A STUDY OF FACTORS ASSOCIATED WITH VARICOSE VEINS AMONG WOMEN WORKERS IN THE ELECTRONIC FACTORIES

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Thesis
Entitled

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A STUDY OF FACTORS ASSOCIATED WITH VARICOSE VEINS AMONG WOMEN WORKERS IN THE ELECTRONIC FACTORIES

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ABSTRACT

This study of the factors associated with varicose veins in women workers in electronics factories was conducted with a group of female workers from two electronic factories. The research was designed as a retrospective by case-control study. The study comprised 82 women with varicose veins and 164 women in a control group who did not have varicose veins or other venous diseases. The methodology of this study was designed as a matching technique between the case and control groups. Each case was matched with the controls who did not have a difference of more than 3 years of age. Physical examinations were performed by specialized physicians in order to determine the status of the varicose veins. Self-administered questionnaires used in this study consisted of two types : questionnaires related to factors associated with varicose veins; and questionnaires related to symptoms and signs of varicose veins.

The results of this study revealed that the prevalence rate of varicose veins was 32.99% (27.99%-37.99%). Most were primary varicose veins with a severity of level one. However, the results of symptoms and signs from the questionnaires showed that there was a positive correlation between frequency, feeling and interference with their work activities. In order to control the other influencing factors, logistic regression was used to find the significant influencing factors. These included working posture, a family history of varicose veins, whether the women had had more than one child, and whether they tended to lift heavy weights.

The result of this study suggests that information about risk factors of varicose veins should be provided to female workers so that they can be made more aware of their health while working.

KEY WORDS: FACTORS / VARICOSE VEINS / WOMEN WORKERS / THE ELECTRONIC FACTORIES / SYMPTOMS AND SIGNS

92 pp.

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การศึกษาปัจจัยที่มีความสัมพันธ์กับการเกิดหลอดเลือดดำขอดในกลุ่มพนักงานหญิงโรงงานอิเล็กทรอนิกส์ (A STUDY OF FACTORS ASSOCIATED WITH VARICOSE VEINS AMONG WOMEN WORKERS IN THE ELECTRONIC FACTORIES)

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บทคัดย่อ

การศึกษาปัจจัยที่มีความสัมพันธ์กับการเกิดหลอดเลือดดำขอดได้จัดทำขึ้นในกลุ่มพนักงานหญิงโรงงานอิเล็กทรอนิกส์ 2 แห่ง การศึกษานี้ได้ออกแบบการศึกษาแบบ Retrospective by case-control study กลุ่มตัวอย่างประกอบด้วยกลุ่มศึกษาซึ่งเป็นผู้ป่วยหลอดเลือดดำขอด 82 คน และกลุ่มควบคุมที่ไม่เป็นโรคหลอดเลือดดำขอดหรือโรคที่เกี่ยวข้องอื่นๆ 164 คน วิธีการที่ใช้ศึกษาคือใช้เทคนิคการจับคู่ระหว่างกลุ่มศึกษาและกลุ่มควบคุมที่มีอายุแตกต่างกันไม่เกิน 3 ปี ผู้ที่เข้าร่วมการศึกษาได้ถูกตรวจร่างกายเพื่อตรวจหาภาวะหลอดเลือดดำขอดโดยแพทย์ผู้เชี่ยวชาญ ส่วนการตอบแบบสอบถามซึ่งให้พนักงานกรอกเองประกอบด้วยแบบสอบถาม 2 แบบสอบถามคือ แบบสอบถามเกี่ยวกับปัจจัยที่มีความสัมพันธ์ในการเกิดหลอดเลือดดำขอด และแบบสอบถามเกี่ยวกับอาการและอาการแสดงของหลอดเลือดดำขอด

ผลการศึกษาพบว่าอัตราความชุกของหลอดเลือดดำขอดเท่ากับร้อยละ 32.99 (ร้อยละ 27.99-37.99) ซึ่งทั้งหมดเป็นหลอดเลือดดำขอดชนิดปฐมภูมิและส่วนใหญ่มีความรุนแรงระดับที่ 1 ส่วนผลการวิเคราะห์แบบสอบถามเกี่ยวกับอาการและอาการแสดงพบว่า มีความสัมพันธ์เชิงบวกระหว่างความถี่ ความรู้สึก และการรบกวนกิจวัตรประจำวันหรือการทำงานกับอาการและอาการแสดงต่างๆจากการเกิดหลอดเลือดดำขอด ผลการวิเคราะห์โดยสถิติ Logistic regression เพื่อควบคุมอิทธิพลของปัจจัยอื่นๆ พบปัจจัยที่มีอิทธิพลอย่างมีนัยสำคัญทางสถิติและมีอิทธิพลสูงสุดในการเกิดหลอดเลือดดำขอดคือ ท่าทางในการทำงาน รองมาคือ การที่มีประวัติการเกิดหลอดเลือดดำขอดของคนในครอบครัว การมีบุตรมากกว่า 1 คน และการยกของหนักในขณะทำงาน ตามลำดับ

ข้อเสนอแนะจากการศึกษานี้คือควรนำความรู้เกี่ยวกับปัจจัยที่มีอิทธิพลต่อการเกิดหลอดเลือดดำขอดไปให้พนักงานหญิงทราบเพื่อจะได้ระมัดระวังสุขภาพในการทำงาน

92 หน้า

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CHAPTER I
INTRODUCTION

1.1 Background and rationale

A circulatory system which a heart and blood vessels are part of it, is one of the significant systems in the body (1). The way that the circulatory system work begins when the arteries bring oxygenated blood to the tissues and the veins bring deoxygenated blood back to the heart. Then passes it to the lungs to pick up the oxygen (2). For this reason, a good functional circulatory system favors you in getting a healthy body.

Currently, diseases of the circulatory system is one of the significant problems. According to the statistics of Health Service Units from the Ministry of Public Health, grouped by a cause groups, shows that in 2002 (3) 7,247,573 patients faced the circulatory system diseases. It increased to 8,235,263 patients in 2003 and continued to 8,972,078 patients in 2004 (Table 1-1). With those statistics, the circulatory system diseases became the fourth rank (4^{th}) after respiratory system diseases, digestive system diseases, and the diseases of the musculoskeletal system and connective tissue. The number of the patients from circulatory disease has increased every year and expansion rate of 2004 when compare with 2002 that raised up to 24%.

Table 1-1 Number of outpatients grouped by causes groups from the Health Service Units, Ministry of Public Health 2002-2004.

Cause groups	2002 (1)	2003 (2)	2004 (2)
Centain infectious Parasititic diseases	5,773,982	5,661,398	5,412,339
Endocine, nutritional and metabolic diseases	5,153,176	5,984,658	6,268,544

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Table 1-1 Number of outpatients grouped by causes of sickness from the Health Service Units, Ministry of Public Health 2002-2004 (continued).

Cause groups	2002 (1)	2003 (2)	2004 (2)
Diseases of the circulatory system	7,247,573	8,235,263	8,972,078
Diseases of the respiratory system	24,409,573	24,341,791	22,410,801
Diseases of the digestive system	13,400,295	13,602,424	12,609,469
Diseases of the skin and subcutaneous tissue system	5,595,782	5,572,099	4,723,980
Diseases of the musculoskeletal system and connective tissue	9,452,707	9,861,112	9,617,899
Diseases of the genitournary system	2,477,100	2,709,055	2,608,684
Symptoms, signs and abnormal clinical and laboratory findings, unclassifed	8,985,119	9,844,741	10,519,356
Others	16,830,637	17,469,313	16,915,159

(1) Excludes Bangkok, Lop Buri, Samut Songkhram and Maha Sarakham.

(2) Excludes Bangkok, Samut Songkhram and Maha Sarakham.

Source : Office of Permanent Secretary, Ministry of Public Health

One of the most commonly found circulatory system diseases is the varicose veins which usually discovered clearly on legs (4). Generally, varicose veins is one of the most prevalent chronic diseases in the developed countries, progress technological countries or industrial countries (5).

Varicose veins and complications are presented 500,000 persons in England each year (6). About 12 millions are presented in Germany, according to the health survey (7) and about 20-25 millions in the United States of America (8). Unfortunately, in 2002, 163 Americans died from this disease (9). For Thailand, there is no survey related to the prevalent or incident rate in Thais yet. Thus there is no information available about varicose veins in Thailand.

An epidemiology study that studied prevalence and risk factors of varicose veins, differs from country to country. Each study is different and it is still difficult to decide

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which prevalence is true and correct. Moreover, there are conflicts between factors in each study. The differences and conflicts mainly occurred from the criteria in choosing the population, method of study, a definition of varicose veins, diagnosis and classification of varicose veins and various lifestyle of population. These factors effect the result which differentiate each study (10, 11).

There are many factors that were regularly identified as causes of varicose veins and were relative in many studies. Varicose veins are found more in women than men (12) and they are increased in correlation with age (13). Varicose veins are mostly found in overweight and obese people (14). Moreover, they are found in those whose parents or cousins had varicose veins (15) and number of childbirth are also related to the cause (16, 17). The more children you have the more risk you take. In addition, varicose veins happen in prolonged standing workers as well (18, 19).

Sisto T, et al. (16) studied the prevalence and risk factors of varicose veins in Finland. They found that the prevalence in industrial workers is higher than in another workers. Apparently, the varicose veins is one of the significant problems for industrial workers.

Patients with varicose veins on their legs may have several symptoms, but the common symptoms are heavy legs, fatigue, numbness, night cramps, itching, tighting, burning. Some cases with severe varicose veins may complaint of venous ulcers, hemorrhage and thrombophlebitis. Without proper care, varicose veins may increase severity which cause active ulcers, because insufficient venous effects capillary and lymph that create abnormal circulation (4, 20, 21).

The above mentioned study presents the fact that there are several factors related to varicose veins. Industrial workers face risky factors and high prevalence so that they ought to obtain more attention. According to the survey in electronic factory, 40 out of 69 women workers have varicose veins (58%) and their frequent symptoms are aching at calf or legs, night cramp and ankle, calf or legs edema.

The researcher is interested in studying the association between risk factors and varicose veins that effect on health, lead to discomfort and quality of life such as fear or worry, decrease efficiency of work, loss time and working day. By this study, it can be applied in order to reduce the incidence of varicose veins which prevent the varicose vein by reducing the risk factors in women workers.

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1.2 Objective and hypotheses

1.2.1 General Objective

The objective of this study is to find the factors associated with varicose veins of legs among the women workers in the electronic factories.

1.2.2 Specific Objective

1. To determine the prevalence of varicose veins of legs among women workers population in two electronic factories.

2. To determine the types, severity, symptoms and signs of varicose veins of legs among women workers in two electronic factories.

3. To analyse the associated factors on varicose veins of legs among women workers.

4. To identify the potential factors of varicose veins of legs which associate with the signs and symptoms.

1.2.3 Hypotheses

1. The personal factors such as Body Mass Index, number of pregnancy, number of children, family history of varicose veins, duration of work, duration of traveling and the way of traveling to work have association with the occurrences of varicose veins.

2. The characteristics of work factors such as working posture, lifting and heat exposure associate with varicose veins.

3. Health behavioral factors such as alcohol drinking, smoking, exercise and oral contraceptive pill have association with varicose veins.

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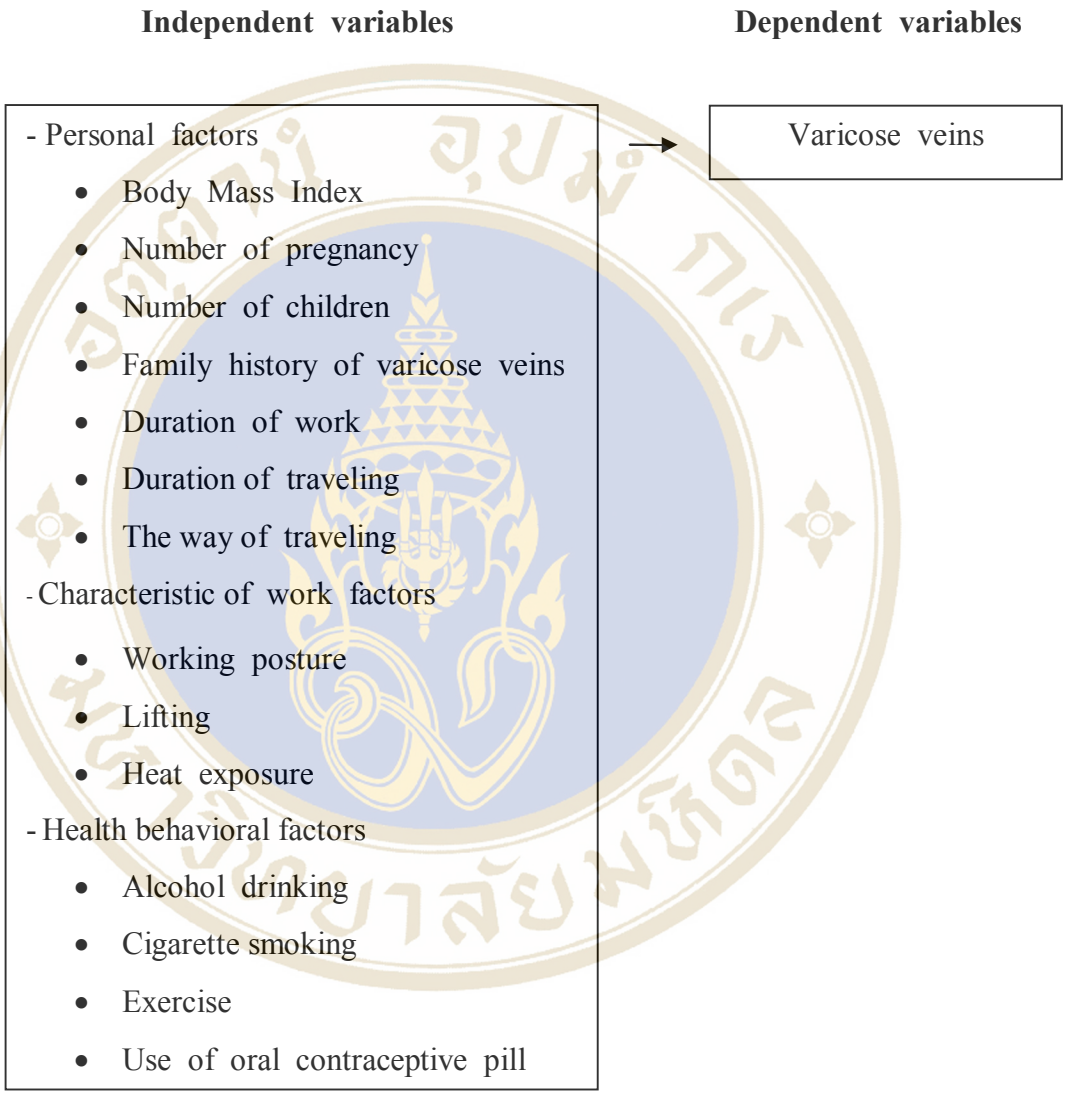
1.3 Conceptual framework and variables

1.3.1 Conceptual framework



1.3.2 Variables

Independent Variables

- Personal factors
  - Body Mass Index
  - Number of pregnancy

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- Number of children
- Family history of varicose veins
- Duration of work
- Duration of traveling
- The way of traveling

- Characteristic of work factors
  - Working posture
  - Lifting
  - Heat exposure
- Health behavioral factors
  - Alcohol drinking
  - Cigarette smoking
  - Exercise
  - Use of oral contraceptive pill

Dependent Variables

- Varicose veins occurrence
  - Types of varicose veins
  - Severity of varicose veins
  - Symptoms and signs of varicose veins

1.4 Definitions

1. **Varicose veins** are defined as an effect which superficial veins were dilated, elongated, twisted tortuous and swollen veins of legs. The veins are visible or palpable under the skin when standing .

2. **Types of varicose veins** are defined as they are divided into two types.

Primary varicose veins are caused by valve failure or weakness of the vein wall. This defect affects a blood from deep veins in lower legs returning to superficial veins which later causes dilatation and twist of veins.

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Secondary varicose veins are defined as varicose veins which are caused by deep vein thrombosis that damaged the valves. The flow of blood is reversed and the congestion occurs around the legs.

3. **Level of severity**, the level of severity in this study is classified into 5 levels including simple varicose veins, varicose veins and edema, varicose veins and skin pigmentation, varicose veins and healed venous ulcer and varicose veins and active venous ulcer.

Table 1-2 Level of severity of varicose veins.

Level of severity	Characteristics
C_1 simple varicose veins	
C_2 varicose veins with edema	
C_3 varicose veins with skin pigmentation	
C_4 varicose veins with healed venous ulcer	

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Table 1-2 Level of severity of varicose veins (Continued).

Level of severity	Characteristics
C_5 varicose veins with active venous ulcer	

* Refer and adjust from South Worcestershire Primary Care Trust. Varicose veins Referral Guideline : Commissioning Policy. 3 August 2004 (22).

4. **Symptoms and signs** which are caused by varicose veins include heaviness, aching, swelling, night cramp, burning and itching.

5. **Study group** is defined as women workers in electronic factories who have been diagnosed and confirmed that they have varicose veins.

6. **Control group** is defined as women workers in electronic factories who have been diagnosed and confirmed that they do not have varicose veins.

7. **Body Mass Index** formula is calculated by weight (kg.) divide by height (m.) squared.

Classification of weight by BMI

Under weight	=	< 18.5	kg/m^2
Normal	=	18.5-22.9	kg/m^2
Over weight	=	23.0-24.9	kg/m^2
Obesity	=	> 25.0	kg/m^2

8. **Number of pregnancy** is defined as number of pregnancy included every pregnancy and abortion.

9. **Number of children** is defined as a total number of live birth.

10. **Family history of varicose veins** is defined as father, mother or other relative in family who had varicose veins.

11. **Duration of work** is defined as all times of working including in every workplaces.

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12. **Duration of traveling** is defined as a duration of traveling from home to workplace.

13. **The way of traveling** is defined as the vehicle taking to work.

14. **Working posture** is defined as a working posture such as standing, sitting and movement between positions from here and there.

15. **Lifting** is defined as the women who used to work in heavy lifting work or have to lift heavy item while working.

16. **Heat exposure** is defined as the women who were exposed to high temperature at workplace such as melt metal, boiled water.

17. **Alcohol drinking** is defined as the drinker which categorized as non-drinker, ex-drinker and drinker.

Non-drinker : women who have never drunk or drink non-regularly or drink less than one year.

Ex-drinker : women who had been drinking but stopped drinking.

Drinker : women who drink regularly for a year or more.

18. **Cigarette smoking** is defined as cigarette smoker who categorized as non-smoker, ex-smoker and smoker.

Non-smoker : women who have never smoked or smoke non-regularly or smoke less than one year.

Ex-smoker : women who has been smoking but stopped smoking.

Smoker : women who smoke regularly for a year or more.

19. **Exercise** is defined as exerciser who were categorized as non- exercise, and exercise.

Non-exercise: women who have never exercised or exercise non-regularly or exercise less than one year.

Exercise : women who exercise regularly for a year or more.

20. **Used of oral contraceptive pill** is defined as non- oral contraceptive pill, ever-oral contraceptive pill and oral contraceptive pill.

Non-used of oral contraceptive : women who have never used oral contraceptive irregularly or used of oral contraceptive less than one year.

Ever-used of oral contraceptive : women who have been using an oral contraceptive but stopped .

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Used of oral contraceptive : women who use oral contraceptive regularly for a year or more.

21. **Confounder** is a risk factor effecting on outcome and relates to exposure. It associates with other factors that mask or distort the true effect of exposure in the study.

1.5 Scope of the study and basic agreement

1.5.1 Scope of the study

The study was a case-control study which aimed to search factors that effect varicose veins on legs among women workers in electronic factories and also to define prevalence, types, severity and symptoms of varicose veins.

1.5.2 Basic agreement

1. The target is women workers in the electronic factories.
2. The answers from a questionnaire of women workers are a reliable data.

1.6 Expected outcomes and benefits

1. To know the situations of varicose veins that occur in the women workers.
2. To verify types, severity, symptoms and signs of varicose veins and use these basic information for safety and health management.
3. From the finding of influencing factors, the preventive planning programs such as education, rotation of work and workstation design could be appropriately used in order to improve the health status of the workers.

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CHAPTER II
LITERATURE REVIEW

2.1 Vein and venous circulation

2.1.1 Vein (23, 24, 25, 26)

The vein is a part of the circulatory system that transport blood from tissues and organs of the body back to the heart. The generality of veins are larger and more plentiful than arteries but their wall of veins are thinner. Veins are composed with three layers which are similar to those found in arteries such as tunica intima, tunica media and tunica adventitia. However, veins are classified by size.

1. Venous capillary

Venous capillary is the smallest vessels located among the tissues that transport blood from the arteries to the venule. Venous capillary opening into venule.

2. Venules and small veins

Venules are small vessels that drain blood from capillaries into veins. They have internal diameter of about 10-50 μm.

Small-sized veins, average small-sized veins have internal diameter of 0.1-1.0 mm.

3. Medium-sized veins

Medium-sized veins range from 1-10 mm. in diameter and have valves throughout the main veins. Valves function as a protector for a reverse blood flow against to the heart.

4. Large veins

Large veins called superior and inferior vena cava are the two large veins that bring venous blood return directly to the heart.

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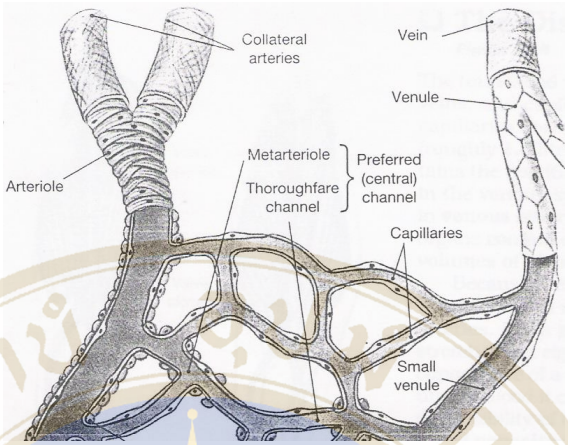

Figure 2-1 Patterns of blood vessels (25)

2.1.2 The veins of leg (7, 27, 28, 29)

The veins of legs and lower body bring venous blood flow to inferior vena cava. The diseases of vein commonly happen in legs, especially the varicose veins. The knowledge and understanding of how the veins of leg function is a priority to evaluate the status of leg veins.

The veins of leg are divided into three groups

1. Deep veins : Almost 90% of blood in legs goes through the deep veins. Deep veins lie beneath the deep fascia. The circulatory system in vein of the legs is against the gravity which causes high pressure, then the body provides the pumping system to direct blood into heart in the same direction. Furthermore, tissues also help in the circulatory system.

2. Superficial veins : Superficial veins are situated beneath the skin within the superficial fascia. Superficial vein systems are divided into two main systems.

Long (greater) saphenous vein is the longest vein in the body and run from the inner leg of the ankle to the groin and pass through the fossa ovalis to join the femoral veins.

Short (lesser) saphenous vein pass through the deep fascia and run from outside of the ankle joint and end at the popliteal veins.

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3. Communicating veins

Communicating veins are composed with two systems, one is the communicating between one superficial vein and another superficial vein. The other are perforating veins which communicating between superficial veins and deep veins. Normally the blood flow is unidirectional, only one way from superficial system to deep system.

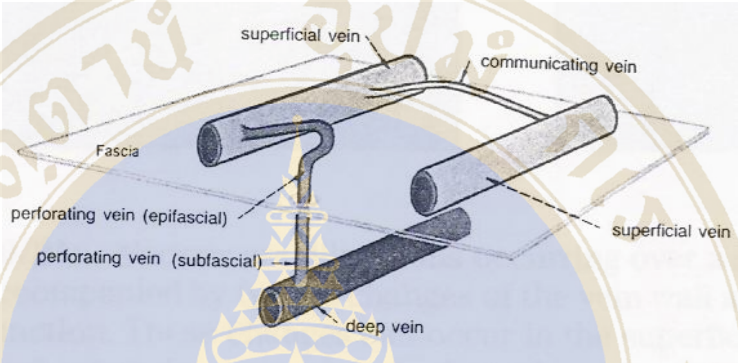

Figure 2-2 The veins of leg (7)

2.1.3 Venous circulation (30, 31, 32, 33)

Blood goes to veins passively after the heart contraction. Veins are flexible because they have muscle and elastic fiber in the wall. The pressure in veins change frequently depends on the movements and the actions of the muscles. The veins level and size varies by the gravity. Venous circulation works with favor of venous contraction together with the movements and the actions of the muscle, that way it increases the amount of blood that goes from veins to the heart.

Venous pressure is measured at foot level the pressure approaches 85 mm.Hg in a fixed standing posture. Prolonged standing is related to fatigue and leading to discomfort from insufficient reverse blood flow. If the processes are intensive and regular, varicose veins on legs can develop.

In addition, sitting in a fixed position for long time cause dysfunction of venous reflux because legs or thigh are pressed which will block the venous reflux and will put more pressure into the veins. Later on, it becomes a reason for an inefficient blood circulation.

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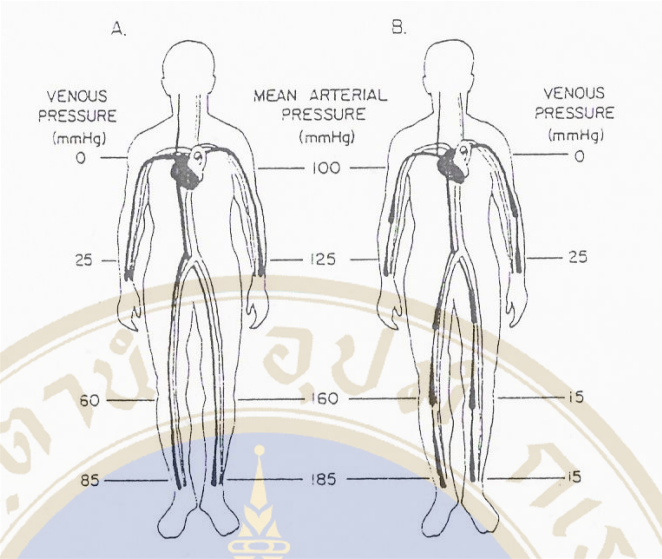

Figure 2-3 Venous pressures while standing (A) and contracting muscles (B) (30).

2.2 Venous return (25, 26, 34, 35, 36)

The volume of blood returned to the heart is called the venous return. Venous return is influenced by several factors. The main factors which influence the venous return from the legs are the following :

1. The respiratory venous pump.

Venous return is assisted by actions of the breathing on intrathoracic and intra-abdominal, such as the flow in the vena cava raises during inspiration and falls during expiration. When inspiration occurs, the thoracic pressure is reduced. This venous pressure decreases and therefore venous return is greater. The venous return also increased after, the diaphragm pushing on abdominal contents.

2. The heart

Venous return is reflected in changes of cardiac output and venous return which is greater during increased cardiac activity.

3. Skeletal muscle venous pump.

Skeletal muscle venous pump is a very important mechanism for venous return. Increased muscular activity pushes blood out of the veins and return to the heart.

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4. Gravity

Gravitational forces significantly affect venous return. When a person is standing, the forces of gravity resist venous return to the heart.

5. Venous Valves

Venous valves are designed as a one-way valves, allowing blood to flow against gravity from the legs toward the heart and point in the direction of blood flow. Valves permit blood flow in only one direction and prevent the backflow of blood.

2.3 Varicose Veins

2.3.1 Varicose veins (33, 37)

Varicose veins are defined as an effect which superficial veins were dilated, elongated, twisted, tortuous and swollen and are visible or palpable underneath the skin while standing.

Varicose veins developed from valve failure, weakness of the vein wall or blood clots that disturbed the proper blood circulation. They become bulge gradually increasing as pools of veins.

2.3.2 Pathophysiology of varicose veins (38, 39)

Varicose veins are dilated veins which raising and tortuous on the surface of the skin (superficial vein). The venous dilatation is caused by high pressure in the veins and valves that can not prevent blood from flowing backwards then the venous flow will raise the pressure in superficial vein.

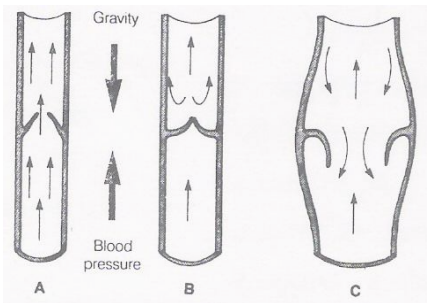

Figure 2-4 Normal veins (A) and valve failure (B). (39)

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Cause of irregular venous return or poor circulation leads to blood pools in the superficial veins. In case of a frequented occurrence, veins walls will be enlarged, prolonged and twisted.

2.3.3 Types of varicose veins (33, 40, 41)

Varicose veins are the result of functional defects in the venous systems and classified as either primary or secondary varicose veins.

Primary varicose veins are caused by valvular incompetence or weakness of the vein wall so the reflux of blood occurs in the circulation of superficial veins at the lower leg. The venous blood flow backward to the lower superficial veins causing dilated and tortuous veins.

Secondary varicose veins are caused by deep vein thrombosis as post-thrombotic syndrome which destroy the deep vein function. In this case, blood can not flow backward through the deep veins. Patients will have swollen legs and tortuous superficial veins.

Distinguishing of the primary varicose veins from secondary varicose veins are necessary because method of treatment is different. Primary varicose veins are treated by high ligation or vein stripping but secondary varicose vein are treated according to signs and symptoms. The veins operation will be made only when it is necessary and certain that deep veins do not clot. Patients with primary varicose veins do not need any special diagnosis but if they do have a history of deep vein thrombosis or skin damaged around the ankle-deep veins diagnosis is then a must. Further diagnosis such as Duplex ultrasonography or Phlebography is always helpful.

2.3.4 Signs and symptoms (4, 39, 42, 43)

The result of abnormal reflux in leg veins effect the congestion of the blood. If it appear in the superficial vein (primary varicose veins), it may represent repeated signs and symptoms such as tension, fatigue, ankle edema, heaviness and night cramps. In addition, patients with secondary varicose veins may have symptoms of chronic venous insufficiency, most of the patients commonly complains about aching, swelling, skin changes (hyperpigmentation) and ulcer.

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Varicose veins can cause various signs and symptoms of discomfort in the legs. However, signs and symptoms of varicose veins are not directly related to severity or size of varicose veins.

The study of Bradbury A., et al. found that prevalence of leg symptoms increased by age in both sex but higher in women. In men, the only symptoms that significantly associated with varicose veins were itching. In women, there were heaviness or tension, aching and itching significantly related to varicose veins.

2.3.5 Complications of varicose veins (4, 6, 39, 41)

1. Thrombophlebitis can complicate varicose veins. Inflammation of the vein wall can occur due to thrombosis. It presents as swelling, red and pain. Treatment depends on the location of the thrombosis.

2. Hemorrhage can occur in the large varicose veins, especially in ankle or lower calf areas. The skin at these 2 areas are sensitive and they tend to get hit or wounded. Bleeding can be found often because of high venous pressure when patients are on standing position.

3. Pigmentation is commonly happen on the medial side of the ankle and as a result of venous hypertension. Pigmentation is due to deposits of haemosiderin into the skin from erythrocytes.

4. Dermatitis is the itching and extravasation of inflammation of the skin that can occur on ankle or lower leg.

5. Venous stasis ulcer is caused by chronic venous hypertension, usually around the inside of anklebone.

2.3.6 Diagnosis of varicose veins (4, 8, 29, 41, 44, 45)

Diagnosis methods for varicose veins are made by history and physical examination as the varicose veins are seen more easily when the patient is standing. There are specific techniques for assessing varicose veins that lead to appropriate treatment.

1. Brodie-Trendelenburg test has been used to evaluate incompetence of valve in superficial veins and perforating veins.

2. Perthes' test has been used to assess deep veins and perforating veins.

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Tourniquet tests such as Brodie-Trendelenburg test and Perthes' test have been abandoned by vascular specialists.

3. Doppler flow meter is used to evaluate flow in superficial veins and deep veins.

4. Phlebography is an x-ray test that provides a constant image of anatomy of the leg vein after the contrast dye is injected into the vein.

5. Plethysmography is a test used to measure changes in venous blood volume. Recently, Plethysmography is used in three methods.

5.1 Air Plethysmography is the record of changes in the venous of the leg. Changes in venous refilling time, venous outflow and venous volume can be measured.

5.2 Photoplethysmography is the measurement done by infrared light to determine the reflux of blood and change in blood volume in the subcutaneous.

5.3 Light Reflection Rheography is a technique for assessing venous function in the leg and developed from photoplethysmography.

6. Duplex ultrasonography is commonly used to evaluate flow in the blood vessels which provides detail phthophysiology and accurate results. Duplex ultrasonography is important to evaluate the deep vein system in patients and essential in planning for surgical treatment.

Figure 2-5 Physical examination when the patient is standing. (45)

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2.3.7 Treatment (6, 29, 33, 40, 41)

1. Elastic stocking compression

Elastic stocking compression is a method using an elastic stocking to squeezes superficial veins and remain the mainstay of therapy for varicose veins. Elastic stocking compression is effective in relieving swelling, pain, ulcers and less expensive than other treatments. Elastic stocking compression is not a treatment to reduce the number of dilated veins but it prevents the expansion of severity. Elastic stocking compression can be used alone or in conjunction with other therapies. To select the degree of elastic stocking compression, the symptoms and compliance are considered. Elastic stocking compression must be replaced every six months.

2. Sclerotherapy

Sclerotherapy is one of the most popular treatment for small varicose veins, the smaller veins are better than large veins responding to sclerotherapy. Sclerotherapy involves an direct injection of a 3% sodium tetradecyl sulfate solution into the small varicose veins. The solution irritates the lining of the vein, leading to the destruction of the endothelium. After the treatment, (need subject) patients are required to wear elastic stocking compression or put elastic compression bandage on for about 6 weeks. Daily activity is to walk, to reduce the burning.

3. Surgery

Surgery is often a treatment for large size and high severity level. Surgery is done to remove the affected superficial veins. Surgery also is often performed for cosmetic reasons. There are many methods of operations but the gold standard surgical therapy for varicose veins are ligation and stripping. In ligation procedure, veins are tied and cut. In veins stripping, varicose veins are removed through small incisions.

2.3.8 Recurrent varicose veins (29, 46)

Varicose veins can be treated by sclerotherapy or surgery but they may reoccur. Approximately 20% of varicose veins surgery is for recurrence. Recurrent varicose veins can be resulted from:

1. Misdiagnosis of the original state which leads to an inadequate initial operations.
2. Defective primary surgery.

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3. The development in new sites of reflux.

Improve assessment and rigorous primary surgery lead to reducing the recurrent varicose veins.

2.4 Posture and monotonous work

A variety of work environment exposures related to uncomfortable work positions, repetitive monotonous movements have been found to be associated with sickness (47).

Generally, while working, the working posture must be stable and relaxed specially while using your energy. The appropriate working postures creates higher performance and decrease unsafety which caused from work. The inappropriate working postures and imbalance movements cause fatigue, uncomfort, pain and disorders (48).

Highly repetitive monotonous work is common in the factories (49). Monotony is a stereotype, repetitive process work may be called monotonous work when it involves in the same type of postures over a long period (50) Those postures in monotonous work are associated with discomfort in the lower limb and with the development of diseases of varicose veins. The maintenance of sitting, standing and walking posture at work has been related to progression of varicose veins (51).

Because of prolong sitting, these changes increase the range of static posturing, which leads to restriction, fatigue and disorders while static work reduced blood circulation (52).

In the standing posture, reduced reabsorption of tissue fluid and increased transcapillary filtration due to increased hydrostatic pressures while standing in the blood vessels lead to an accrue in the extravascular fluid volume of the leg (53).

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2.5 Factors associated with the development of varicose veins

The development of varicose veins are resulted from multiple factors. the review literature found that factors associated with varicose veins are as follows :

2.5.1 Aging factor

Age is a main factor associated with varicose veins. Varicose veins appear more frequently in old age. The occurrence of varicose veins is increasing by age because of senile changes in vessel walls. Several studies have confirmed age related factor of varicose veins.

Studied from Sao Paulo, Brazil by Maffei FHA , et al. (13) found that the prevalence of varicose veins increased with age. Advanced age was associated with decreasing in vascular distensibility (54). In addition, increase in thickness and lost elasticity of vessel wall was related to age.

The similar result was found by Hirai H, et al. (55) who studied the factors associated with varicose veins in Japan. The study included 541 Japanese women, age between 15-90 years. The prevalence of varicose veins increased with age, it was 12% in subjects aged 15-24 , 37% in subjects aged 25-39 , 64 % in subjects aged 40-59 and 78% in subjects aged 60 and above.

Franks PJ, et al. (56) suggested that increasing age was an independent risk factors for varicose veins. Logistic regression analysis identified that increasing age was an independent variable that associated with varicose veins in West London Community.

In the San Diego, cross-sectional population study by Criqui MH, et al. (57) found that risk of varicose veins increase with age increase. The odds ratio of age 50-59 years was 1.37, 60-69 years was 1.96 while more than 70 years old was 2.42 respectively.

2.5.2 The gender

Most studies in several countries have shown that prevalence of varicose veins is more in women. Scott TE, et al. (12) studied the factors associated with chronic venous insufficiency by case-control study in 129 patients with varicose veins at Boston. After adjust for confounding, the risk for females was 5.0 times (95% CI = 2.2-12.5) higher than in men.

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The explanation why the risk in women is higher than men is sex hormones that increasing venous distension. Ciardullo AV, et al. (58) determined the association between sex hormones and venous distensibility in menopausal women. One-hundred four women, aged 48-65 years, underwent a physical examination to diagnose varicose veins. Plethysmographic was used to measure venous distensibility and the level of testosterone, estradiol, SHBG, glucose and insulin were analyses. The study found that high estradiol are associated with varicose veins (odds ratio 3.6; 95% CI = 1.1-11.6) and increasing in lower limb venous distensibility (odds ratio 4.4; 95% CI = 1.2-15.5).

Kontosic I, et al.(59) in Rijeka, Croatia found an association between varicose veins and females. Prevalence of varicose veins was significantly higher in females (34.6% in females and 18.9% in males). Multiple logistic regression analysis revealed that odd ratio of females was 1.92 (95% CI = 1.37-2.67).

Kroeger K, et al. (60) studied the prevalence of varicose veins and risk factors in German population of Duesseldorf and Essen civil servants. The rate of varicose veins is higher in females. The odds ratio was 2.3 (95% CI = 1.9-2.7).

2.5.3 Weight and Body Mass Index

Previous studies have suggested that heavy weight or high body mass index (BMI $\geq$ 30 kg/m^2) is associated with varicose veins. In Netherlands, Seidell JC, et al. (14) reported the association of weight in women with varicose veins. Risk of varicose veins increased by weight. Odd ratio for moderately overweight (25-29.9 kg/m^2) was 1.53 while odd ratio for severely overweight (30-40 kg/m^2) was 3.06.

The elderly population in Southern Italy (61), Canonico S, et al. found body weight and BMI were strongly related to varicose veins in women ($p<0.0001$).

Iannuzzi A, et al. (62) evaluated the relationship between the weight and varicose veins in Milan, Italy. Women with BMI $\geq$ 30 kg/m^2 shown a positive association with varicose veins. The risk of varicose veins was 5.8 (95% CI = 1.2-28.2).

2.5.4 Pregnancy and parity

The relationship between pregnancy and parity with varicose veins has been found in several studies. Varicose veins are more common in women who had

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children because venous dilation during pregnancy. Pregnancy enlarges uterine volume and increases estrogen and progesterone production (63). In addition, fetus obstruct circulation around inferior vena cava causing increase venous pressure.

Cross-sectional study by Sisto T, et al. (16) supports that the prevalence of varicose veins increases with parity. Parity was reported to be a strong risk factor of varicose veins. The risk increases with the number of children. The odd ratio of 1 child was 1.4, 2-4 children was 1.8 and 5 or more children the risk rose to 3.0 when compare with women with no child. The study found high prevalence of varicose veins in industrialized population.

In a study of Dindelli M, et al. (17), among women in Milan, found that the risk of varicose veins increases with parity. The number of childbirth had a positive trend of varicose veins. The estimated relative risk was 1.2 in women who had 1 child and the risk increased to 3.8 in women reporting two or more children.

2.5.5 Heredity

One of the major risk factors of varicose veins is heredity. Heredity is a significant predisposing factor in development of varicose veins.

Brinsuk M, et al. (64) investigated the heritability of venous function in 46 twin pairs. There were 24 monozygotic and 22 dizygotic twin. Venous capacity and venous compliance were highly correlated in monozygotic twin. It was consistent with a genetic influence on venous function and the genetic effect lead to occurrence of varicose veins.

Cornu-Thenard A, et al. (15) perfored a case-control study in France, 67 patients with varicose veins and 67 controls and their parents were examined. The results confirmed the association of heredity with the risk of varicose veins ($p<0.001$). The risk of varicose veins significantly increased with the number of parents affected, such as 20% of children developed varicose veins when neither parent had them while 90% of children developed when both parents had varicose veins.

The study of Laurikka JO, et al. (65), confirmed that family history (varicose veins in parents or siblings) was a strong causative effect in varicose veins. The odds ratio of positive family history was 4.9 (95% CI = 4.1-5.6).

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In United Kingdom, Lee AJ, et al. (11) studied relationship between lifestyle factors and risk of varicose veins. The results suggested that heredity was an etiology of varicose veins. The study was a cross-sectional survey comprising men and women in Edinburgh. This study found a significant positive association between family history of varicose veins and the appearance of varicose veins in both men and women. The highest risk of varicose veins was associated with family history of varicose veins in women (OR = 2.19).

2.5.6 Working posture

Working posture related to venous circulation such as standing increased venous pressure in the veins (66) or heavy lifting increased the intra-abdominal pressure (67). There were many studies demonstrated the association between working posture and varicose veins.

Prolonged standing can lead to the development of varicose veins. The importance of prolonged standing was confirmed by Abramson JH, et al. (18). Varicose veins were investigated in Western Jerusalem, in the people age format more than 15 years old. In both sexes, the prevalence of varicose veins was relatively high in people who reported that they spent much time standing and also found significant association with standing posture while working.

Tuchsen F, et al. (19) studied the relation between prolonged standing during work and varicose veins in Danish population. During 12 years of follow up, the related risk was 1.75 for men, 1.82 for women and the pooled estimated of the relative risk was 1.78 in employees with prolonged standing or walking compared to all other.

Heavy lifting also related to the development of varicose veins. A pilot survey from Weddell JM (68) investigate aetiology of varicose veins in the city of Cardiff. Work involved with heavy lifting was significantly associated to the presence of varicose veins in both men and women.

2.5.7 Heat exposure

NIOSH (69) reported effect of working in hot environments. There is an increase of blood vessels which expanded to accommodate the flow. The results is similar to a

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study by Gascho JA, et al. (70) who did the study in ten male volunteers. Venous distensibility happened more frequent in a warmer than in a cool environment. Therefore, heat exposure is possible to be one of the risk factors of varicose veins.

2.5.8 Alcohol drinking

Johns Hopkins University (71) showed that alcohol increased blood pressure and dilated peripheral blood vessels. The study by Tanyol H. in 114 male with chronic alcoholics and 60 male abstainers showed high prevalence of varicose veins in alcoholic patients (72) and suggested that extreme vasodilation which caused by alcohol maybe develop to varicose veins (73).

2.5.9 Cigarette smoking

One of the factors that had influence on varicose veins were smoking. Smoking is known to increase blood pressure (74). Cigarette is a potent health hazard which lead to avoidable causes of mortality and morbidity (75).

Ducimetiere P, et al. (76) performed a longitudinal study in Paris. In 7,425 policemen aged 42-53 years old, there were 1,948 people with varicose veins. This study found that varicose veins was positively associated with a cigarette smoking ($p < 0.001$).

La Vecohia C, et al. (77) found the relationship between smoking habits and varicose veins or haemorrhoids, the result was evaluated from the data of Italian National Health survey. The diseases were positively related to current and past cigarette smoking. When compared with the never- smoking people, the point estimated smoking behavior of or more 15 cigarattes per person per day were 1.6 for varicose veins and haemorrhoids.

2.5.10 Exercise

The benefit of exercise is maximizing the potential of blood circulation system. Exercise increases the amount of blood flow back to the heart. When the amount of blood reach the high point, the veins will stretch and shrink from the elasticity of veins (78). The influence of regular physical exercise reduced platelet aggregation blood vessels

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(79). In addition, physical inactivity is a risk factor of cardiovascular diseases and other chronic diseases (80).

A study from France (37) by Carpentier PH, et al. found the negative effect of doing an exercise less than once a week on evolution of varicose veins in men (OR = 1.97, 95% CI = 1.08-3.61).

2.5.11 The use of oral contraceptive pill

Oral contraceptive pill including estrogens and progestogens can cause venous distension (81). The venous dilation decreases the velocity of blood flow within the veins which can increase risk of thrombosis occurrence. The continuous dilatation of veins is the potential risk of varicose veins (82). Several studies have found an association between the use of oral contraceptive pill and venous thrombosis (83). However, the relationship between oral contraceptive pill and varicose veins was not confirmed. Some studies has found that oral contraceptive pill were not associated with varicose veins. Górski G, et al. (84) found that oral contraceptive intake had an inverse correlation with varicose veins.

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CHAPTER III
MATERIALS AND METHODS

3.1 Study design

A retrospective by case-control study was used for this study. Firstly, the survey was used to determine the prevalence of varicose veins. Then, the population from the survey were grouped as the cases and the controls in order to analyze the factors associated with varicose veins.

3.2 Population and sample

3.2.1 Population

This research study was conducted in women workers of the two electronic factories in Bangkok and Pathumthani.

3.2.2 Sample

The samples were divided into 2 groups as follows :

1. The cases : the women workers who were diagnosed in accordance of varicose veins by specialized physicians.

2. The controls : the women workers who were healthy and diagnosed as no varicose veins and no venous diseases such as spider veins, reticular veins or deep vein thrombosis.

The case and control groups were determined using the matching technique by age within the range of ± 3 years and the ratio of case per controls was 1:2.

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Exclusion criteria

The exclusion criteria in this study was consisted of the women workers who were pregnant, women workers who have history of many working postures and who used to work in another posture for more than one year before working in this current posture.

3.2.3 Sample size

The sample size were based on match case-control and calculated by using Connor's formula (85). Applying the previous risks for a comparison, using the least risk in the calculation in finding the sample size covers all the factors. This study based on a risk in England (11) which is the most familiar with this study. The risk of varicose vein running in family was 2.19. Data used for calculation is as follows :

a) The exposure of interest was family history of varicose veins that ran in the family members. Presently, the family history of varicose veins in elementary survey was 33.33%.

b) Odd ratio of those who have family history of varicose veins was 2.19 (11)

c) Level of significance (α) was 0.05

d) Power of test (1-β) was 0.80

e) The ratio of cases : controls was 1:2

$$M = \frac{\left(Z_{\alpha/2} + Z\beta\sqrt{1-\Delta}\right)^2}{\Delta}$$

$$\Delta = \frac{p_d(\Psi-1)^2}{(\Psi+1)^2}$$

$$p_d = \frac{(\Psi+1)p_0 q_0}{q_0 + \Psi p_0}$$

$$n = \frac{(r+1)M}{2r}$$

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The equation is as follows:

$Z_{\alpha/2}$ = 1.96

ψ = Odds ratio associating disease with exposure = 2.19

$Z\beta$ = 0.84

p_0 = Proportion of the exposure rate = 0.333

q_0 = $1 - p_0$

r = number of control per case = 1: 2

When replaced in the formula:

$$p_d = \frac{(2.19+1)0.333(0.667)}{0.667+2.19(0.333)} = 0.507$$

$$\Delta = \frac{0.507(2.19-1)^2}{(2.19+1)^2} = 0.071$$

$$M = \frac{\left(1.96+0.84\sqrt{1-0.071}\right)^2}{0.071} = 108.040$$

$$n = \frac{(2+1)108.070}{2(2)} = 81.03$$

The number of subjects was estimated to be 82 cases and using the ratio of 1:2, therefore the number of controls was 164 controls.

3.3 Instrumentation and protocols

The instruments and protocols in this study were composed of the diagnosis and the questionnaires. The instruments using for diagnosis varicose veins are as follow :

a) The physical examination and medical diagnosis use the path of Brodie Trendelenburg test and Perthes' test.

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The instruments using to collect data were described as the following:

a) Forms recording from locations, types and level of varicose veins.

b) Self administered questionnaires that were developed by researcher. The questionnaires were constructed using relevant information from reviewed research literatures.

2.1 The questionnaires for evaluation the factors associated with varicose veins were consisted of 4 parts as the following :

Part I : General information

Part II : History of varicose veins information

Part III : Career information

Part IV : Health behavior information

2.2 The questionnaires for evaluation symptoms and signs of varicose veins. In each question, the frequency and feeling of symptoms and signs were ranked in 6 scales from 0 – 5. The severities are ranked in 3 levels:

0.00-1.66	equal to	mild severity
1.67-3.33	equal to	moderate severity
3.34-5.00	equal to	severe severity

The symptoms and signs that interfered normal activities or work were ranked in 5 scales from 0 – 4. The severities were ranked in 3 levels:

0.00-1.33	equal to	mild severity
1.34-2.66	equal to	moderate severity
2.67-4.00	equal to	severe severity

3.4 Validity of instrument

The questionnaires developed in this study were designed by researcher and approved by the assigned preceptor, co-preceptors and the experts (the experts name were listed in appendix A). Corrections and revisions of questionnaires were made according to suggestions and recommendations.

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3.5 Ethical considerations

The research protocol was approved by the committee on human rights related to human experimentation, Mahidol University (see appendix B).

3.6 Data collection

The female electronic workers who were assigned as the cases were asked to perform by interview and examination of the legs in a standing posture to inspect the varicose veins and grade the levels of severity. The path of Brodie-Trendelenburg test and Perthes' test were used to identify causes of varicose veins (physicians name were listed in appendix C). The female electronic workers who were assigned as the controls were asked to perform in the same manner. Both of the cases and the controls were asked to fill up the self administered questionnaires.

Protocol for diagnosis varicose veins (86).

1. General examination was performed while the workers standing on the platform or floor.
2. The specialized physician inspected and examined the whole of both legs from the groins to the toes.
3. Varicose veins were diagnosed when the vein size is more than 3 mm. Grading the levels of severity is follow by form recording (5 levels as listed in the definition).
4. In order to identify the types of varicose veins, the medical examination was performed by using the path of Brodie Trendelenburg test and Perthes' test.
5. The test of Brodie Trendelenburg diagnoses valvular incompetence in superficial system and perforating system. The method begins with patients lay down, then lift the leg which has varicose veins to empty the blood in superficial vein. A tourniquet is applied to tighten around upper leg. Observation starts when the woman worker stand on her feet. If the valve of perforating vein is dysfunction, The veins will suddenly dilate. After the tourniquet is released, the veins will suddenly dilate or even more dilate in saphenous veins valve disorder.

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6. The Perthes' test was used in order to assess deep veins and perforating veins. The test was performed by using the tourniquet to tighten around the upper leg in upright position and let the patients walk. If the varicose veins disappear, the deep vein system and perforating vein are efficient. If pain occurs after walking, the deep vein system is obstructed.

3.7 Statistical analysis

Data were analyzed by using SPSS version 13.0. The statistical analysis were used as follows :

1. The prevalence rate was used to describe prevalence of varicose veins in population.

2. The descriptive statistics were used to describe the general characteristics of the cases and the controls and were used to describe the general characteristics of varicose veins among cases.

3. The Chi-square test was used to differentiate the factors between the cases and the controls.

4. Spearman rank correlation was used to describe relations between frequency of symptoms and signs, feeling and interfered activities or work in the cases.

5. Univariate analysis was used to determine the association between the factors and varicose veins (one dependent variable and one independent variable). Including the evaluation of crude odds ratio and 95% confidence.

6. Multivariate analysis was used to determine the adjusted association between the factors and varicose veins while simultaneously control the confounders by Forward logistic regression analysis method. The adjusted odds ratio with 95% confidence interval of the important factors and were calculated.

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CHAPTER IV
RESULTS OF THE STUDY

Data were collected from two electronic factories in Bangkok and Pathumthani. Total number of the women workers who were agreed to participate and diagnosed as varicose veins in this study was 770. After the diagnosis, subsequent studied on the factors associated with varicose veins was done by case-control study. The study comprised 82 cases and 164 controls with matching for age (±3 years). The study results were presented in 4 main parts as the following:

4.1 The primary investigation of varicose veins occurrence in population.

4.2 The descriptive analysis of the cases and the controls.

4.3 Correlation between frequency, feeling and interfered activities or work of symptoms and signs.

4.4 Factors associated with varicose veins occurrence.

4.1 The primary investigation of varicose veins occurrence in population.

From 770 of studied population, The result was 254 persons with varicose veins and 258 person without varicose veins. The prevalence of varicose veins in this study was 32.99%, as show in table 4-1.

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Table 4-1 Comparison of occurrence on varicose veins between the two electronic factories.

Occurrence on varicose veins	Factory 1		Factory 2		Total	
	N	%	N	%	N	%
Normal	121	26.02	137	44.92	258	33.51
Spider veins	80	17.20	54	17.70	134	17.40
Reticular veins	44	9.46	80	26.23	124	16.10
Varicose veins	220	47.31	34	11.15	254	32.99
Total	465	100.00	305	100.00	770	100.00

The most common severity of varicose veins is simple varicose veins (96.85%) in this study. The second most common was varicose veins with edema (2.67%). Varicose veins with healed venous ulcer was found in few population (0.39%).

The varicose veins with skin pigmentation and varicose veins with active venous ulcer were not found in this study, as show in table 4.2.

Table 4-2 Severity of varicose veins among the women workers population.

Level of severity	Factory 1		Factory 2		Total	
	N	%	N	%	N	%
Simple varicose veins	212	96.36	34	100.00	246	96.85
Varicose veins and edema	7	3.18	-	-	7	2.76
Varicose veins and skin pigmentation	-	-	-	-	-	-
Varicose veins and healed venous ulcer	1	0.45	-	-	1	0.39
Varicose veins and active venous ulcer	-	-	-	-	-	-
Total	220	100.00	34	100.00	254	100.00

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The results of the case and the control studies consisted of the descriptive analysis, the correlation between frequency, feeling and interfered activities or work of symptoms and signs and associated factors with varicose veins occurrence.

4.2 The descriptive analysis of the cases and the controls.

4.2.1 General characteristics of the cases and the controls

Personal characteristics

The personal characteristics of the cases and the controls consisted of age, body mass index, education level, marital status, number of pregnancy, number of children, family history of varicose veins, knowledge about varicose veins, prevention about varicose veins, duration of work, over time day, duration of traveling and method of traveling were shown in table 4-3.

A) Age

The cases and the controls were matched by age (±3 years). The largest age group in both cases and controls was 30-39 years (45.12% and 48.78%). The second largest age group was 40-49 years (37.80% and 34.76% respectively). The smallest age group was 20-29 years (17.07% and 16.46% respectively). The averaged ages of cases and controls were 36.27±6.79 years and 36.40±6.55 years respectively.

B) Body Mass Index

The majority of the cases had body mass index between 18.5-22.9 kg/m^2 (50.00%). The group of body mass index more than 22.9 kg/m^2 represented smaller groups for cases (41.46%) and body mass index group less than 18.5 kg/m^2 was the smallest group (8.54%). In the control group, most of the subjects had the body mass indices more than 22.9 kg/m^2 (48.78%), Followed by the body mass indices between 18.5-22.9 kg/m^2 (40.85%) and the smallest subject had body mass indices less than 18.5 kg/m^2 (10.37%). The mean of body mass indices (±SD) in case and control groups were 22.95 ± 3.98 and 23.29 ± 4.15 respectively.

C) Education level

The majority of cases and controls were secondary school graduates (48.78% and 62.20% respectively). Following by vocational certificates (28.05 % and 25.00%

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respectively) and bachelor's degrees (23.17 % and 11.59% respectively). The smallest numbers of case and control were primary school (0.00% and 1.22% respectively).

D) Marital status

The majority of both cases and controls were married (53.66% and 52.44% respectively). The second status were single (34.15% of the cases and 39.63% of the controls). The last status of both cases and controls were divorce/widow/ separate (12.19% and 7.93% respectively).

E) Number of pregnancy

After analyzed all marital status (single, married and divorce/widow/ separate), the most of the cases and the controls were non-pregnancy (43.90% and 46.34% respectively). In case of marriage status, the cases and the controls who had more than one pregnancy were 51.85% and 53.54% respectively. The cases and the controls who had only one pregnancy were 33.33% and 35.35% respectively. The nulliparus status of the cases and the controls were 14.81% and 11.11% respectively. The number of parity that most commonly found in cases were 3 and in controls were 5 pregnancy.

F) Number of children

In women who have been married, the major group of cases and controls who had more than 1 child were (51.85% and 47.47% respectively. Having only one child was a smaller group (31.48% of the cases and 39.39% of the controls) while having no children was the smallest group (16.67 % of the cases and 13.13 % of the controls). The average number of children were 1.37 for the cases and 1.39 for the controls. The most number of children that most commonly found in the cases and the controls were 3.

G) Family history of varicose veins

There were no family histories of varicose veins were found in 65.85% of the cases and 89.63% of the controls. While small numbers of both cases and controls had family histories of varicose veins only 34.15% and 10.37% respectively.

H) Knowledge about varicose veins

The majority of both cases and controls had no knowledge concerning the varicose veins (67.07 % and 78.05 % respectively). However, in the cases group there were more knowledge of varicose veins than the controls (32.93 % and 21.95 % respectively).

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I) Prevention about varicose veins

The majority of cases and controls did not have prevention about varicose veins (79.27 % and 88.41 % respectively). While the cases used prevention methods such as compressive stocking more than controls (i.e. 2:1 ratio).

J) Duration of work

The majority of cases and controls had the duration of work between 121-240 months (56.10% of the cases and 66.46% of the controls). While 0-120 months represented smaller groups (26.83% of the cases and 24.39% of the controls) and more than 240 months was the smallest group (17.07% of the cases and 9.15% of the controls). The average duration of work among the cases and the controls were 173.43 (± 85.54) month and 168.39 (± 84.25) month. The minimum and maximum of duration of work among the cases were 6 month and 362 month respectively, while among the controls were 3 month and 372 month respectively.

K) The overtime

The majority of both cases and controls had worked overtime. The largest group of cases had 1-3 days of overtime per week (59.76%), the second largest group had more than 3 days of overtime per week (23.17%). Among the controls, the largest group more than 3 days of overtime per week (51.22%), the second largest group had 1-3 days of overtime per week (30.49%). While the smallest group of the cases and the controls did not work overtime (17.07% and 18.29% respectively). The average over time day of the cases and the controls were 2.51 (± 1.82) day per week and 3.33 (± 2.35) day per week respectively.

L) Duration of traveling

The majority of the cases and the controls had the average traveling time from home to work less than 30 minutes (53.66% of the cases and 54.88% of the controls). The traveling time between 30-60 minutes were 36.58% of the cases and 38.41% of the controls and the traveling over 60 minutes were 9.76% of the cases and 6.71% of the controls. The average duration of traveling time among the cases and the controls were 45.24 minutes and 43.21 minutes respectively.

M) The way of traveling

The most common method of traveling in both cases and controls was company's bus (60.97% and 78.05% respectively). In the cases group, the second most

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common method of traveling was by cars (13.41%). The third common method of traveling was by motorcycle (12.20%). The fourth common method of traveling was by public bus (8.54%) and the smallest group was traveled by walking or by bicycle (4.88%). In the controls group, the second largest method of traveling was motorcycle and car (6.71%). The third common was by public bus (4.88%) and the least common was by walking or bicycle (3.66%).

Table 4-3 Personal characteristics of the cases and the controls.

Personal characteristics	Cases		Controls	
	N	%	N	%
Age (years)				
20-29 years group	14	17.07	27	16.46
30-39 years group	37	45.12	80	48.78
40-49 years group	31	37.80	57	34.76
Mean (SD)		36.27(6.79)		36.40(6.55)
Minimum/maximum		22/48		20/49
	$\chi^2 = 0.308$	df = 2	p-value = 0.857	
Body Mass Index				
Underweight (BMI < 18.5)	7	8.54	17	10.37
Normal (BMI 18.5 – 22.9)	41	50.00	67	40.85
Overweight (BMI ≥ 23.0)	34	41.46	80	48.78
Mean (SD)		22.95(3.98)		23.29(4.15)
Minimum/maximum		17.40/36.94		15.81/40.00
	$\chi^2 = 1.861$	df = 2	p-value = 0.394	
Education level				
Primary school	0	0.00	2	1.22
Second school	40	48.78	102	62.20
Vocational certificate	23	28.05	41	25.00
Bachelor's degree	19	23.17	19	11.59
	$\chi^2 = 7.650$	df = 3	p-value = 0.054	

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Table 4-3 Personal characteristics of the cases and the controls (continued).

Personal characteristics	Cases		Controls	
	N	%	N	%
Marital status				
Single	28	34.15	65	39.63
Married	44	53.66	86	52.44
Divorce/widow/separate	10	12.19	13	7.93
	$\chi^2 = 1.516$	df = 2	p-value = 0.469	
Number of pregnancy				
None	8	14.81	11	11.11
1	18	33.33	35	35.35
More than 1	28	51.85	53	53.54
Mean (SD)	1.44(0.84)			1.53(0.86)
Minimum/maximum	0/3			0/5
	$\chi^2 = 0.446$	df = 2	p-value = 0.800	
Number of children				
None	9	16.67	13	13.13
1	17	31.48	39	39.39
More than 1	28	51.85	47	47.47
Mean (SD)	1.37(0.78)			1.39(0.78)
Minimum/maximum	0/3			0/3
	$\chi^2 = 1.657$	df = 3	p-value = 0.647	
Family history of varicose veins				
No	54	65.85	147	89.63
Yes	28	34.15	17	10.37
	$\chi^2 = 20.684$	df = 1	p-value < 0.001	

* Number of pregnancy and number of children were calculated by samples of married and divorce/widow/separate status.

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Table 4-3 Personal characteristics of the cases and the controls (continued).

Personal characteristics	Cases		Controls	
	N	%	N	%
Family history of varicose veins				
Classification				
- Father	4	14.29	0	0
- Mother	17	60.71	10	58.82
- Elder sister	2	7.14	5	29.41
- Younger sister	1	3.57	0	0
- Younger brother	1	3.57	1	5.88
- Uncle/aunt	2	7.14	0	0
- Father and mother	1	3.57	1	5.88
Knowledge about varicose veins				
No knowledge	55	67.07	128	78.05
Knowledge	27	32.93	36	21.95
	$\chi^2 = 3.457$	df = 1	p-value = 0.063	
Prevention about varicose veins				
No prevention	65	79.27	145	88.41
Prevention	17	20.73	19	11.58
	$\chi^2 = 3.661$	df = 1	p-value = 0.056	
Duration of work (month)				
0-120 month	22	26.83	40	24.39
121-240 month	46	56.10	109	66.46
More than 240 month	14	17.07	15	9.15
Mean (SD)	173.43(85.54)		168.39(84.25)	
Minimum/maximum	6/362		3/372	
	$\chi^2 = 3.975$	df = 2	p-value = 0.137	

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Table 4-3 Personal characteristics of the cases and the controls (continued).

Personal characteristics	Cases		Controls	
	N	%	N	%
The overtime (day/week)				
Never	14	17.07	30	18.29
1-3 days/week	49	59.76	50	30.49
More than 3 days/week	19	23.17	84	51.22
Mean (SD)	2.51(1.82)		3.33(2.35)	
Minimum/maximum	0/6		0/7	
	$\chi^2 = 21.954$ df = 2		p-value < 0.001	
Duration of traveling (minute)				
≤ 30 minute	44	53.66	90	54.88
31 – 60 minute	30	36.58	63	38.41
More than 60 minute	8	9.76	11	6.71
Mean (SD)	45.24(30.39)		43.21(29.40)	
Minimum/maximum	5/150		7/180	
	$\chi^2 = 0.721$ df = 2		p-value = 0.697	
The way of traveling				
Walk/ bicycle	4	4.88	6	3.66
Motorcycle	10	12.20	11	6.71
Car	11	13.41	11	6.71
Company's bus	50	60.97	128	78.05
Public bus	7	8.54	8	4.88
	$\chi^2 = 8.281$ df = 4		p-value = 0.082	

Distribution of factors in personal characteristics, family history of varicose veins and overtime day of case and control were significantly different.

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Characteristics of work

The characteristics of work included working posture, lifting and heat exposure (see table 4-4).

A) Working posture

Most of working posture in the cases study group was standing and moving around, long distances (23.17%). The second posture was found in standing with the possibility of sitting down and sitting and moving around, short distances (18.29%). The third posture was found in standing and moving around, short distances (15.85%). The fourth posture was found in sitting and moving around, long distances (14.63%). The fifth posture was found in fixed sitting posture (7.32%). The last posture was the fixed standing posture (2.44%).

In the control study group, more than a quarter was found to be in the fixed sitting posture (28.05%). The second posture was found in sitting and moving around, short distances (27.44%). The third posture was found in standing and moving around, short distances (17.07%). The fourth posture was found in sitting and moving around, long distances (15.24%). The fifth posture was found in standing with the possibility of sitting down (7.32%). The sixth posture was found in standing and moving around, long distances (3.66%). The last posture was found to be in the fixed standing position (1.22%).

B) Lifting

Most of the cases used to do lifting (59.76%) while lifting among the controls group was found in the smallest group (37.20%). Never done the lifting was found in the controls more than in the cases group (62.80% and 40.24% respectively).

C) Heat exposure

Most of the cases and controls groups were not exposed to heat in working area (73.17% of the cases and 84.76% of the controls). The cases group had exposed to heat more than controls group with the ratio of 27:16.

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Table 4-4 Work characteristics of the cases and the controls.

Work characteristics	Cases		Controls	
	Number	Percentage	Number	Percentage
Working posture				
Fixed sitting posture	6	7.32	46	28.05
Sitting and moving around, short distances	15	18.29	45	27.44
Sitting and moving around, long distances	12	14.63	25	15.24
Fixed standing posture	2	2.44	2	1.22
Standing and moving around, short distances	13	15.85	28	17.07
Standing and moving around, long distances	19	23.17	6	3.66
Standing with the possibility of sitting down	15	18.29	12	7.32
	$\chi^2 = 40.033$	df = 6	p-value < 0.001	
Lifting				
Never	33	40.24	103	62.80
Lifting	49	59.76	61	37.20
	$\chi^2 = 11.256$	df = 1	p-value = 0.001	
Heat exposure				
Never	60	73.17	139	84.76
Exposure	22	26.83	25	15.24
	$\chi^2 = 4.747$	df = 1	p-value = 0.029	

The distribution of factors according to the characteristics of work included working posture, lifting and heat exposure of case and control were significantly different.

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Health behavior

Health behavior included alcohol drinking, cigarette smoking, exercise and used of oral contraceptive pill. These results shown in table 4-5.

A) Alcohol drinking

The majority of cases and controls group were categorized as non-drinking (84.15% and 87.20% respectively). The smallest number was found as ex-drinkers or current drinkers (15.85% of the cases and 12.80% of the controls, respectively).

B) Cigarette smoking

Most of the cases and the controls were non-smoker (97.56% of the cases and 98.17% of the controls, respectively). The smokers of ex-smokers and current-smokers were the smallest number among cases and control groups (2.44% of the cases and 1.83% of the controls, respectively).

C) Exercise

More than half of cases and controls were in the non-exercise group (74.39% and 68.29% respectively) while the exercise group showed the smallest number of cases and controls (25.61% and 31.71% respectively).

D) Use of oral contraceptive pill

The largest number of the cases had been used or currently used of oral contraceptive pill (52.44%). Person who never used of oral contraceptive pill was the smallest number (47.56%). The largest number of the controls who had never used the oral contraceptive pill (54.88%) and the ex-used or currently used of oral contraceptive pill was the smallest number (45.12%).

Table 4-5 Health characteristics of the cases and the controls.

Health characteristics	Cases		Controls	
	Number	Percentage	Number	Percentage
Alcohol drinking				
Never	69	84.15	143	87.20
Ex-drinker/current drinker	13	15.85	21	12.80
	$\chi^2 = 0.427$	df = 1	p-value = 0.514	

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Table 4-5 Health characteristics of the cases and the controls (continued).

Health characteristics	Cases		Controls	
	Number	Percentage	Number	Percentage
Cigarette smoking*				
Never	80	97.56	161	98.17
Ex-smoker/current smoker	2	2.44	3	1.83
			p-value = 1.000	
Exercise				
Exercise	21	25.61	52	31.71
Never	61	74.39	112	68.29
	$\chi^2 = 0.974$	df = 1	p-value = 0.324	
Oral contraceptive pill				
Never	39	47.56	90	54.88
Ex-users/current users	43	52.44	74	45.12
	$\chi^2 = 1.174$	df = 1	p-value = 0.279	

* Fisher's test

Distribution of all factors in health characteristics of case and control had no significantly differences.

4.2.2 Types of varicose veins

This study found only primary varicose veins in the cases group (100%).

4.2.3 Severity of varicose veins.

Most of cases had simple varicose veins (96.34%). The second had varicose veins and edema (3.66%). There was no severity of varicose veins was found to be skin pigmentation, healed venous ulcer and active venous ulcer (see table 4-6).

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Table 4-6 Severity classification of varicose veins.

Severity of varicose veins	Number	Percentage
1. Simple varicose veins	79	96.34
2. Varicose veins and edema	3	3.66
3. Varicose veins and skin pigmentation	-	-
4. Varicose veins and healed venous ulcer	-	-
5. Varicose veins and active venous ulcer	-	-
Total	82	100.00

4.2.4 Locations of varicose veins

In this study, the locations of varicose veins were divided into 5 locations. The majority of varicose veins was below knee (54.88%). The next were popliteal only, whole legs, above knee and ankle only (31.71%, 9.76%, 2.44% and 1.22% respectively).

Table 4-7 The location of varicose veins classified along with the types of varicose veins.

Location	Varicose viens (leg)			N	%
	Left	Right	Left and right		
Above knee	-	-	2	2	2.44
Popliteal only	6	12	8	26	31.71
Below knee exclude ankle	12	8	25	45	54.88
Ankle only	-	1	-	1	1.22
Whole legs	2	2	4	8	9.76
Total	20	23	39	82	100.00

4.2.5 Symptoms and signs

The results from questionnaire showed that the symptoms and signs of varicose veins in the cases had many frequency levels (see table 4-8).

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Frequency of symptoms and signs

Most of the cases had aching (93.90%) and more than half of the cases had cramp (80.49%), heaviness (54.88%) and itching (54.88%). The rest of cases had swelling (46.34%) and burning (34.15%).

Levels of severity of frequency in occurrence were separated by symptoms and signs. Aching had moderate severity while 5 other symptoms and signs such as heaviness, swelling, cramp, burning and itching had mild severity.

Feeling of symptoms and signs

In the cases group, the feeling of aching and cramp had moderate severity while the feeling of other symptoms and signs had mild severity.

Interfered activities or work

Symptoms and signs that interfered activities or work in 82 cases were divided as heaviness (48.78%), aching (91.46%) swelling (43.90%), cramp (69.51%), burning (30.49%) and itching (50.00%). The results showed that aching had moderate severity in interference of activities or work. Interference of activities or work in other symptoms and signs had mild severity. The details were also shown in table 4-8.

Table 4-8 The symptoms and signs classified according to the frequency level, feeling level and interfered level.

Symptoms and signs	Number	Percentage	Mean	Indicator (severity)
Frequency level				
Heaviness	45	54.88	1.16	Mild
Aching	77	93.90	2.22	Moderate
Swelling	38	46.34	1.09	Mild
Cramp	66	80.49	1.50	Mild
Burning	28	34.15	0.59	Mild
Itching	45	54.88	1.13	Mild

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Table 4-8 The symptoms and signs classified according to the frequency level, feeling level and interfered level (continued).

Symptoms and signs	Number	Percentage	Mean	Indicator (severity)
Feeling level				
Heaviness	45	54.88	0.98	Mild
Aching	77	93.90	2.09	Moderate
Swelling	38	46.34	0.99	Mild
Cramp	66	80.49	1.70	Moderate
Burning	28	34.15	0.72	Mild
Itching	45	54.88	1.01	Mild
Interfered level				
Heaviness	40	48.78	0.82	Mild
Aching	75	91.46	1.72	Moderate
Swelling	36	43.90	0.87	Mild
Cramp	57	69.51	1.28	Mild
Burning	25	30.49	0.59	Mild
Itching	41	50.00	0.83	Mild

4.2.6 The association between the posture and symptoms and signs of varicose veins.

A) Heaviness

More than half of the cases had heaviness and majority of heaviness occurred while walking (44.44%), followed by heaviness occurred after walking (22.22%), then standing (20.00%), after standing (8.89%) and after sitting (6.67%). The second last occurred at night (4.44%). And the last of heaviness occurred while sitting (2.22%).

B) Aching

The largest number of aching was found while walking (41.56%), after walking (28.57%), while standing (25.97%), after standing (16.88%) and at night (10.39%). The

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second to last was found while sitting (9.10%) and the smallest number was found to be after sitting (3.90%).

C) Swelling

Swelling after standing showed the largest number of swelling (31.58%). Other postures included after walking (28.95%), when walking (21.05%), when standing (18.42%), and when sitting (15.79%) and the smallest number of swelling occurred after sitting and at night (5.26%).

D) Cramp

The largest group of cramp occurred at night (77.27%). The second largest group occurred while sitting (12.12%). The third largest group occurred after sitting (9.10%). The fourth largest group occurred while walking (4.55%) and the smallest number had cramp after walking (1.52%).

E) Burning

The largest group of burning had burning while walking (39.29%). The second, the third, the fourth and the last group had burning after walking and while standing (17.86%), while sitting (14.29%), after standing (10.71%) and after sitting and at night (7.14%) respectively .

F) Itching

The majority of itching occurred in the cases while walking (33.33%). The second occurred after walking and at night (20.00%). The third occurred while sitting (15.56%). The fourth occurred after standing (13.33%). The fifth occurred while standing (8.89%) and the smallest number occurred after sitting (6.67%). The details of itching were shown in table 4-9.

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Table 4-9 Classification of symptoms and signs according to the posture of work.

Symptoms and signs	Posture of work													
	While walking		After walking		While standing		After standing		While sitting		After sitting		At night	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Heaviness	20	44.44	10	22.22	9	20.00	4	8.89	1	2.22	3	6.67	2	4.44
Aching	32	41.56	22	28.57	20	25.97	13	16.88	7	9.10	3	3.90	8	10.39
Swelling	8	21.05	11	28.95	7	18.42	12	31.58	6	15.79	2	5.26	2	5.26
Cramp	3	4.55	1	1.52	0	0.00	0	0.00	8	12.12	6	9.10	51	77.27
Burning	11	39.29	5	17.86	5	17.86	3	10.71	4	14.29	2	7.14	2	7.14
Itching	15	33.33	9	20.00	4	8.89	6	13.33	7	15.56	3	6.67	9	20.00

* Percentage were calculated from 82 cases that cases can select one or more answer in each items.

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4.3 Correlation between frequency, feeling and interfered activities or work of symptoms and signs.

In this study, the correlations between frequency, feeling and interfered activities or work of each symptoms and signs were tested by spearman rank correlation.

All levels of correlations were positive and had significant correlations. The correlation coefficients were between 0.670 - 0.970. The correlations between frequency and feeling had high correlation coefficient. The data was shown in table 4-10.

A) Heaviness

The correlation between frequency and feeling, frequency and interfered activities or work, feeling and interfered activities or work of heaviness showed significantly positive correlations (p-value < 0.001) and the correlation coefficients were equal to 0.923, 0.872 and 0.865 respectively.

B) Aching

The significant correlations were found between the frequency and the feeling, the frequency and the interfered activities or work, the feeling and the interfered activities or work of aching (p-value < 0.001), the correlation coefficients were 0.724, 0.731 and 0.710 respectively.

C) Swelling

There were highly significant correlations occurred between the frequency and the feeling of swelling. The result showed significant correlation at 0.930 (p-value < 0.001). The correlation between the frequency and the interfered activities or work, the feeling and the interfered activities or work were also significant (p-value < 0.001) with the correlation coefficients of 0.923 and 0.901 respectively.

D) Cramp

Statistically significant correlations occurred between the frequency and the feeling, frequency and the interfered activities or work, the feeling and the interfered activities or work of cramp (p-value < 0.001), the correlation coefficients were 0.718, 0.670 and 0.723 respectively.

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E) Burning

The frequency of burning showed very high significant correlation with the feeling of burning. The correlation coefficient was 0.970. While the correlations between the frequency and the interfered activities or work, the feeling and the interfered activities or work of burning were also significant (p-value < 0.001). The correlation coefficients were 0.902 and 0.877 respectively.

F) Itching

There were significant correlations between the frequency and the feeling, frequency and the interfered activities or work, the feeling and the interfered activities or work of itching (p-value < 0.001). The correlation coefficients were 0.913, 0.885 and 0.879 respectively.

Table 4-10 Spearman rank correlations between the frequencies and the symptoms and signs.

Symptoms and signs	r	r^2	p-value
Heaviness			
Frequency and feeling	0.923	0.852	< 0.001
Feeling and interference	0.872	0.760	< 0.001
Frequency and interference	0.865	0.748	< 0.001
Aching			
Frequency and feeling	0.724	0.524	< 0.001
Feeling and interference	0.731	0.534	< 0.001
Frequency and interference	0.710	0.504	< 0.001
Swelling			
Frequency and feeling	0.930	0.865	< 0.001
Feeling and interference	0.923	0.852	< 0.001
Frequency and interference	0.901	0.812	< 0.001
Cramp			
Frequency and feeling	0.718	0.516	< 0.001
Feeling and interference	0.670	0.449	< 0.001
Frequency and interference	0.723	0.523	< 0.001

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Table 4-10 Spearman rank correlations between the frequencies and the symptoms and signs (continued).

Symptoms and signs	r	r^2	p-value
Burning			
Frequency and feeling	0.970	0.941	< 0.001
Feeling and interference	0.902	0.814	< 0.001
Frequency and interference	0.877	0.769	< 0.001
Itching			
Frequency and feeling	0.913	0.834	< 0.001
Feeling and interference	0.885	0.783	< 0.001
Frequency and interference	0.879	0.773	< 0.001

4.4 Factors associated with varicose veins occurrence.

4.4.1 The factors associated with varicose veins occurrence tested by univariate analysis.

According to the different statistical analyses of influencing factors which analyzed between case and control groups in each factor. The family history of varicose veins, working posture, lifting and heat exposure showed significant differences while the body mass index, the number of pregnancy, the number of children, the family history of varicose veins, duration of work, duration of traveling, the way of traveling, working posture, lifting, heat exposure, alcohol drinking, cigarette smoking, exercise and oral contraceptive pill showed no significantly differences between the cases and the controls.

The association between the factors and the development of varicose veins (using univariate analysis for estimated odd ratio) showed that the family history of varicose veins had the strong association with varicose veins occurrence (p-value < 0.001). Univariate analysis showed increase in the risk of family history of varicose veins (OR = 4.48, 95% CI = 2.28-8.84) when compared with people who had no family history of varicose veins.

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For working posture, it was found that the risk was significantly increased in standing and moving around, short distances (OR = 3.56, 95% CI = 1.21-10.43) sitting and moving around, long distances (OR = 3.68, 95% CI = 1.23-10.99), standing with the possibility of sitting down (OR = 9.58, 95% CI = 3.06-29.97) and standing and moving around, long distances (OR = 24.28, 95% CI = 6.95-84.86).

Lifting was found to have a strong association with the occurrence of varicose veins (p-value = 0.001). Women workers who had lifting history had the risk for developing varicose veins as compared to those who never had lifting history while working (OR = 2.51, 95% CI = 1.46-4.32).

The association between heat exposure and varicose veins showed that the women workers who had heat exposure history had the risk for developing varicose veins when compared to women workers who never had heat exposure history while working (OR = 2.04, 95% CI = 1.07-3.90).

Table 4-11 The association between the factors and the varicose veins by using chi-square test and univariate analysis.

Factors	χ^2	df	p-value	OR	95%CI	p-value
Body Mass Index						
Underweight (BMI< 18.5)	1.861	2	0.394	1.00		
Normal (BMI 18.5 – 22.9)				1.49	0.57-3.89	0.420
Overweight (BMI≤ 23.0)				1.03	0.39-2.72	0.949
Number of pregnancy						
None	0.136	2	0.934	1.00		
1				1.09	0.54-2.17	0.816
More than 1				1.12	0.61-2.04	0.724
Number of children						
None	0.833	2	0.659	1.00		
1				0.92	0.46-1.83	0.810
More than 1				1.26	0.68-2.31	0.464
Family history of varicose veins						
No	20.684	1	< 0.001	1.00		
Yes				4.48	2.28-8.84	< 0.001

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Table 4-11 The association between the factors and the varicose veins by using chi-square test and univariate analysis (continued).

Factors	χ^2	df	p-value	OR	95%CI	p-value
Duration of work						
0-120 month	3.975	2	0.137	1.00		
121-240 month				0.77	0.41-1.43	0.405
More than 241 month				1.7o	0.69-4.15	0.247
Duration of traveling						
≤30 minute	0.721	2	0.697	1.00		
31 – 60 minute				0.97	0.55-1.71	0.927
More than 60 minute				1.49	0.56-3.96	0.427
The way of traveling						
Walk/ bicycle	8.281	4	0.082	1.00		
Motorcycle				1.36	0.30-6.28	0.691
Car				1.50	0.33-6.83	0.600
Company's bus				0.59	0.16-2.16	0.423
Bus				1.31	0.26-6.64	0.742
Working posture						
Fixed sitting posture	40.033	6	< 0.001	1.00		
Sitting and moving around short distances				2.56	0.91-7.17	0.075
Sitting and moving around long distances				3.68	1.23-10.99	0.020
Fixed standing posture				7.67	0.91-64.94	0.062
Standing and moving around, short distances				3.56	1.21-10.43	0.021
Standing and moving around, long distances				24.28	6.95-84.86	< 0.001
Standing with the possibility of sitting down				9.58	3.06-29.97	< 0.001
Lifting						
Never	11.256	1	0.001	1.00		
Lifting				2.51	1.46-4.32	0.001

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Table 4-11 The association between the factors and the varicose veins by using chi-square test and univariate analysis (continued).

Factors	χ^2	df	p-value	OR	95%CI	p-value
Heat exposure						
Never	4.747	1	0.029	1.00		
Exposure				2.04	1.07-3.90	0.029
Alcohol drinking *						
Never			1.000	1.00		
Ex-drinker/current drinker				1.28	0.61-2.71	0.514
Cigarette smoking						
Never	0.102	1	0.749	1.00		
Ex-smoker/current smoker				1.34	0.22-8.19	0.749
Exercise						
Exercise	0.974	1	0.324	1.00		
Never				1.35	0.74-2.45	0.324
Oral contraceptive pill						
Never	1.174	1	0.279	1.00		
Ex-users/current users				1.34	0.79-2.28	0.279

* Fisher's test

4.4.2 The factors associated with varicose veins occurrence using multivariate analysis.

The logistic regression analysis was performed in order to determine the high influencing or important factors associated with varicose veins occurrence. The logistic regression was used to calculate odds ratio of factors after the adjustment of other variables then analyzed by forward stepwise method.

Table 4-12 showed results between the factors associated with varicose veins using logistic regression, comparing the univariate analysis after limiting the influence of other variables. Simultaneously, the results indicated that the important risk factors

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of varicose veins were the number of children, family history of varicose veins, working posture and lifting.

After controlling the effect of other factors, the significant associated between number of children and varicose veins was found. The result of this study showed that the women who had more than 1 children risked in having varicose veins (OR = 2.62, 95% CI = 1.21-5.69).

The result of multivariate analysis according to family history of varicose veins was shown in table 4-12. The risk of varicose vein occurrence in women who had family history of varicose veins remained statistically significant (OR = 6.17, 95% CI = 2.72-13.98).

After adjustment of other factors, the odd ratio for working posture was still strongly significant associated with varicose veins. The risk of varicose veins occurrence significantly increased at other working postures when compared to fix sitting posture. Standing and moving around, short distances posture was the least risk factor (OR = 3.29), followed by sitting and moving around, long distances (OR = 4.48), standing with the possibility of sitting down (OR = 12.03), fixed standing posture (OR = 12.53) and standing and moving around , long distance (OR = 26.85).

Lifting was associated with varicose veins after analyzing by multivariate analysis. Lifting was the risk of varicose veins occurrence among women workers (OR = 2.29).

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Table 4-12 The association between the factors and varicose veins occurrence by using multivariate analysis.

Factors	OR	95%CI	P-value
Number of children			
None			
1	1.43	0.62-3.28	0.404
More than 1	2.62	1.21-5.69	0.015
Family history of varicose veins			
No			
Yes	6.17	2.72-13.98	< 0.001
Working posture			
Fixed sitting posture			
Sitting and moving around, short distances	2.80	0.92-8.47	0.069
Sitting and moving around, long distances	4.48	1.36-14.83	0.014
Fixed standing posture	12.53	1.39-113.00	0.024
Standing and moving around, short distances	3.29	1.02-10.64	0.047
Standing and moving around, long distances	26.85	6.88-104.82	< 0.001
Standing with the possibility of sitting down	12.03	3.35-43.21	< 0.001
Lifting			
Never			
Lifting	2.29	1.19-4.38	0.013

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Consideration of each factors, the most powerful factor associated with varicose veins was working posture (21.1%), followed by family history of varicose veins (8.8%), and number of children (2.7%) The least powerful associated factor was lifting (1.9%). The results showed in table 4-13 and 4-14.

Table 4-13 Comparison between factors and r square.

Influenced factors	r	r^2	% difference of r^2
Working posture	0.459	0.211	21.1
Family history of varicose veins	0.547	0.299	8.8
Lifting	0.564	0.318	1.9
Number of children	0.587	0.345	2.7

Table 4-14 The effective associated factors arranged from the most to the least.

Order	Influenced factors
1	Working posture
2	Family history of varicose veins
3	Number of children
4	Lifting

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CHAPTER V
DISCUSSION

5.1 Discussion of study design and methodology

In this study, researcher had conducted the survey leading to the study of risk factors of varicose veins in a retrospective by case-control study, the study was conducted in the cases and the controls group who work in the same type of electronic factory. All subjects were diagnosed as varicose veins by the specialized physicians in the same period of time and responded to the same questionnaires.

In this study, the error might have been occurred in the three manners. These included the selection bias, the information bias and the confounding bias.

1. The selection bias

In order to decrease bias from selecting of the cases and the controls, this study used the cases and the controls in the same source namely electronic factories. Reduction of selection bias was done by determining a strict criteria for the cases and controls group. This study excluded the case and the control with venous disease which could happen by the same cause as varicose veins such as spider veins, reticular veins or deep vein thrombosis. Thus, the results from this study illustrated the real factor which associated with the varicose veins.

2. The information bias

The results of diagnosis on population may be bias from personal variables because there were three physicians. However each subject were diagnosed by a separate physician who was trained on the method of diagnosis and

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identified varicose veins. Each physician used the grading form in order to reduce bias from inter-observer variation such as misclassification.

Recall bias was minimized by reviewing the record of factories and checking for each subjects in some part of questionnaire. Another method to avoid the recall bias was to create the connection between each questions.

3. The confounding

The control, the association of extraneous variables was conducted by selecting the same characteristics of the subjects. Therefore, only female workers in the electronic factories were utilized in this study in order to decrease the differences of other variables which lead to confounding factors for instance, socio-economic and employment status. Age associates with varicose vein occurrences and can be defined as confounding factor in this study. Thus, variable of age was rejected with matching between the case and the control by age (±3 years) which was performed in this study.

In addition, analysis statistical was used to control confounding factors by using logistic regression analysis was performed in order to test the adjusted OR for the interpretation of data.

5.2 Discussion of statistics analysis.

1. Descriptive statistic

Descriptive statistic presented in frequency, percentage, mean, SD (standard deviation), minimum and maximum in order to showed characteristics of cases and controls.

2. Inferential statistic

The study of the influence of risk factors and varicose veins using a forward stepwise logistic regression analysis to control the influence that can be happened from another factors. Analysis of risk factors in match case-control study is necessary to use a technique that is a clear condition otherwise it may be an occurrence bias in the odd ratio.

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5.3 Discussion of study results.

According to the result of calculated prevalence of varicose vein in study population, the number is 32.99% (27.99% - 37.99%). Approximately one third of 770 study populations have varicose veins which is similar to previous study by Sisto T, et al. (16) that varicose veins had high prevalence in the industrialized population. Regarding, to types of varicose veins in the cases found only primary varicose veins which caused by valve failure or weakness of the vein wall. Most severity of varicose veins was simple varicose veins (grade 1) was 96.34% followed by varicose veins and edema (grade 2) in 3.66%. The patient in worse condition was not found in this study because patients with a higher severity level were not be able to work regularly. The age of population in this study is between 20 to 49 which is a midlife, therefore the varicose veins had not yet developed to the high severity level. However, if the study wants to find the higher severity level in population, the design should be developed in the older population. The cases had symptoms and signs of heaviness, aching, swelling, night cramp, burning and itching. In addition that association between frequency, feeling and interfered activities or work of all symptoms and signs presented positive correlations. As occur more frequent, the cases reported more feelings and more disturbances to their routine of working activities. The result of the analysis had shown that the risk factors associated with varicose veins in women workers are similar to those identified in several previous studies of other countries.

5.3.1 Factors that associated with the development of varicose veins

A) Number of children

After adjusting for the affect of other factors by logistic regression, this study confirmed the association between number of children and varicose veins. In women who had more than 1 children, the risk factor was higher than those without children (OR = 2.62 ; 95% CI = 1.21-5.69) and coincide with the results reported by Sisto T, et al. (16) and Dindelli M, et al. (17). Number of childbirth influenced the varicose veins because estrogen and progestogen during pregnancy could raise the venous pressure that can not decrease to the normal level until after the pregnancy.

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Moreover, the increase of uterine volume during the period of pregnancy could affect the venous distensibility that lead to the varicose veins occurrence (63).

B) Family history of varicose veins

The finding of this study revealed that family history of varicose veins was strongly associated with varicose veins both in univariate analysis (OR = 4.48 ; 95% CI = 2.28-8.84) and multivariate analysis (OR = 6.17 ; 95% CI = 2.72-13.98). Similar to Lee JA, et al. (11), Cornu-Thenard A. et al.(15) and Laurikka JO, et al. (65), this result followed the report of Brinsuk M, et al. (64) that found heredity affect on venous function. Then there was proof stating that the venous disorder can be transmitted within the family and that disorder can develop to be a varicose vein.

C) Working posture

There are many other studies which discovered that working posture was a main risk factor of varicose veins. In this study, both univariate and multivariate analyses demonstrated that the working posture was related to the increase risk of varicose veins such as standing and moving around, long distances (OR = 26.85 ; 95% CI = 6.88-104.82) fixed standing posture (OR = 12.53 ; 95% CI = 1.39-113.00) standing with the possibility of sitting down (OR = 12.03 ; 95% CI = 3.35-43.21) sitting and moving around, long distances (OR = 4.48 ; 95% CI = 1.36-14.83) and standing and moving around, short distances (OR = 3.29 ; 95% CI = 1.02-10.64) when compared to fixed sitting posture and pointed out that working posture that contains standing and walking increases risk factor of varicose veins. This finding was consistent when compared to the previous studies by Abramson JH, et al. (18) who compared the working posture between standing and sitting or walking for work and Tuchsen T, et al. (19) found that standing or walking for work could be one of the main risk factor of varicose veins. This supported that those working posture put more pressure into veins when standing or walking for a long time.

D) Lifting

Lifting significantly associated with the development of varicose veins (OR = 2.29 ; 95% CI = 1.19-4.38). This result agreed with Weddell JM (68) who studied in Cardiff. The association between lifting and varicose veins was explained by heavy lifting adds more intra- abdominal pressure. Then the effected veins became varicose veins.

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5.3.2 The factors had no association with varicose veins development

A) Body Mass Index

This study did not find the association between BMI and varicose veins according to the univariate analysis and multivariate analysis. This may be the BMI index did not show significant difference in the cases and the control (the mean BMI of the cases and the controls groups were 22.95 and 23.29 respectively). The results were inconsistent with previous study by Seidell JC, et al. (14), Canonico S, et al. (61) and Iannuzzi A, et al. (62). The reason may be explained that the previous studies selected the general population from residential area but this current study selected the population from the same industrial types. Specific group of women workers who worked in electronics factories and the age of women workers for both cases and control groups had not differences according to the increase or decrease of BMI of women workers.

B) Number of pregnancy

Number of pregnancy did not find the association with increase risk of varicose veins. This might be explained by the number of population in this study. The majority of the cases and the controls had neither pregnanted nor abortion. This result was different from De Barros NJr (63) that explained the mechanism of pregnancy which increased venous pressure inside femoral veins during the period of pregnancy.

C) Duration of work

The duration of work was found to be not associated with varicose veins occurrence. This result can be explained by matching between cases and controls with age (±3 years). Age related to duration of work then the duration of work between cases and controls had no difference either.

D) Duration of traveling

No significant difference in duration of traveling to work in cases and controls was found in this study then there were no significant association between duration of traveling to work and varicose veins. This might be explained by most of the workers stay in an area nearby route of bus that provided by the company with free of change and also the workers stayed close to the industrial estate.

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E) The way of traveling

This study showed that way of traveling to work was not associated with varicose veins. This may due to the workers who came to work by the company's bus were more than other.

F) Heat exposure

From univariate analysis, the heat exposure was found to be significantly associated with varicose veins (p-value = 0.029) (OR = 2.04; 95% CI = 1.07-3.90). However, after controlling for confounding factors by multivariate analysis, heat exposure had no association. The results that were found in the univariate analysis might possible be the effects from confounders.

G) Alcohol drinking

This study showed that the alcoholic factor did not associate with the varicose veins. In contrast to Tanyol H (72, 73), this difference may be due to several factors such as small number of cases and less drinking in the Thai women population.

H) Cigarette smoking

Cigarette smoking was not significantly associated with varicose veins. This result was in contrast to the result of Ducimetiere P, et al. (76) which studied in only men and La Vecohia C, et al. (77) which studied in both men and women. However, the population in this study was all women whom did not smoke. Then this study found no significance and difference from the other previous studies.

I) Exercise

Carpentier PH, et al. (37) showed that exercise could associate with varicose veins which was contrast to this study. It was possible that the majority of women workers were non-exercise because most of them worked over time. Then they did not have time to do any exercises.

J) Use of oral contraceptive pill

Result in the present study showed that use of oral contraceptive pill was not a risk for varicose veins. This result is similar to Górski G, et al. (81) who studied risk factors in women in Poland. This result repeatedly confirmed that the use of oral contraceptive pill had no association with risk factors of varicose veins . It was possible that the use of oral contraceptive pill could have association with venous thrombosis. It was probably associate with secondary varicose veins which was caused by clotted in deep

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veins and lead to secondary varicose veins. However in this study only primary varicose veins were detected.

5.3.3 Associated factors and varicose veins occurrence

From the 4 factors that associated with the occurrence of varicose veins, there were 2 factors were personal factors and 2 factors were characteristics of work. After deliberation all the mentioned factors, it was found that the working posture (21.1%) family history of varicose veins (8.8%), number of children (2.7%) and lifting (1.9%) were associated with varicose veins occurrence. This study demonstrated the importance of working posture on varicose veins occurrence that might have possibility more than other factors.

An equation for prediction of varicose veins probability in women workers was generated by using a forward stepwise logistic regression analysis. The best model of predicting the risk of varicose veins occurrence was the following:

$$Y = -3.273 + 0.355(X_1) + 0.964(X_2) + 1.819(X_3) + 1.029(X_4) + 1.500(X_5) + 2.528(X_6) + 1.190(X_7) + 3.290(X_8) + 2.487(X_9) + 0.827(X_{10})$$

Where

X_1 = One pregnancy (yes = 1, no = 0)

X_2 = More than one pregnancy (yes = 1, no = 0)

X_3 = Family history of varicose veins (yes = 1, no = 0)

X_4 = Sitting and moving around, short distances (yes = 1, no = 0)

X_5 = Sitting and moving around, long distances (yes = 1, no = 0)

X_6 = Fixed standing posture (yes = 1, no = 0)

X_7 = Standing and moving around, short distances (yes = 1, no = 0)

X_8 = Standing and moving around, long distances (yes = 1, no = 0)

X_9 = Standing with the possibility of sitting down (yes = 1, no = 0)

X_{10} = Lifting (yes = 1, no = 0)

The predictive power was 34.5% of the variance.

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CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

A retrospective by case-control study was conducted during the period of 1 October - 30 January in the two electronics factories of Bangkok and Pathumthani provinces. The main objective was to determine the risk factors that associated with the development of varicose veins. Total of 82 cases and 164 controls were included in this study. The cases were women workers who have been diagnosed with varicose veins by the specialized physician, the control group were women workers who did not have varicose veins. The controls were selected by matching age within three years of difference from the cases. The data of sign and symptom were collected by using questionnaires.

From the result of diagnosis of varicose veins among population participated, the result showed that the prevalence rate was 32.99%. The retrospective by case-control study showed that 82 cases had primary varicose veins (100%). The majority was in severity level 1 as referred to simple varicose veins (96.34 %) and the most location of varicose veins were below knee (54.88%).

The signs and symptoms of varicose vein were heaviness, aching, swelling, night cramp, burning and itching which occurred in level of mild to moderate degree. Aching was only symptom that found in the most frequency feeling and the interference to the activities or work was found in the moderate degree.

Demographic characteristics were similarly between the cases and the controls. The majority of the cases and the controls were 30-39 years old who attended the high school graduates and marital status.

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Analyzing the risk factors of varicose veins using multivariate analysis by forward stepwise logistic regression after adjusting the confounding to receive a true connection between factors associated with varicose veins. Four risk factors that associated with the varicose veins were the workers who had more than 1 children (OR = 2.62, 95% CI = 1.21-5.69), family history of varicose veins (OR = 6.17, 95% CI = 2.72-13.98), working posture included standing and moving around, long distances (OR = 26.85, 95% CI = 6.88-104.82), fixed standing posture (OR = 12.53, 95% CI = 1.39-113.00), standing with the possibility of sitting down (OR = 12.03, 95% CI = 3.35-43.21), sitting and moving around, long distances (OR = 4.48 , 95% CI = 1.36-14.83) and standing and moving around, short distances (OR = 3.29, 95% CI = 1.02-10.64) and lifting (OR = 2.29, 95% CI = 1.19-4.38).

Working posture was the highest associated factor on varicose veins occurrence (21.1%). The second, third and fourth of associated factors were family history of varicose veins (8.8%), number of children (2.7%) and lifting (1.9%) respectively.

6.2 Recommendations

The recommendations are as follow:

1. To use as the basic data and factors contributing to varicose veins in women workers in electronics factories such as number of children, family history of varicose veins, working posture and lifting.

2. To decrease the complication of varicose veins, the factories should assign the policy and according to the following activity.

2.1 Education training program should be provided to bring the employees to comprehend varicose veins occurrence.

2.2 The company should a work rotation system for the worker who has to work in the same posture during the period of work. This work system may reduce the risk of having varicose veins. Also the worker should avoid static position as standing walking or weigh lifting for a long times.

2.3 Furthermore, workstation should be adjusted according to the activities of the workers. For a work that requires sitting for a long time, an appropriate chair with ergonomic design is absolutely helpful; to reduce the pressure

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on thighs. For a standing position, a stool and a foot rest might helpful. The change of working posture to reduce the hour of standing. For heavy lifting workers, lifting machine or tools should be provided. The more duration of sitting or standing, the more break time need.

6.3 Recommendation for further study

1. The further study should be the prospective study in the same occupational population. A comparison study with other occupations which will confirm the factors and results as will as calculate incident rate of varicose veins.

2. The future should be concentrated in the study of risk factors comparing between male and female.

3. The researcher suggested that there should be study about other factors associated with varicose veins which was limited in this study but might be an influence to determine varicose veins.

4. Future research should be conducted in order to find prevention or intervention program in order to decrease incident rates and severity of varicose veins.

5. Future studies should be performed in order to assess the impact of varicose veins on quality of life and study the association between varicose veins and quality of life.

6. In future, the epidemiologic studies should be used to determined risk factors of varicose veins according each type and severity.

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APPENDIX

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APPENDIX A
LIST OF EXPERTS

There are two experts who validated content of self administered questionnaires.

1. Lect. Wiwat Tirapanich, M.D.

Department of surgery, Faculty of Medicine Ramathibodi Hospital, Mahidol University.

2. Assistant Professor Dr. Wattana Jalayondeja

Faculty of Physical Therapy and Applied Movement Science, Mahidol University.

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APPENDIX B

No. MU 2007-173

Documentary Proof of Ethical Clearance
The Committee on Human Rights Related to
Human Experimentation
Mahidol University, Bangkok

Title of Project: A Study of Factors Influencing Varicose Veins of Leg among Women Workers in Electronic Factory
(Thesis for Master Degree)

Principle Investigator: Miss Jutarat Rakprasit

Name of Institution: Faculty of Public Health

Approved by the Committee on Human Rights Related to Human Experimentation

Signature of Chairman: .....
(Professor Dr.Srisin Khusmith)

Signature of Head of the Institute: .....
(Professor Dr.Pornchai Matangkasombut)

Date of Approval: 19 SEP 2007

Date of Expiration: 18 SEP 2008

Figure B-1 Documentary Proof of Ethical Clearance

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APPENDIX C
LIST OF PHYSICIANS

There are three physicials who diagnosed varicose veins.

1. Tharin Thampongsa, M.D.

Department of surgery, Faculty of Medicine Ramathibodi Hospital, Mahidol University.

2. Narongrit Kantathut, M.D.

Department of surgery, Faculty of Medicine Ramathibodi Hospital, Mahidol University.

3. Charnchai Pattanapeechai, M.D.

Department of surgery, Faculty of Medicine Ramathibodi Hospital, Mahidol University.

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APPENDIX D
INFORMED CONSENT FORM AND QUESTIONNAIRE

แบบฟอร์มใบยินยอมให้ทำการวิจัย

โดยได้รับการบอกกล่าวและเต็มใจ (Informed Consent Form)

การวิจัยเรื่อง การศึกษาปัจจัยที่มีอิทธิพลต่อการเกิดหลอดเลือดดำขอดที่ขาในกลุ่มพนักงานหญิง โรงงานผลิตชิ้นส่วนอิเล็กทรอนิกส์

วันที่ให้คำยินยอม วันที่.....เดือน.....พ.ศ.....

ก่อนที่จะลงนามในใบยินยอมให้ทำการวิจัยนี้ ข้าพเจ้าได้รับการอธิบายจากผู้วิจัยให้ทราบถึงวัตถุประสงค์ของการวิจัย วิธีการวิจัย อันตราย หรือความเสี่ยงที่อาจเกิดขึ้นจากการวิจัย รวมทั้งประโยชน์ที่จะเกิดขึ้นจากการวิจัยอย่างละเอียด และมีความเข้าใจดีแล้ว

ผู้วิจัยรับรองว่าจะตอบคำถามต่างๆ ที่ข้าพเจ้าสงสัยด้วยความเต็มใจ ไม่ปิดบัง ซ่อนเร้น จนข้าพเจ้าพอใจ

ข้าพเจ้ามีสิทธิที่จะบอกเลิกการเข้าร่วมโครงการวิจัยนี้เมื่อใดก็ได้ และเข้าร่วมโครงการวิจัยนี้โดยสมัครใจ และการบอกเลิกการเข้าร่วมวิจัยนี้จะไม่มีผลกระทบใดๆต่อข้าพเจ้า

ผู้วิจัยรับรองว่าจะเก็บข้อมูลเฉพาะเกี่ยวกับตัวข้าพเจ้าเป็นความลับ และจะเปิดเผยได้เฉพาะในรูปที่เป็นสรุปผลการวิจัย การเปิดเผยข้อมูลเกี่ยวกับตัวข้าพเจ้าต่อหน่วยงานต่างๆ ที่เกี่ยวข้อง กระทำได้เฉพาะกรณีจำเป็นด้วยเหตุผลทางวิชาการเท่านั้น

ผู้วิจัยรับรองว่าหากมีข้อมูลเพิ่มเติมที่ส่งผลกระทบต่อการวิจัย ข้าพเจ้าจะได้รับการแจ้งให้ทราบโดยไม่ปิดบังซ่อนเร้น

ข้าพเจ้าได้อ่านข้อความข้างต้นแล้ว มีความเข้าใจดีทุกประการ และได้ลงนามในใบยินยอมนี้โดยได้รับการบอกกล่าวและเต็มใจ

ลงนาม.....ผู้ยินยอม

ลงนาม.....พยาน

ลงนาม.....พยาน

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แบบสอบถาม

การศึกษาปัจจัยที่มีอิทธิพลต่อการเกิดภาวะหลอดเลือดดำขอดที่ขา

ในกลุ่มพนักงานหญิงโรงงานอิเล็กทรอนิกส์

คำชี้แจง กรุณาทำเครื่องหมาย ✓ ลงในช่อง ☐ และเติมข้อความลงในช่องว่าง .....ให้ตรงกับความเป็นจริง

ส่วนที่ 1 ข้อมูลทั่วไป

1. อายุ ..... ปี ..... เดือน
2. น้ำหนัก ..... กิโลกรัม ส่วนสูง ..... เซนติเมตร
3. ระดับการศึกษาสูงสุด .....
4. สถานภาพ
   - ☐ โสด ☐ สมรส ☐ หย่าร้าง
   - ☐ หม้าย ☐ แยกกันอยู่
5. หากท่านเคยสมรส ท่านเคยตั้งครรภ์และมีบุตรจำนวนกี่คน
   - ☐ ไม่เคยตั้งครรภ์ ☐ เคยตั้งครรภ์ ..... ครั้ง
   - ☐ จำนวนบุตรที่คลอดมีชีวิต ..... คน

ส่วนที่ 2 ข้อมูลการเจ็บป่วยด้วยภาวะหลอดเลือดดำขอด

6. ท่านเคยได้รับการวินิจฉัยว่ามีภาวะหลอดเลือดดำขอดมาก่อนหรือไม่
   - ☐ ไม่เคย ☐ เคย เมื่อ พ.ศ. ..... โดย .....
7. บุคคลในครอบครัวของท่านมีภาวะหลอดเลือดดำขอดหรือไม่
   - ☐ ไม่มี ☐ มี โปรดระบุบุคคลที่มีภาวะหลอดเลือดดำขอด
     - ☐ บิดา ☐ มารดา
     - ☐ อื่นๆ โปรดระบุ .....
8. ท่านมีความรู้เกี่ยวกับภาวะหลอดเลือดดำขอดหรือไม่
   - ☐ ไม่มี ☐ มีความรู้ โปรดระบุแหล่งความรู้
     - ☐ หนังสือพิมพ์ ☐ นิตยสาร
     - ☐ โทรทัศน์ ☐ วิทยุ
     - ☐ อื่นๆ โปรดระบุ .....

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9. ท่านคิดว่าภาวะหลอดเลือดดำขอดเกิดจากสาเหตุใดเป็นสาเหตุสำคัญ โปรดระบุ

.....

10. ท่านมีการปฏิบัติตัวเพื่อป้องกันการเกิดภาวะหลอดเลือดดำขอดหรือไม่

☐ ไม่มี ☐ มี โปรดระบุ .....

ส่วนที่ 3 ข้อมูลการทำงาน

ตอนที่ 1 ข้อมูลประวัติการทำงาน

ในปัจจุบัน

11. ปัจจุบันท่านทำงานในแผนก/ฝ่าย .....

รวมระยะเวลาที่ทำงานตำแหน่งปัจจุบัน ..... ปี ..... เดือน

12. ลักษณะงานที่ทำ (หน้าที่รับผิดชอบ).....

13. ขั้นตอนในการทำงาน

.....

.....

.....

14. ระยะเวลาปฏิบัติงาน ..... ชั่วโมง/วัน ..... วัน/สัปดาห์

15. ทำงานล่วงเวลาวันละ ..... ชั่วโมง เฉลี่ยสัปดาห์ละ ..... วัน

16. ระยะเวลาที่ท่านใช้ในการเดินทางมาทำงานประมาณ ..... ชั่วโมง ..... นาที

17. พาหนะส่วนใหญ่ที่ท่านใช้ในการเดินทางมาทำงาน .....

18. ปกติที่ท่านมาทำงานในรอบ 1 เดือน (30 วัน) ขณะกำลังเดินทางมาทำงาน

ท่านนั่ง ประมาณ ..... วัน

ท่านยืน ประมาณ ..... วัน

ท่านนั่งสลับยืน ประมาณ ..... วัน

ในอดีต

19. ท่านเคยเปลี่ยนแผนก/ฝ่าย ในการทำงานสถานที่ทำงานปัจจุบันหรือไม่

☐ ไม่เคย

☐ เคย โปรดระบุ (เรียงตามลำดับก่อน-หลัง)

1.แผนก/ฝ่าย ..... ลักษณะงาน .....ระยะเวลา ..... ปี ..... เดือน

2.แผนก/ฝ่าย ..... ลักษณะงาน .....ระยะเวลา ..... ปี ..... เดือน

3.แผนก/ฝ่าย ..... ลักษณะงาน .....ระยะเวลา ..... ปี ..... เดือน

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20. จากประสบการณ์การทำงานในอดีต ก่อนที่ท่านจะมาทำงานที่บริษัทแห่งนี้ท่านเคยทำงานที่ใดมาก่อน (ทุกตำแหน่งและทุกแห่งที่ท่านปฏิบัติงาน เรียงตามลำดับก่อน-หลัง)

สถานที่ทำงาน ลักษณะงานที่ทำ ระยะเวลา (ปี/เดือน)

1.....

2.....

3.....

4.....

5.....

ตอนที่ 2 ข้อมูลท่าทางและการเคลื่อนไหวในการทำงาน

21. จากประสบการณ์การทำงานของท่านตั้งแต่อดีตจนถึงปัจจุบัน ท่านมีท่าทางและการเคลื่อนไหวในการทำงานแต่ละงานอย่างไร

ประวัติการทำงาน		การเคลื่อนไหวในการทำงาน					
		อยู่กับที่ ≥80% ทำงานอยู่กับที่			เคลื่อนที่ (เดิน) ≥80% ทำงานเคลื่อนที่		
		ยืน	นั่ง	ยืนสลับนั่ง	ยืน	นั่ง	ยืนสลับนั่ง
ในอดีต (ตามข้อ 20)	1						
	2						
	3						
	4						
	5						
ในอดีต (ตามข้อ 19)	1						
	2						
	3						
ปัจจุบัน	1						

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22. จากประสบการณ์การทำงานของท่านตั้งแต่อดีตจนถึงปัจจุบัน งานที่ท่านทำส่วนใหญ่มีท่าทางและการเคลื่อนไหวในการทำงานอย่างไร (เลือกได้เพียง 1 ข้อ)

☐ ยืนทำงานอยู่กับที่ตลอดเวลาโดยมีเฉพาะการเอี้ยวตัวและมีการขยับเฉพาะมือหรือส่วนแขน

☐ ยืนทำงานประจำจุดปฏิบัติงานและเดินสลับไปทำงานยังจุดปฏิบัติงานอื่นในระยะใกล้ (1- 5 เมตร)

☐ ยืนทำงานประจำจุดปฏิบัติงานและเดินสลับไปทำงานยังจุดปฏิบัติงานอื่นในระยะไกล (> 5 เมตร)

☐ ยืนทำงานอยู่กับที่เป็นส่วนใหญ่สลับกับนั่งทำงานบ้างเล็กน้อย

☐ นั่งทำงานอยู่กับที่ตลอดเวลาโดยไม่มีการลุกยืนหรือเดินในขณะกำลังทำงาน

☐ นั่งทำงานและลุกเคลื่อนที่ออกจากจุดปฏิบัติงานในระยะใกล้ (1- 5 เมตร)

☐ นั่งทำงานและลุกเคลื่อนที่ออกจากจุดปฏิบัติงานในระยะไกล (> 5 เมตร)

☐ อื่นๆ โปรดระบุ .....

23. ตามข้อ 22 ท่านทำงานในลักษณะนั้นรวมระยะเวลา ..... ปี..... เดือน

24. จากประสบการณ์การทำงานของท่านตั้งแต่อดีตจนถึงปัจจุบัน ท่านเคยทำงานในท่าทางและการเคลื่อนไหวในการทำงานใดบ้าง (เลือกได้มากกว่า 1 ข้อ)

☐ ยืนทำงานอยู่กับที่ตลอดเวลาโดยมีเฉพาะการเอี้ยวตัวและมีการขยับเฉพาะมือหรือส่วนแขน

☐ ยืนทำงานประจำจุดปฏิบัติงานและเดินสลับไปทำงานยังจุดปฏิบัติงานอื่นในระยะใกล้ (1- 5 เมตร)

☐ ยืนทำงานประจำจุดปฏิบัติงานและเดินสลับไปทำงานยังจุดปฏิบัติงานอื่นในระยะไกล (> 5 เมตร)

☐ ยืนทำงานอยู่กับที่เป็นส่วนใหญ่สลับกับนั่งทำงานบ้างเล็กน้อย

☐ นั่งทำงานอยู่กับที่ตลอดเวลาโดยไม่มีการลุกยืนหรือเดินในขณะกำลังทำงาน

☐ นั่งทำงานและลุกเคลื่อนที่ออกจากจุดปฏิบัติงานในระยะใกล้ (1- 5 เมตร)

☐ นั่งทำงานและลุกเคลื่อนที่ออกจากจุดปฏิบัติงานในระยะไกล (> 5 เมตร)

☐ อื่นๆ โปรดระบุ .....

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ตอนที่ 3 การยกของหนักในการทำงาน

25. จากประสบการณ์การทำงานของท่านตั้งแต่อดีตจนถึงปัจจุบัน ท่านเคยทำงานที่ต้องยกของที่มีน้ำหนักมากเป็นประจำในการทำงานหรือไม่

☐ ไม่เคย ☐ เคย เป็นเวลา ..... ชั่วโมง/วัน หรือ ..... ชั่วโมง/สัปดาห์

26. การทำงานตามข้อ 25 ท่านทำงานยกของที่มีน้ำหนักมากรวมระยะเวลา ..... ปี ..... เดือน

27. การทำงานตามข้อ 25 ส่วนใหญ่ท่านต้องยกของที่มีน้ำหนักประมาณ ..... กิโลกรัม

ตอนที่ 4 การสัมผัสความร้อนในการทำงาน

28. จากประสบการณ์การทำงานของท่านตั้งแต่อดีตจนถึงปัจจุบัน ท่านเคยทำงานสัมผัสกับความร้อนหรือทำงานกับเครื่องจักรที่มีอุณหภูมิสูง เช่น เตาอบ เตาหลอม เครื่องขึ้นรูปหรือไม่

☐ ไม่เคย ☐ เคย ลักษณะงาน .....

29. การทำงานตามข้อ 28 ท่านสัมผัสกับความร้อนติดต่อกันรวมระยะเวลา ..... ปี ..... เดือน

ส่วนที่ 4 ข้อมูลพฤติกรรมสุขภาพ

ตอนที่ 1 ข้อมูลการดื่มแอลกอฮอล์

30. ท่านดื่มเครื่องดื่มที่มีแอลกอฮอล์หรือไม่

☐ ไม่ดื่ม

☐ เคยดื่ม แต่เลิกดื่มมาเป็นระยะเวลา ..... ปี ..... เดือน
ท่านเคยดื่มติดต่อกันมาเป็นระยะเวลา ..... ปี ..... เดือน

☐ ปัจจุบันดื่มอยู่
ท่านดื่มติดต่อกันมาเป็นระยะเวลา ..... ปี ..... เดือน

31. ส่วนใหญ่ท่านดื่มเครื่องดื่มที่มีแอลกอฮอล์ชนิดใด

☐ ไม่ดื่ม ☐ ดื่ม (เลือกได้เพียง 1 ข้อ)

☐ สุรา ☐ เบียร์

☐ อื่นๆ โปรดระบุ .....

32. ความถี่ของการดื่มเครื่องดื่มที่มีแอลกอฮอล์เฉลี่ย ..... แก้ว/ครั้ง ..... ครั้ง/สัปดาห์

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ตอนที่ 2 ข้อมูลการสูบบุหรี่

33. ท่านสูบบุหรี่หรือไม่

☐ ไม่เคยสูบ

☐ เคยสูบ แต่เลิกสูบมาเป็นระยะเวลา ..... ปี ..... เดือน

ท่านเคยสูบติดต่อกันมาเป็นระยะเวลา ..... ปี ..... เดือน

☐ ปัจจุบันสูบอยู่

ท่านสูบติดต่อกันมาเป็นระยะเวลา ..... ปี ..... เดือน

34. ความถี่ของการสูบบุหรี่เฉลี่ย จำนวน ..... มวน/วัน ..... วัน/สัปดาห์

ตอนที่ 3 ข้อมูลการออกกำลังกาย

35. ตามปกติท่านออกกำลังกายที่บ้านหรือไม่

☐ ไม่ออกกำลังกาย

☐ ออกกำลังกาย (ระบุประเภท/ชนิดกีฬา) .....

36. เฉลี่ยระยะเวลาในการออกกำลังกายแต่ละครั้ง ..... นาที ..... ครั้ง/สัปดาห์

37. ท่านออกกำลังกายติดต่อกันมานาน ..... ปี ..... เดือน

ตอนที่ 4 ข้อมูลการรับประทานยาคุมกำเนิด

38. ท่านเคยรับประทานยาคุมกำเนิดหรือไม่

☐ ไม่เคยรับประทาน

☐ เคยรับประทาน แต่เลิกรับประทานมาเป็นระยะเวลา..... ปี ..... เดือน

ท่านเคยรับประทานติดต่อกันมาเป็นระยะเวลา ..... ปี ..... เดือน

☐ ปัจจุบันรับประทานอยู่

ท่านรับประทานติดต่อกันมาเป็นระยะเวลา ..... ปี ..... เดือน

ขอขอบคุณที่ท่านให้ความร่วมมือในการตอบแบบสอบถาม

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<u>แบบสอบถามอาการและอาการแสดงของการเกิดภาวะหลอดเลือดดำขอด</u>

1. อาการและอาการแสดงเหล่านี้เกิดขึ้นกับท่านหรือไม่

<u>คำชี้แจง</u> ให้ทำเครื่องหมาย ✓ ลงในช่องว่างที่แสดงระดับความถี่ของการเกิดอาการและอาการแสดงจากภาวะหลอดเลือดดำขอดที่ตรงกับความจริง โดยที่

0	หมายถึง	ไม่เคยเกิดขึ้น
1	หมายถึง	2-3 ครั้งต่อเดือน
2	หมายถึง	1-2 วันต่อสัปดาห์
3	หมายถึง	3-4 วันต่อสัปดาห์
4	หมายถึง	5-6 วันต่อสัปดาห์
5	หมายถึง	เกิดขึ้นเป็นประจำทุกวัน

อาการและอาการแสดง	ความถี่ของการเกิด					
	0	1	2	3	4	5
1. หนักขา						
2. ปวดขา						
3. ขาบวม						
4. ตะคริวที่ขา						
5. ปวดแสบปวดร้อนที่ขา						
6. คันหรือระคายเคืองที่ขา						

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2. อาการและอาการแสดงที่เกิดขึ้นกับท่านมีระดับความรู้สึกใด

<u>คำชี้แจง</u> ให้ทำเครื่องหมาย ✓ ลงในช่องว่างที่แสดงระดับความรู้สึกของอาการและอาการแสดงจากการเกิดภาวะหลอดเลือดดำขอดที่ตรงกับความจริง โดยที่

0 หมายถึง ไม่มีอาการ
1 หมายถึง เริ่มมีความรู้สึกว่ามีอาการดังกล่าว
2 หมายถึง เริ่มมีความรู้สึกมากขึ้นแต่ยังพอทนได้
3 หมายถึง รู้สึกมากแต่ปล่อยไว้ให้หายเองได้
4 หมายถึง รู้สึกมากจนต้องแก้ไขโดยการบีบนวดหรือทำหัตการอื่นๆ
5 หมายถึง รู้สึกทนต่อไปไม่ไหวต้องรับประทานยาหรือไปพบแพทย์

อาการและอาการแสดง	ระดับความรู้สึก					
	0	1	2	3	4	5
1. หนักขา						
2. ปวดขา						
3. ขาบวม						
4. ตะคริวที่ขา						
5. ปวดแสบปวดร้อนที่ขา						
6. คันหรือระคายเคืองที่ขา						

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3. อาการต่างๆที่เกิดขึ้น ท่านรู้สึกว่ารบกวนกิจวัตรประจำวันหรือการทำงานของท่านหรือไม่

<u>คำชี้แจง</u> ให้ทำเครื่องหมาย ✓ ลงในช่องว่างที่ตรงกับระดับความรู้สึกรบกวนกิจวัตรประจำวันหรือการทำงานที่เกิดจากอาการและอาการแสดงของภาวะหลอดเลือดดำขอดที่ตรงกับความจริง โดยที่

0 หมายถึง ไม่รบกวน
1 หมายถึง รบกวนเล็กน้อย
2 หมายถึง รบกวนปานกลาง
3 หมายถึง รบกวนมากแต่ยังพอทนได้
4 หมายถึง รบกวนมากถึงขั้นทำกิจวัตรประจำวันหรือทำงานไม่ได้

อาการและอาการแสดง	ระดับความรู้สึก				
	0	1	2	3	4
1. หนักขา					
2. ปวดขา					
3. ขาบวม					
4. ตะคริวที่ขา					
5. ปวดแสบปวดร้อนที่ขา					
6. คันหรือระคายเคืองที่ขา					

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4. อาการที่เกิดขึ้นกับท่านเกิดขึ้นในขณะที่ท่านทำกิจกรรมอะไร (ตอบได้มากกว่า 1 ข้อ)

<u>คำชี้แจง</u> ให้ทำเครื่องหมาย ✓ ลงในช่องว่างหรือเติมข้อความที่ตรงกับกิจกรรมที่ทำให้เกิดอาการและอาการแสดงจากภาวะหลอดเลือดดำขอดที่ตรงกับความจริง โดยที่แต่ละกิจกรรมในช่องมีความหมายดังนี้

0 หมายถึง ไม่เคยเกิดขึ้น
1 หมายถึง ในขณะเดิน
2 หมายถึง หลังจากที่เดิน
3 หมายถึง ในขณะยืน
4 หมายถึง หลังจากที่ยืน
5 หมายถึง ในขณะนั่ง
6 หมายถึง หลังจากที่นั่ง
7 หมายถึง ในขณะนอนหลับตอนกลางคืน
8 หมายถึง อื่นๆ โปรดระบุ .....

อาการและอาการแสดง	กิจกรรม								
	0	1	2	3	4	5	6	7	8
1. หนักขา									
2. ปวดขา									
3. ขาบวม									
4. ตะคริวที่ขา									
5. ปวดแสบปวดร้อนที่ขา									
6. คันหรือระคายเคืองที่ขา									

ขอขอบคุณที่ท่านให้ความร่วมมือในการตอบแบบสอบถาม

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