. Percent of health checkup clients' SGPT (ALT) by age and sex.

Age group	Levels of SGPT (ALT)														
	Male					Female					Total				
	0-38	39-76	> 76	Total (n)		0-38	39-76	> 76	รวม (n)		0-38	39-76	> 76	รวม (n)	
20-24 Yr.	100.0 %	0.0 %	0.0 %	100.0 %	(13)	94.7 %	5.3 %	0.0 %	100.0 %	(19)	96.9 %	3.1 %	0.0 %	100.0 %	(32)
25-29 Yr.	78.8 %	15.4 %	5.8 %	100.0 %	(52)	93.4 %	5.3 %	1.3 %	100.0 %	(76)	87.5 %	9.4 %	3.1 %	100.0 %	(128)
30-34 Yr.	75.0 %	21.4 %	3.6 %	100.0 %	(56)	96.2 %	1.3 %	2.6 %	100.0 %	(78)	87.3 %	9.7 %	3.0 %	100.0 %	(134)
35-39 Yr.	65.1 %	27.1 %	7.8 %	100.0 %	(129)	93.1 %	5.4 %	1.5 %	100.0 %	(204)	82.3 %	13.8 %	3.9 %	100.0 %	(333)
40-44 Yr.	67.4 %	25.5 %	7.1 %	100.0 %	(184)	94.7 %	5.3 %	0.0 %	100.0 %	(246)	83.0 %	14.0 %	3.0 %	100.0 %	(430)
45-49 Yr.	59.7 %	33.6 %	6.7 %	100.0 %	(149)	92.0 %	6.1 %	1.9 %	100.0 %	(262)	80.3 %	16.1 %	3.6 %	100.0 %	(411)
50-54 Yr.	67.3 %	29.2 %	3.5 %	100.0 %	(113)	87.6 %	9.0 %	3.4 %	100.0 %	(178)	79.7 %	16.8 %	3.4 %	100.0 %	(291)
55-59 Yr.	73.0 %	24.3 %	2.7 %	100.0 %	(74)	86.8 %	8.8 %	4.4 %	100.0 %	(114)	81.4 %	14.9 %	3.7 %	100.0 %	(188)
≥ 60 Yr.	66.7 %	22.2 %	11.1 %	100.0 %	(9)	80.0 %	10.0 %	10.0 %	100.0 %	(10)	73.7 %	15.8 %	10.5 %	100.0 %	(20)
Total	67.9 %	26.3 %	5.8 %	100.0 %	(779)	91.9 %	6.1 %	1.9 %	100.0 %	(1187)	82.4 %	14.1 %	3.5 %	100.0 %	(1966)

Table 12. Number and percent of health checkup clients' Levels of SGPT (ALT) by alcohol consumption.

Alcohol Consumption	Levels of SGPT (ALT)			Total (n)
	0 -38	39-7	> 76	
Yes	1217	159	39	1415
	86.0 %	11.2 %	2.8 %	100.0 %
No	380	111	29	520
	73.1 %	21.3 %	5.6 %	100.0 %
Total	1597	270	68	1935
	82.5 %	14.0 %	3.5 %	100.0 %

χ^2 = 44.164, $p < 0.001$

Table 13. Percent of health checkup clients' Hemoglobin (g/dl) by age and sex.

Age group	Levels of Hemoglobin (g/dl)														
	Male					Female					Total				
	Lower	Normal*	Upper	Total (n)		Lower	Normal*	Upper	Total (n)		Lower	Normal*	Upper	Total (n)	
20-24 Yr.	7.7 %	92.3 %	0.0 %	100.0 %	(13)	4.2 %	95.8 %	0.0 %	100.0 %	(24)	5.4 %	94.6 %	0.0 %	100.0 %	(37)
25-29 Yr.	3.4 %	96.6 %	0.0 %	100.0 %	(58)	9.2 %	90.8 %	0.0 %	100.0 %	(87)	6.9 %	93.1 %	0.0 %	100.0 %	(145)
30-34 Yr.	4.7 %	95.3 %	0.0 %	100.0 %	(129)	14.1 %	85.9 %	0.0 %	100.0 %	(135)	9.5 %	90.5 %	0.0 %	100.0 %	(264)
35-39 Yr.	3.6 %	96.4 %	0.0 %	100.0 %	(194)	18.5 %	81.1 %	0.4 %	100.0 %	(249)	12.0 %	87.8 %	0.2 %	100.0 %	(443)
40-44 Yr.	4.4 %	95.1 %	0.5 %	100.0 %	(182)	15.4 %	84.6 %	0.0 %	100.0 %	(246)	10.7 %	89.0%	0.2 %	100.0 %	(428)
45-49 Yr.	2.7 %	97.3 %	0.0 %	100.0 %	(149)	13.8 %	86.2 %	0.0 %	100.0 %	(261)	9.8 %	90.2 %	0.0 %	100.0 %	(410)
50-54 Yr.	4.4 %	95.6 %	0.0 %	100.0 %	(113)	14.1 %	85.9 %	0.0 %	100.0 %	(177)	10.3 %	89.7 %	0.0 %	100.0 %	(290)
55-59 Yr.	12.2 %	86.5 %	1.4 %	100.0 %	(74)	17.5 %	82.5%	0.0 %	100.0 %	(114)	15.4%	84.0 %	0.5 %	100.0 %	(188)
≥ 60 Yr.	11.1 %	88.9 %	0.0 %	100.0 %	(9)	0.0 %	100.0 %	0.0 %	100.0 %	(11)	5.0 %	95.0 %	0.0 %	100.0 %	(20)
Total	4.7 %	95.1 %	0.2 %	100.0 %	(921)	14.8 %	85.1 %	0.1%	100.0 %	(1304)	10.6 %	89.3 %	0.1 %	100.0 %	(2225)

* Normal hemoglobin in male 13-18 g/dl, female 12-16 g/dl

Table 14. Number and percent of health checkup clients by cholesterol and BMI.

BMI	Cholesterol (mg/dl)			Total
	Normal (≤ 220)	221-299	≥ 300	
Underweight	235	130	5	370
(< 20.00)	63.5 %	35.1%	1.4 %	100.0 %
Normal	547	592	54	1193
(20.00-24.99)	45.9 %	49.6 %	4.5 %	100.0 %
Overweight	202	306	33	541
(25.00-29.99)	37.3 %	56.6 %	6.1 %	100.0 %
Obesity	30	70	10	110
(≥ 30.00)	27.3 %	63.6 %	9.1 %	100.0 %
Total	1014	1098	102	2214
	45.8 %	49.6 %	4.6 %	100.0 %

$\chi^2 = 83.27$, $p < 0.001$

Table 15. Number and percent of health checkup clients by Fasting Blood Sugar and BMI.

BMI	Fasting Blood Sugar (FBS) mg/dl			Total
	Normal (≤ 110)	110 - 125	≥ 126	
Underweight	364	1	3	368
(< 20.00)	98.9 %	0.3 %	0.8 %	100.0 %
Normal	1140	30	21	1191
(20.00-24.99)	95.7 %	2.5 %	1.8 %	100.0 %
Overweight	475	30	33	538
(25.00-29.99)	88.3 %	5.6 %	6.1 %	100.0 %
Obesity	90	10	11	111
(≥ 30.00)	81.1 %	9.0 %	9.9 %	100.0 %
Total	2069	71	68	2208
	93.7 %	3.2 %	3.1 %	100.0 %

$\chi^2 = 83.72$, $p < 0.001$

Table 16. Number and percent of health checkup clients by hypertension and BMI.

BMI	Levels of Hypertension			Total
	Normal	Mild Hypertension	Moderate and Severe Hypertension	
Underweight	353	21	2	376
(< 20.00)	93.9 %	5.6 %	0.5 %	100.0 %
Normal	979	175	46	1200
(20.00-24.99)	81.6 %	14.6 %	3.8 %	100.0 %
Overweight	341	138	64	543
(25.00-29.99)	62.8 %	25.4 %	11.8 %	100.0 %
Obesity	53	36	22	111
(≥ 30.00)	47.7 %	32.4 %	19.8 %	100.0 %
Total	1726	370	134	2230
	77.4 %	16.6 %	6.0 %	100.0 %

χ^2 = 209.73, $p < 0.001$

Discussion

The negative health behaviors of health-checkup clients should be prevented. 9.8 % were smokers; 27.3 % were alcohol drinkers; and 53.9 % had no regular exercise. The clients should have at least three regular exercises per week. The Second Edition of the US Preventive Service Task Force Guide recommends to clinical preventive services that physical activity and fitness reduce morbidity and mortality for at least six chronic conditions: coronary heart disease, hypertension, obesity, diabetes, osteoporosis and mental health disorders.[9] The factors influencing optimal frequency of health examination include patient's or client 's age, occupation and environmental hazardous exposure, medical history and personal health behavior.[10-12] The rate of obesity in this study was 5.0 % which was higher than the First National Health Examination Survey (4.0 %) [13], in this study, however, obesity in males was more common than that in females. Either systolic or diastolic hypertension was 22.6 %. The figure was higher than that of the Hypertension Survey at District Kogesamrong, Lopburi (19.7 %).[14] Both used the same definition for hypertension. Fasting blood sugar 126 mg/dl and higher in two consecutive examinations indicates diabetes mellitus. The abnormal FBS at this level was 3.1 % in single examination. The abnormal Cr>2 was relatively small (0.3 %). The high Cr level indicates an abnormal renal function. It was economical reason to have Cr tested alone instead of running both BUN and Cr tests. The prevalence of abnormalities of BUN and Cr from the Shinawatra's employee the routine was very low, 0.08 % for male and 0.04 % for female. They did not recommend the routine use of fasting BUN and Cr. [15] The abnormal uric acid in males (33.7 %) was higher than females (2.7 %). This might be due to the eating-out habit of office personnel. The abnormal SGPT (>76) was 3.5%. Those with three times higher level of normal SGPT indicates hepatocellular damage. Abnormal serum

cholesterol (221-299 mg/dl) in this study was 49.6 %, while in the Second National Health Examination Survey was only 34.4 %.[15] The associa-tions between BMI and cholesterol, fasting blood sugar or hypertension were statistically significant. The medical hazard of obesity was clearly determined. Obesity-related morbidity and mortality increase directly with BMI.[16-18] Management of obesity presents a major challenge to primary care physicians.

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References

1. Han PK. Historical changes in the objectives of the periodic health examination. Ann Intern Med 1997 Nov;127(10): 910 - 7
2. Siegel GS. An American dilemma-the periodic health examination. Arch Environ Health 1966 Sep; 13(3): 292 - 5
3. World Health Organization. Mass health examinations. Public Health Paper No.45. Geneva: World Health Organization, 1971
4. Fletcher SW, Spitzer WO. Approach of the Canadian Task Force to the Periodic Health Examination. Ann Intern Med 1980 Feb; 92(2 Pt 1): 253 - 4
5. WHO Expert Committee. Physical status: the use and interpretation of anthropology. World Health Organ Tech Rep Ser 1995;854:312-452
6. de Onis M, Habicht JP. Anthropometric reference data for international use: recommendations from a World Health Organization Expert Committee. Am J Clin Nutr 1996 Oct; 64(4): 650 - 8
7. WHO Expert Committee. Hypertension control. World Health Organ Tech Rep Ser 1996; 862: 1 - 83
8. The fifth report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC V). Arch Intern Med 1993 Jan 25; 153(2): 154 - 83
9. U.S. Preventive Services Task Force. Guide to Clinical Preventive Services. Baltimore: Williams & Wilkins,1996
10. Medical Practice Committee, American College of Physicians. Periodic health examination: a guide for designing individualized preventive health care in the asymptomatic patients. Ann Intern Med 1981 Dec; 95(6): 729 - 32
11. Eddy D. ACS report on the cancer-related health checkup. CA Cancer J Clin 1980 Jul-Aug; 30(4): 193 - 240
12. Delbanco TL, Taylor WC. The periodic health examination, 1980. Ann Intern Med 1980 Feb; 92(2 Pt 1): 251 - 2
13. Chuprapawan J. The first national health interview and examination survey 1991-1992. Bangkok: Design, 1996
14. Archananuparp S, Chumtong N, Satitniramai S, Siratapaungsa P. Evaluative and developmental research on quality of health care for hypertensive patients. Thailand Health Research Institute, 1999
15. Thailand Health Research Institute: The second national health examination survey 1996-1997.

Ministry of Public Health, 1998

16. Rexrode KM, Hennekens CH, Willett WC, Colditz GA, Stampfer MJ. A prospective study of body mass index, weight change, and risk of stroke in women. New Engl J Med 1990 Mar 29; 322(13): 882 - 9
17. Pi-Sunyer FX. Medical hazards of obesity. Ann Intern Med 1993 Oct 1; 119(7 pt 2): 655 - 60
18. Dorn JM, Schisterman EF, Winkelstein W Jr, Trevisan M. Body Mass Index and Mortality in ageneral population sample of men and women. The Buffalo Health Study. Am J Epidemiol 1997 Dec1; 146(11): 919 - 31