Sudan University of Science and Technology

College of Graduate Studies

Evaluation of Deep Vein Thrombosis in pregnancy and puerperium using Ultrasonography

تقييم الخثار الوريدي العميق للحوامل واثناء الولادة بالموجات فوق الصوتية

A thesis Submitted for Partial Fulfillment of the Requirements of Msc Degree in Medical Diagnosis Ultrasound

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الآيـــة

قَالَ تَعَـالَىٰ:

﴿ ٱلۡحَمۡدُ لِلَّهِ ٱلَّذِيٓ أَنزَلَ عَلَىٰ عَبۡدِهِ ٱلۡكِتَٰبَ وَلَمۡ يَجۡعَل لَّهُۥ عِوَجَاۜ ١ قَيِّمٗا لِّيُنذِرَ بَأۡسٗا شَدِيدٗا مِّن لَّدُنۡهُ وَيُبَشِّرَ ٱلۡمُؤۡمِنِينَ ٱلَّذِينَ يَعۡمَلُونَ ٱلصَّٰلِحَٰتِ أَنَّ لَهُمۡ أَجۡرًا حَسَنٗا ٢ ﴾ ٢

سورة الكهف: 1- 2

Dedication

Firstly I give these thanks to my parents that they was helped me from the beginning of my life until this level.

My husband always give me support and encourage me every the times and give advices.

Second to my sons and daughters and brother and sisters.

Acknowledgements

In the name of ALLAH All my thanks, the most gracious and I thank Sudan University specially Ultrasound department and also the most merciful I would like to express my deep gratitude to honest appreciation to my supervisor ***Dr.Babekr Abd Elwahab*** *And Post Graduates College staff for their offer and supervision and guidance.*

*Finally I would like to express my thanks and gratitude to my friend and college for the goy full time we spent together***.**

Abstract

This was retrospective study aimed to evaluation of deep vein thrombosis during pregnancy and puerperuim at Wad Madani Maternity Teaching Hospital from Januaryuly 2016 to March 2017 , there were 50 patients scanned using Ultrasound machine SEMIENS model 10033322, linear probe, ultrasound machine LINDWIND linear probe and MINDARY model DC-N3 linear probe, ultrasound gel.

In this study the incidence of deep vein thrombosis was found to be (0.46%) in pregnancy and puerperium , and the risk factors include past history of DVT, caesarean section , anemia , post partum hemorrhage , pre eclampcia and pelvic infection .

In this study the main symptoms were lower limb swelling (100%), lower limp pain (76%) in ability to walk (80%) fever (68%) the main signs include lower lip tenderness (96%) and lower limp swelling (100%) .

The Doppler ultrasound was used to confirm the diagnosis of deep vein thrombosis in this study (92%) of this cases had show reduced blood flow .

The deep vein thrombosis is more common in puerperium (84%) the involvement of the left lower limp was dominant (60%).

Four percents of cases complicated by pulmonary embolism and there was no maternal death in this study .

The study also concluded that a high prevalence of DVT , most of cases occurred in the puerperium , minimization of these risk factors will reduce the incidence of deep vein thrombosis and pulmonary embolism .

And the study recommended that the Doppler U/S machine must be in all hospital in Sudan , use Doppler U/S to detect the feature of patients with septum's of DVT .

المستخلص

هذه الدراسة عن الخثار الوريدي العميق اجريت في الفترة من يونيو 2016م الى مارس 2017م في مستشفى مدني التعليمي لأمراض النساء والتوليد . اجريت هذه الدراسة على 50 حالة مرضية بالخثار الوريدي العميق . ولقد كانت نسبة وقوع الخثار الوريدي العميق لكل حالات الولادة في الفترة (0.46%).

الاسباب المعرضة لهذا المرض والتي ظهرت في هذه الدراسة كانت فقر الدم ، الولادة القيصرية ، النزيف بعد الولادة ، مقدمة الارتعاج ودوالي الوريد بالرجلين والاصابة السابقة باخثارة .

في هذه الدراسة كانت الاعراض الرئيسية ورم بالرجل (100%) ، الم الرجل (76%)، عدم القدرة على الشي (8%) ، الحمى (68%)، وكانت العلامات الرئيسية هي ايلام بالرجل (96%) ، ورم بالرجل (100%) . في هذه الدراسة استعمل جهاز دوبلار للموجات فوق الصوتية لتشخيص حالات الخثار الوريدي العميق ولقد تم تشخيص (95.3%) من الحالات التي لديها المرض. في هذه الدراسة وجد أن معظم حالات الخثار الوريدي العميق حدثت في فترة النفاس (84%) ووجد أن (60%) من حالات الخثار حدثت في الرجل اليسرى. (4%) من حالات الخثار الوريدي العميق حدثت لها مضاعفات الانسمام الرئوي .

لا توجد وفيات في هذه الدراسة .

وقد أوصت الدراسة بعدة توصيات اهمها ضرورة وجود جهاز الموجات الصوتية بكل المستشفات في السودان وأيضاً استخدام جهاز الموجات الصوتية لتشخيص المرضى الذين تظهر عليهم اعراض الخثار الوريدي .

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LIST OF ABBREVIATIONS

(AT III): Antithrombin III

(CFV) : common femoral vein

(CIV) : Common Iliac Vein

(DFV) : Deep Femoral Vein

(DVT) : Deep vein thrombosis

(FV) : Femoral vein

(IVC) : Inferior vena cava

(LG) : lateral gastrocnemius muscle

(MG) : Medial gastrocnemius muscle

(PD, CD) : Pulsed and color Doppler

(PE) : pulmonary embolus

(PTS) : post-thrombotic syndrome

(PV) : Popliteal vein

(SC) : saphenous compartment

(SFV) : Superficial Femoral Vein

(US) : Ultra Sonography

(VTE) : venous thrombo embolism

1-1: Introduction:

Deep vein thrombosis (DVT) is a blood clots forming in the deep veins often of the legs, pelvic or abdomen. But can also occur in the arm veins, is a serious healthcare problem. Among patients with (DVT), one third of them are diagnosed due to blood clot travelling in the blood vessels to the lung, causing shortness of breath and chest pain. This is called a pulmonary embolus (PE). The long-term effect of (DVT), called post-thrombotic syndrome (PTS), affects about 500,000 patients with skin ulcers and millions more with discoloration and other skin changes on the legs. Because of the clot's ability to travel to the lungs, the effects of post-thrombotic syndrome, and the risk of recurrent (DVT), it is important to prevent (DVT) from ever forming (prevention). In order to prevent (DVT) and (PE) some knowledge of who is at risk is needed.(Peter Gloviczki , 2009)

The use of Doppler ultrasound to evaluate blood flow within the body is steadily expanding. Peripheral vascular Doppler investigation of the carotid arteries and the deep veins of the legs are well established procedures. Duplex scanning (Doppler and B mode) is considered to be the method of choice for the imaging of (DVT), with venography reserved for technically incomplete or difficult duplex examinations. Duplex scanning can be used for serial investigations to monitor the progression and outcome of thrombosis. In addition, duplex scanning can be useful for assessing the long-term damage to veins and valve function as a result of chronic post-thrombotic syndrome. This can lead to the development of lower limb venous hypertension and possible leg ulceration.(Abigail Trush , 2005)

Color duplex ultrasonography has developed as a noninvasive test that can be repeated any time, sonography is increasingly replacing conventional diagnostic modalities that cause more discomfort to the patient. The combination of gray-scale sonographic information for evaluating topographic relationships and morphologic features of vessels with the qualitative and quantitative data obtained

with the Doppler technique enables fine diagnostic differentiation of vascular disorders. In particular, the hemodynamic Doppler information is a useful supplement to the findings obtained with radiologic modalities. Being noninvasive and easy to perform any time, duplex sonographyprecedes more invasive, stressful, and expensive diagnostic tests in the step by step diagnostic workup of patients with vascular disease. It provides crucial information for optimal therapy and will replace invasive modalities such as angiography and venography. Pulsed and color Doppler (PD, CD) studies add significant information for the diagnosis and characterization of the colt. (CD) quickly determines whether the colt is occlusive or non-occlusive. It can readily characterize a hematoma, lymph node, baker's cyst or differentiate between a vascular and nonvascular mass.(Devin Dean , 2005)

1.2 Problem of the study :

Lack of the studies in Sudan which evaluate the Deep Vein Thrumbosis in pregnancy and puerperium .

1-3: Objective of the study:

13.1General objective:

- To evaluate deep veins thrombosis in pregnancy and puerperium using ultrathenography th of lower extremities in Wad Madani hospital.

1.3.2 Specific objectives: -

1. To estimate the incidence of deep veins thrombosis among the women in the pregnancy and puerperium.
2. To determine the most risk factor that causes the (DVT) among women in the pregnancy and puerperium.
3. To evaluate the method of confirmation of deep vein thrombosis to confirm by Doppler ultrasound.
4. Identify the complications of deep vein thrombosis regarding the pulmonary embolism, morbidity and mortality.

2-Literature Review:

2-1: Anatomy of the veins of lower limbs:

Veins have walls made of three principal layers; each layer is called a coat or tunic. The outer layer (tunicaexterna or adventitia) consists of strong connective tissue which acts as a specular reflector (a broad, smooth echogenic interface). The middle layer (tunica media) consists of smooth muscle and elastic fibers. The muscle contraction propel the blood along the vessel, whereas, the elastic fibers enable vessel expansion due to surges in blood pressure. The inner layer (tunica intima) consists primarily of epithelial tissue which acts as a smooth lining so blood will encounter the least possible resistance to blood flow. Venous blood flow is improved by massaging action of adjacent skeletal muscle contractions.In this manner, blood is said to be "milked" along the vessel toward the heart.(Wilhelm Schaberle , 2005)

The caliber of veins varies with the respiratory phase. In most patients the caliber is minimal at end-inspiration without breath holding and maximal at end-expiration. The Valsalva maneuver produces a more variable response. Distention may be greater when the patient holds his breath after a deep inspiration. .(Wilhelm Schaberle , 2005)

The lower limb venous system can be divided into the deep and superficial veins, located in two main compartments. The deep compartment contains all the deep Veins and is bounded by the muscular fascia. The superficial veins lie in the superficial compartment and are bounded deeply by the muscular fascia and superficially by the dermis. The muscular facial layer is usually visible on an ultrasound Image. .(Abigail Trush , 2005)

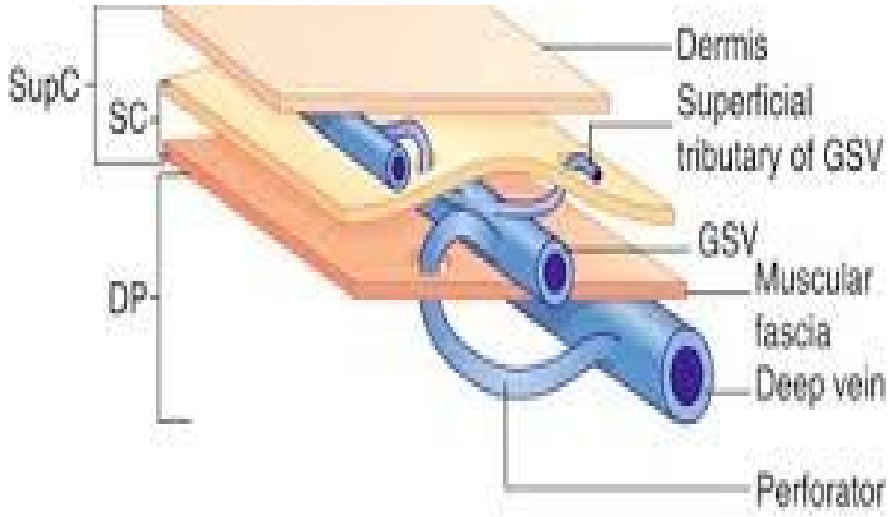
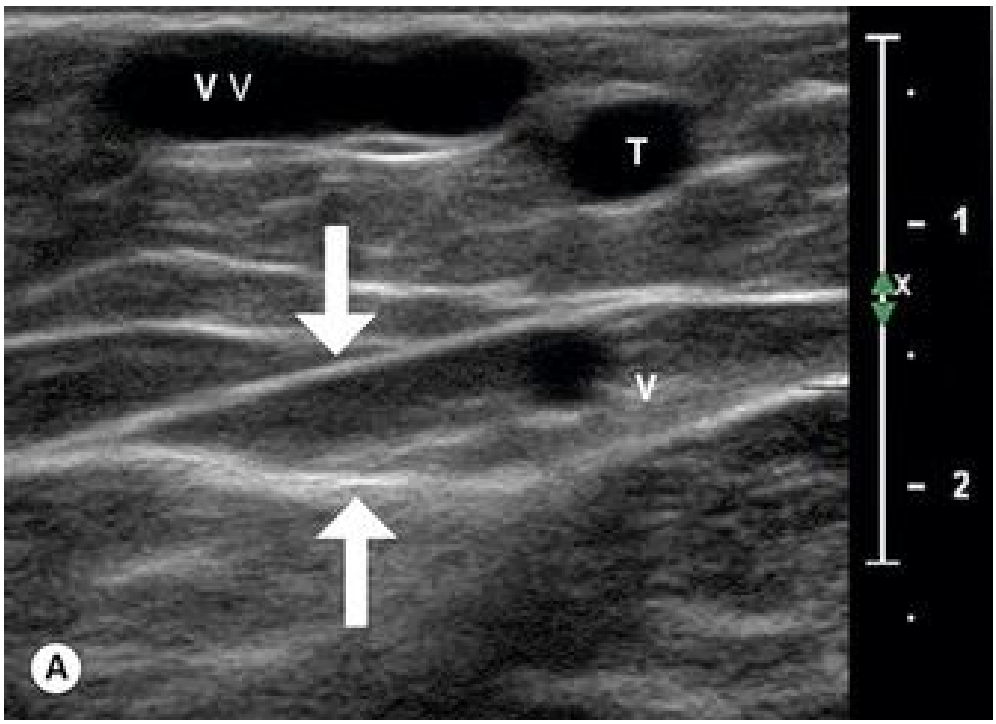
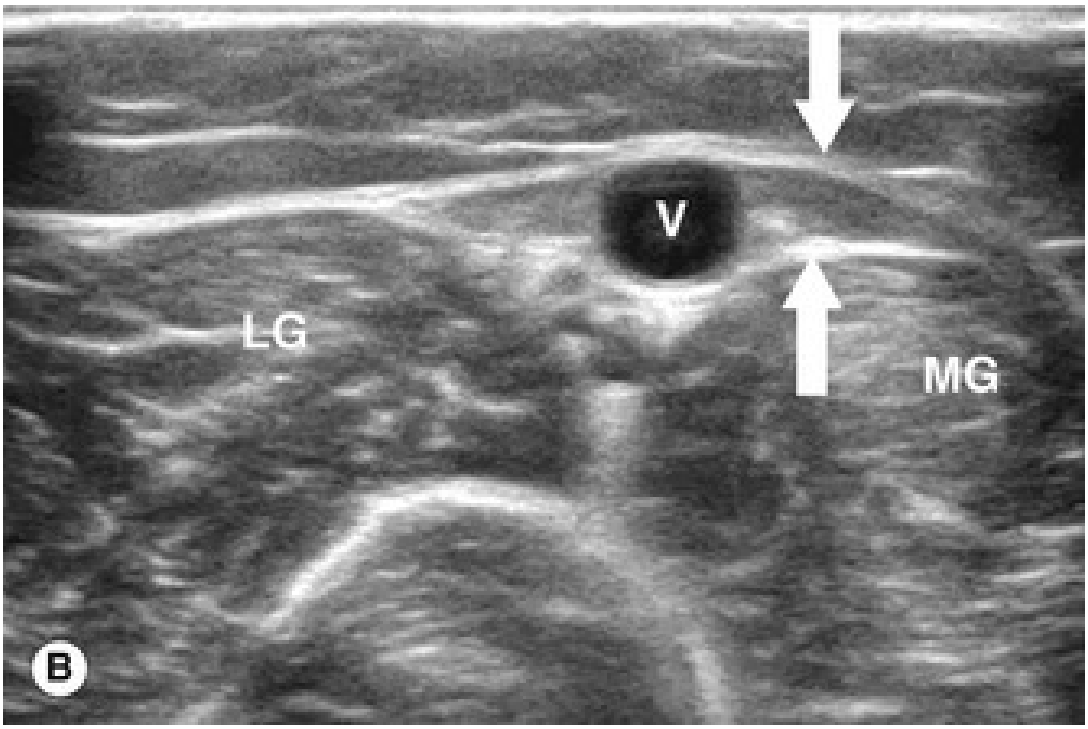


Figure (2.1): diagram of the deep and superficial vein compartments. The main trunk of the saphenous vein lies in the saphenous compartment (SC), located within the superficial compartment.(Abigail Trush , 2005)



(A)



(B)

Figure (2.2) (A, B): The main trunks of the superficial veins are shown in cross section. A: the long saphenous vein (V) lies in the superficial compartment, bounded by the deep muscular fascia (upward arrows) and the saphenous fascia (downward arrows). B: the short saphenous vein (V) is also bounded by the deep fascia (upward arrows) and the saphenous fascia (downward arrows). The medial gastrocnemius muscle (MG) and lateral gastrocnemius muscle (LG) are shown on this image of the right leg. .(Abigail Trush , 2005)

The superficial (epifascial) venous drainage system consists of two subsystems, that of the great saphenous vein and that of the small saphenous vein, which receive the larger arch veins and side branches. The great saphenous vein extends from the back of the foot to the medial malleolus and takes a medial course through the lower and upper leg to about 2 – 3 cm below the inguinal ligament, where it opens into the popliteal vein. There is a variation in the tributaries to the great saphenous vein in the lower leg but these are mainly the following: the posterior arch vein, which is connected to the major deep veins, in particular the

posterior tibial vein, through the perforating veins (Cockett I, II and III); the great saphenous branch from the back of the foot, and the anterior tributary vein. In the thigh, connections to the deep venous system are established by Dodd's perforators. Just before its junction with the common femoral vein, the great saphenous receives tributary veins of the upper leg and lateral branches that establish collateral connections to the abdominal (epigastric) veins and become important as collateral in pelvic vein thrombosis. (Wilhelm Schaberle , 2005)

The small saphenous vein drain the lower leg and arise at the lateral dorsum of the foot, coursing behind the lateral malleolus to the posterior side of the lower leg, where it ascends between the heads of the gastrocnemius and pierces the fascia to open into the popliteal vein above the knee joint cleft. The gastrocnemius veins enter the small saphenous vein shortly before its opening or enter the popliteal vein directly. The femoropopliteal vein passes from the small saphenous vein (just before it opens the popliteal vein) as collateral to the deep veins of the upper leg. (Wilhelm Schaberle , 2005)

Both the great and small saphenous veins have valves. In comparison to the deep veins, the superficial veins have thicker walls with a thin muscular layer. The lumen varies with the intravenous pressure and can be compressed by external structures. There is wide variation in the course of individual veins and the connections they form.The perforating veins are transfascial veins that drain blood from the superficial venous system into the major deep veins. About 150 such short veins exist between the superficial and deep venous systems, among which the Cockett group I-III, the Sherman vein, and the Boyd vein are of clinical importance in the lower leg, the Dodd group in the upper leg and the May perforator between the small saphenous vein and deep lower leg veins. Under normal conditions, valves ensure blood flow from the superficial to the deep venous system while the blood is propelled toward the heart by muscular contraction with compression of the deep veins. This mechanism prevents

backward flow into the superficial vein. (Wilhelm Schaberle , 2005)

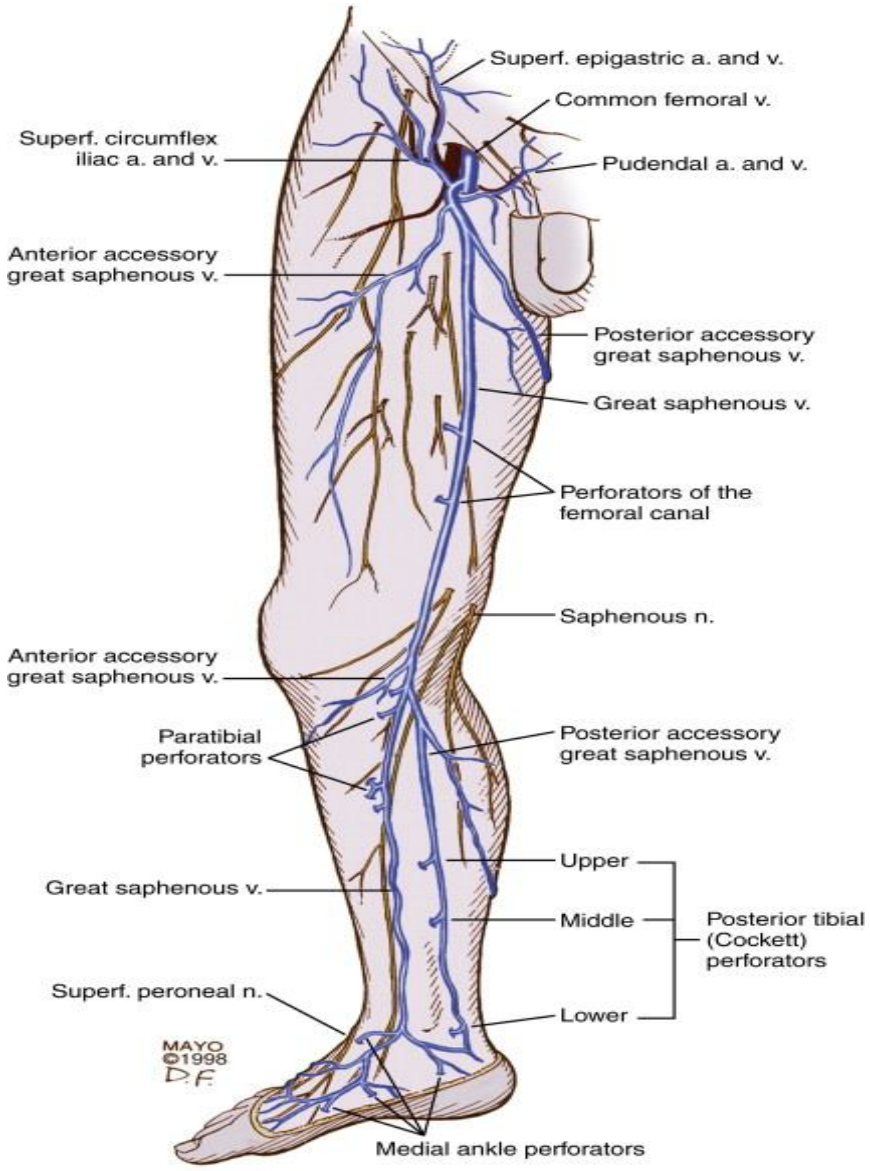


Figure (2.3): Medial, superficial and perforating veins of the lower limb (Peter Gloviczki , 2011)

2-1-1: Deep veins system:

Include Deep veins of the leg which include Anterior tibial veins, Posterior tibial veins and alsoincllude Venous sinusoids in the calf which include Gastrocnemius veins and Soleal veins and also include Popliteal vein and Femoral vein which include Deep femoral., Common femoral vein and Iliac vein this divided to

External iliac vein and Internal iliac vein.

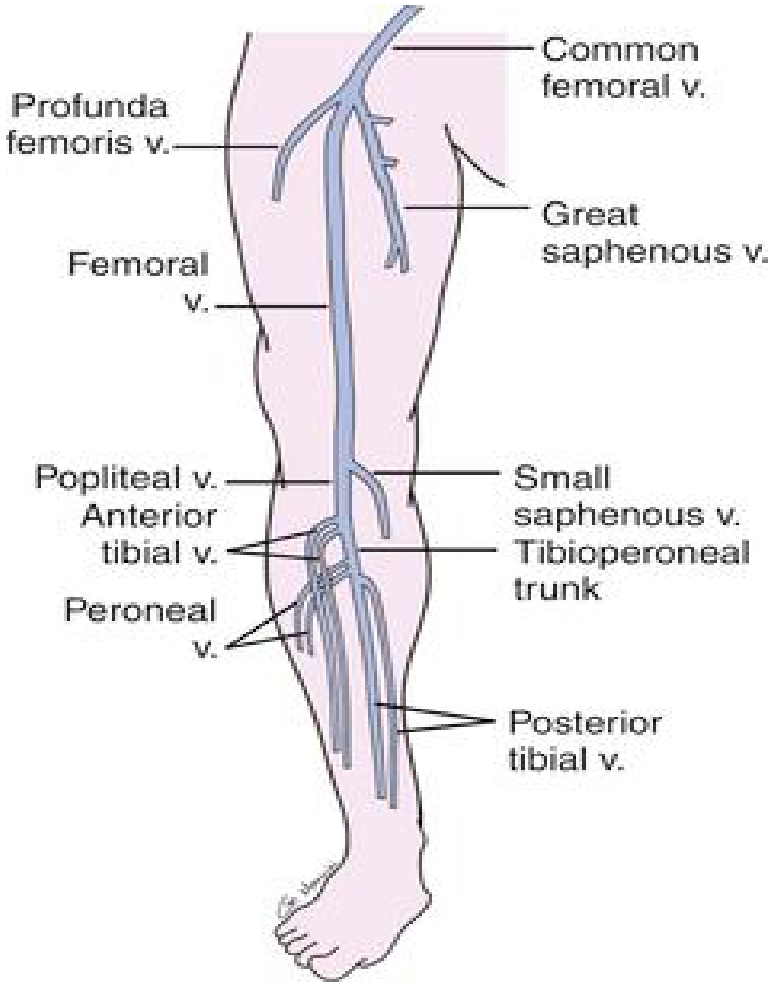


Figure (4): Deep veins of lower limbs. .(Professional ultrasound services , 2006)

(a) Calf Veins:

The deep veins in the calf arise in the dorsal venous rete (foot), course up the leg through the soleus and gastrocnemius muscles and empty into the popliteal vein behind the knee. A set of paired tibial veins accompanies each of the three runoff arteries: anterior tibial, posterior tibial, and peroneal. The anterior tibial veins are formed by the cephalad continuation of the veins that accompany the dorsalispedis artery. They pass between the tibia and fibula through a large opening anterior to

the interosseousmemberane. They join with the tibioperoneal trunk vein to form the popliteal vein behind the knee..(Professional ultrasound services , 2006)

The posterior tibial veins are formed by the internal and external plantar veins of the foot and course cephalad with the posterior tibial artery along the medial aspect of the tibia. In the lower popliteal space they join with the peronealveins to form a short trunk (tibioperoneal trunk vein). This trunk in turn joins with the anterior tibial veins to form the popliteal veins. Veins that drain the major calf muscles, also referred to generically as sural veins, join the deep calf veins in the popliteal fossa. There is considerable anatomic variation in venous drainage from the calf muscles. In fact, most of these veins are not named. Generally, smaller veins draining muscles mass coalesce to form the soleal and gastrocnemius muscle head which, in turn, empty into a medial or lateral gastrocnemius vein. In the great majority (87%) of the cases, the main gastrocnemius veins drain into a gastrocnemius trunk that then empty into the popliteal vein.The soleal veins drain the soleus muscle which is a broad flat muscle located anterior the gastrocnemius muscles. Like the gastrocnemius veins, the irregularly arranged plexus veins deep within the muscle drain into one or several main trunks. These short extra muscular trunks can terminate in a number of ways: a single common trunk may drain into the posterior tibial or peroneal veins, or; the terminal branches may create an anastomosis with the posterior tibial or peroneal veins via multiple intra muscular communications at different levels throughout the leg. .(Professional ultrasound services , 2006)

Inferior vena cava (IVC);the external iliac vein receives several large tributaries that follow their adjacent arteries: the inferior epigasteric vein, the deep iliac circumflex vein, and the superficial external pudendal vein all described above as superficial veins of the leg. .(Professional ultrasound services , 2006)

(b) Popliteal vein (PV):

The popliteal vein is formed by the junction of the anterior and posterior tibial

veins at the lower border of the popliteus muscle. It receives tributaries corresponding to the branches of the popliteal fossa to the adductor canal where it becomes the femoral vein. In the lower part of its course, the popliteal vein runs medial to the popliteal artery. As it courses cephalad between the heads of gastrocnemius muscles, it rises superficial to the artery and exits the popliteal space along its lateral margin. There are between two and four valves in the popliteal vein. While the popliteal vein is single most of the time (56%), duplication anomalies are be found. .(Professional ultrasound services , 2006)

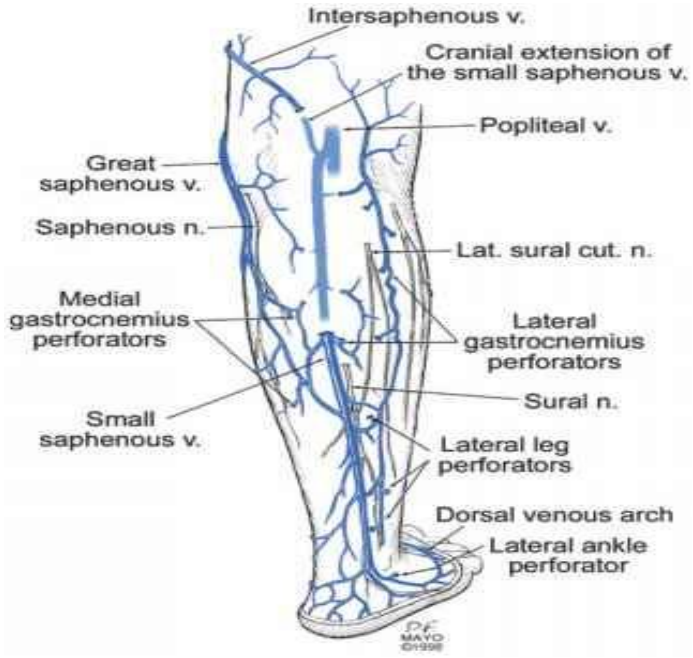


Figure (2.5): Posterior, superficial and perforating veins of the leg. (Wilhelm Schaberle , 2005)

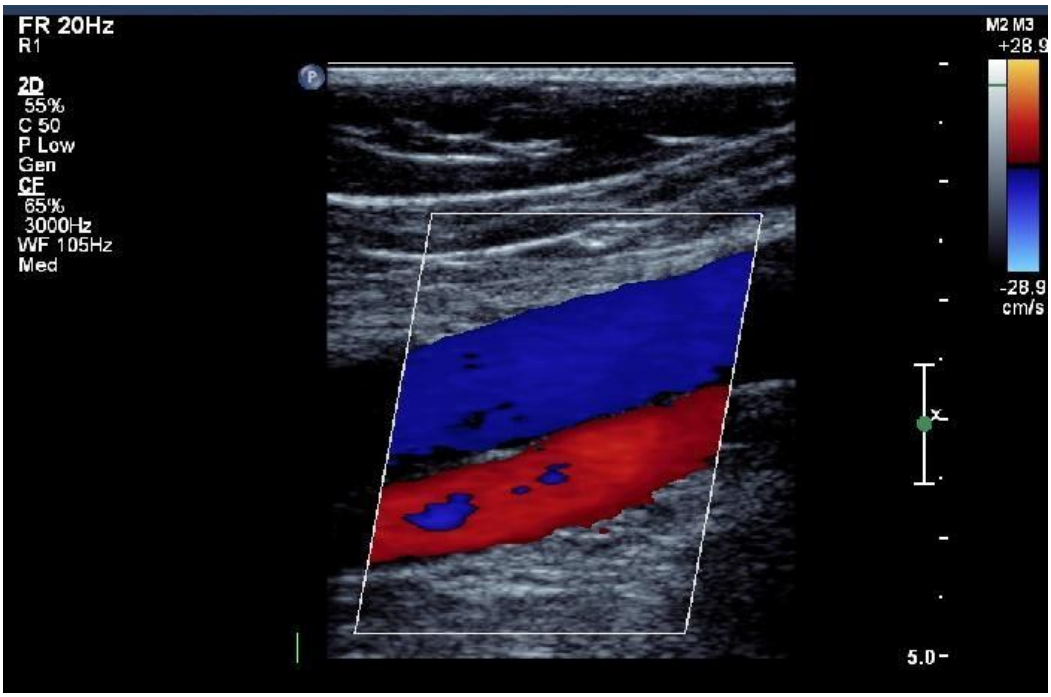


Figure (2.6): Color Doppler ultrasound image longitudinal view of normal popliteal vein and artery.(www.bing.co , 2014)

(c) Femoral vein (FV):

Anatomic nomenclature for this vascular structure can be confusing since it is frequently referred to as the superficial femoral vein (SFV) but it is, in fact, a deep vein. To obviate this confusion, the SFV is now simply called the femoral vein. Beginning In the distal, medial thigh just above the medial condyle of the femur, the popliteal vein exits the adductor (Hunter's) canal as the femoral vein. It courses up thigh medially and slightly posteriorly to the femoral artery. Just below the level of the Inguinal ligament (≈ 4cm), it is Joined by the deep femoral vein to form the common femoral vein (CFV). The CFV passes, together with the femoral artery and nerve, beneath the inguinal ligament to enter the pelvis as the external iliac vein. Along its course in the thigh, the femoral vein accommodates perforator veins arising from the GSV which joins it near its termination in the groin.(Professional ultrasound services, 2006)

The FV usually contains 2-5 valves. It may be single (62%) or duplicated. Duplication of the distal segment is more common with sequential fusing to form a

single vein in mid-thigh (31%). Complete duplication of the entire vein occurs about 3% of the time. .(Professional ultrasound services, 2006)

(d) Deep Femoral Vein (DFV):

The deep femoral vein (profundafemoris v.) receives numerous muscular tributaries from the upper leg. It courses along the profundafermoris artery and joins the superficial vein to form the common femoral vein (CFV) in the groin.It receives the medial and lateral femoral circumflex veins. .(Professional ultrasound services, 2006)

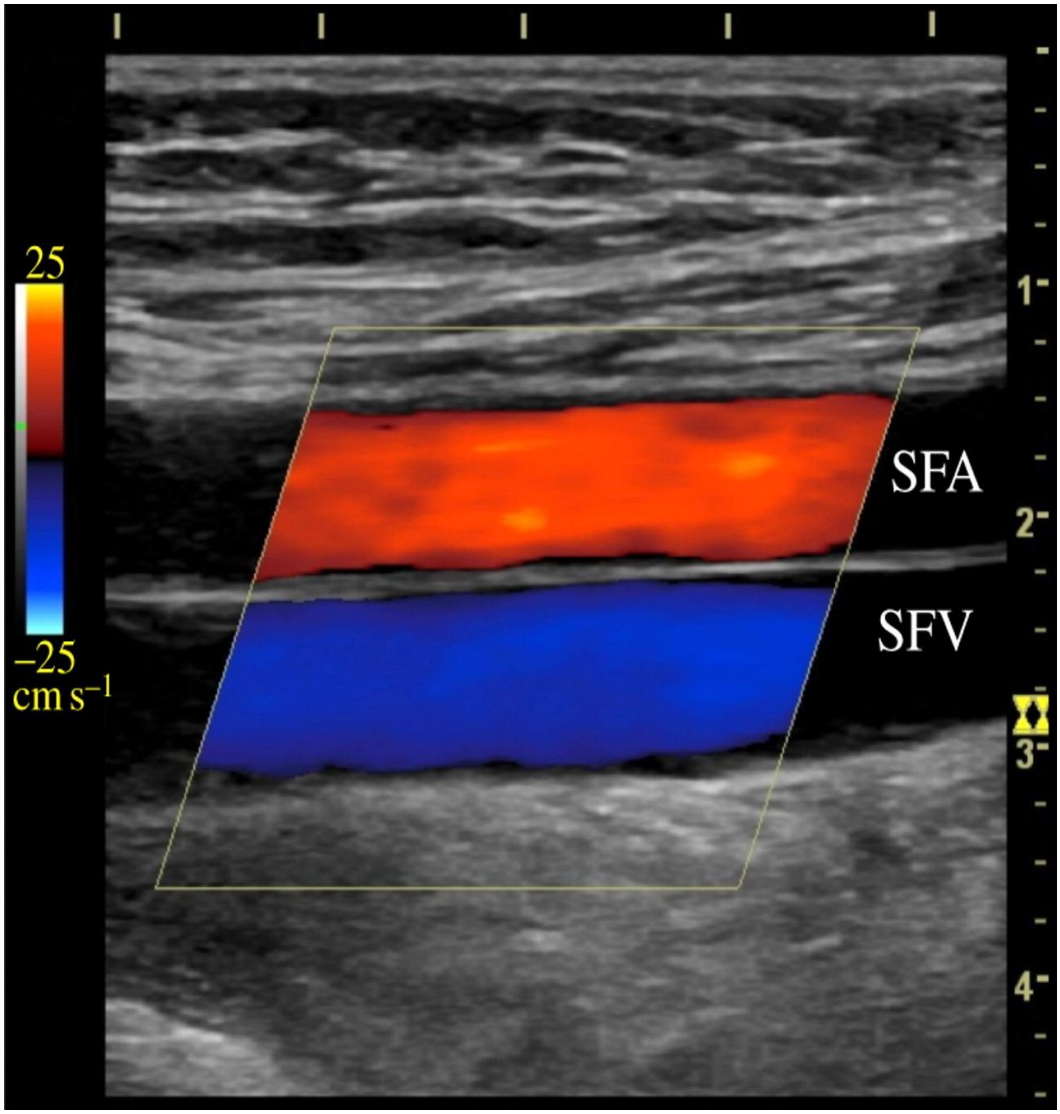


Figure (2.7): Color Doppler ultrasound image (longitudinal view) shows communication of SFV and DFV and origin of CFV and femoral artery. (http://www.bing.com , 2014)

(e) Iliac Veins:

The external iliac vein begins as the femoral veins terminate at the level of the inguinal ligament. As it courses into the pelvis, it is joined by the internal iliac vein (hypogastric v.) to form the common iliac vein (CIV) at the level of sacro-iliac joint. The common iliac veins on each side unite to form the inferior vena cava (IVC). (Professional ultrasound services , 2006)

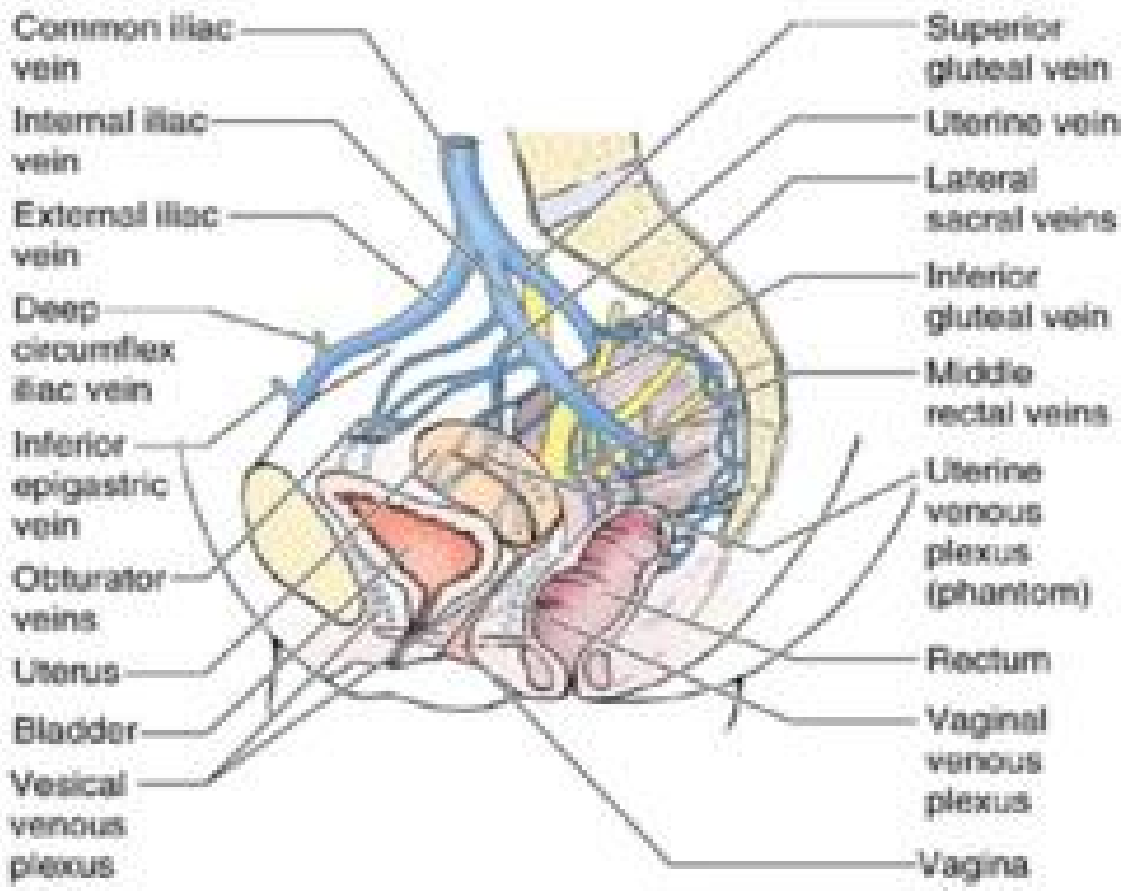


Figure (2.8): shows common iliac vein and internal and external iliac veins. (Professional ultrasound services , 2006)

The external iliac vein receives several large tributaries that follow their adjacent arteries: the inferior epigastric vein, the deep iliac circumflex vein, and the superficial external pudenda vein all described above as superficial veins of the leg.On the right side, the CIV initially lies medial to the iliac artery but, as it courses cephalad, it gradually inclines behind it. On the left side, the CIV passes posterior to the internal iliac artery on its way to the IVC. This subtle anatomic distinction between the two sides can impact venous outflow from the leg. The compression of the vein by the artery or adjacent pathology can reduce venous flow volume resulting in mild to severe venous congestion with attendant sequelae such as deep vein thrombosis. This configuration also contributes to the increased incidence of variococeles in the left hemiscrotum. (Professional ultrasound services , 2006)

f. Venous valves:

Bicuspid venous valves are important structures assisting unidirectional flow in the normal venous system. The GSV usually has at least 6 valves (range, 4-25), with a constant valve present within 2 to 3 cm of the SFJ in 85% of cases, and the SSV has a median of 7 to 10 valves (range, 4-13). There are valves in the deep veins of lower limbs, but the common femoral or external iliac vein has only one valve in about 63% of cases. In 37%, there is no valve in the common femoral or external iliac veins. The internal iliac vein has a valve in 10%; its tributaries have valves in 9%. (Peter Gloviczki , 2011)

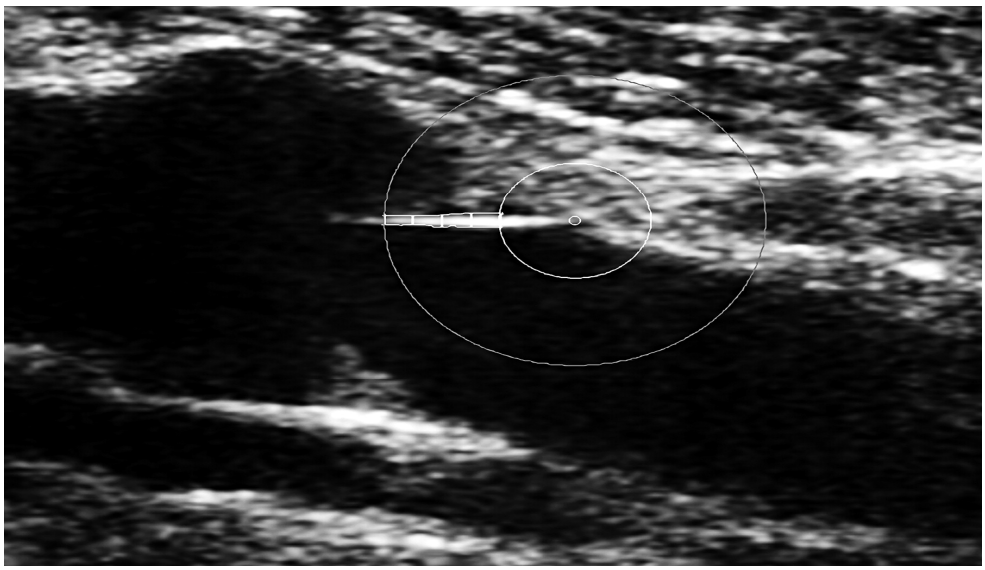


Figure (2.9): Sonographic demonstration of normal venous valves cusps and sinus. (http://www.bing.com , 2014)

2-2: Physiology:

2-2-1: Introduction:

The circulatory system is responsible for circulating (moving) blood throughout the body. The heart and the blood vessels are the most important parts of the circulatory system. With each beat it forces blood into the blood vessels which transport or carry oxygen and nutrients to all the tissues and organs (the arteries) of the body and then blood returns back to the heart through the veins. (Peter Gloviczki , 2009)

There are three types of blood vessels which play different roles within the circulatory system. The two main blood vessels are the arteries and the veins. The arteries carry the blood loaded with oxygen and nutrients away from the heart and the veins return the "used" blood, which has had the oxygen and nutrients removed, back to the heart. The lymphatic vessels are the third component. Briefly, they act as a "clean-up" system to pick up fluid, protein, and other debris left behind by the veins. They filter and clean the fluid before returning it to the heart. (Peter Gloviczki , 2009)

2-2-2: Physiology/Hemodynamic:

In normal circulation, the oxygenated blood leaves the left side of the heart through very large arteries. It flows through smaller and smaller arteries and even smaller arterioles and capillaries until it reaches the tissues and organs where the blood vessels are very small usually requiring a microscope to see them. This is called the (capillary bed). This is where the end of the arterial system connects to the beginning of the venous system. The blood vessels in the "capillary bed" are very tiny, thin walled vessels. This allows for easy release of oxygen and nutrients (sugar, fats, etc.) into the tissues. Blood must then return through the veins to the right side of the heart where it can enter the lungs and pick up more oxygen. The venous system has deep and superficial veins. The deep veins are the major veins which return the blood. These lie within the muscles of the arms and legs. The superficial veins collect blood from the skin and are intended to take blood through the communicating veins back into the deep system. This is assisted by a series of one-way valves. (Peter Gloviczki , 2009)

The regulation of blood flow through the blood vessels and to the tissues is under fairly complex control of the brain and nervous system as well as local chemicals which may be released by the tissues. Throughout the course of blood vessels there is a complex network of nerves that help regulate the flow through the arteries and veins. This allows tissues to have more blood flow when they are active or exercising and less flow when they are quite or relaxed. For example, the blood vessels within the skin play a major role in maintaining body temperature. When it is cold they constrict or shut down and move blood away from the skin to the center of the body to preserve heat and when it is hot, they shunt more blood towards the skin to increase heat loss.(Peter Gloviczki , 2011)

Local injury or trauma causes release of chemicals; which may create either increased or decreased flow. Increased flow may be seen as localized swelling such as in the case of a burn or an ankle sprain.The veins are fairly thin walled and are

able to change their shape depending on the volume or amount of blood within the vein. The volume of blood is proportional or related to the pressure in the veins. When the amount of blood (or pressure) in the vein is low, the vein are flat like an empty balloon. As the volume (or pressure) increases, the vein expands, similar to an inflated balloon. If the pressures are elevated in the venous system and the veins are too full this may cause leaking into the tissues which is reflected as swelling or edema. To normally circulate blood through the body, there are 4 requirements:

(1) A pump – the heart.
(2) A pressure difference or areas of high pressure and areas of low pressure.
(3) A "venous pump" – the muscles.
(4) A normal vein with intact valves.

If any of the above mechanisms of venous return are impaired for a short time – swelling or leaking of fluid into the tissues may be noted. This is commonly noted after a long flight or with short-term immobilization. When these mechanisms are chronically impaired and pressures are chronically or persistently elevated we can begin to see the effects reflected in the skin and tissues of the legs as long-standing swelling, darkening and thickening of the skin, and occasionally even ulceration or wound formation. (Peter Gloviczki , 2009)

2-3: Pathology:

2-3-1: DVT:

Deep vein thrombosis (DVT) is a blood colts forming in the deep veins often of the legs, pelvic or abdomen. But can also occur in the arm veins, is a serious healthcare problem. Among patients with (DVT), one third of them are diagnosed due to blood clot travelling in the blood vessels to the lung, causing shortness of breath and chest pain. This is called a pulmonary embolus (PE). The long-term effect of (DVT), called post-thrombotic syndrome (PTS), affects about 500,000 patients with skin ulcers and millions more with discoloration and other skin

changes on the legs. Because of the clot's ability to travel to the lungs, the effects of post-thrombotic syndrome, and the risk of recurrent (DVT), it is important to prevent (DVT) from ever forming (prevention). In order to prevent (DVT) and (PE) some knowledge of who is at risk is needed. (Peter Gloviczki , 2009)

DVT is acute abnormal clotting In deep veins hindering normal flow of venous blood This may take place when at least one of the three following occurs, venous stasis, vessel wall injury and/or hypercoagulability, known as Virchow's triad since 1856 the initial thrombus formation usually takes place In the paired calf veins and if not recognized and treated may result In continuous clotting and more proximal extension of the clot.When attending medical help, 85% have developed proximal DVT affecting the popliteal or more proximal veins Thrombotic material may embolize and finally lodge in the pulmonary arterial circulation causing pulmonary embolism (PE) in up to 50% of patients with proximal DVT. (Tom Ronny Enden , 2009)

DVT of the lower limb may cause substantial acute and chronic morbidity, and even death in cases of severe PE.(Tom Ronny Enden, 2009)

2-3-2: Risk factor of DVT:

(a) Age, Gender, and Race:

Age, gender, and race may potentially influence the risk of venous thrombo embolism (VTE). Among these, age has most consistently been associated with increased VTE risk. As age increases, so does the risk.(Peter Gloviczki , 2009)

(b) Surgery:

The increased risk of DVT or PE associated with surgery is due to decreased ability to move after surgery, and changes in the level of certain clotting factors in the blood that occur after major surgery.(Peter Gloviczki,2009)

(c) Trauma:

A person who has had a significant trauma (in car crash, for example) is at great risk of DVT and PE. These patients are generally unable to move for long periods of time due to their injuries. (Peter Gloviczki , 2009)

(d) Immobilization or Travel:

Bed rest or other immobilization is also associated with an increased risk of VTE. This has to do with blood "pooling" in the veins for long periods of time, a condition called "stasis". Stasis of blood in the veins is the reason that people on long air flights or long drives are thought to have increased risk of VTE.(Peter Gloviczki , 2009)

(e) Malignancy:

Malignancy (cancer) carries a significant risk of VTE. Up to 30% of patients with cancer can develop a DVT. (Peter Gloviczki , 2009)

(f) Primary blood clotting disorders:

There are several known genetic conditions that alter the presence or amount of clotting factors in the blood. These conditions often are associated with an increased risk of DVT or PE, but usually cause a problem only when another risk factor is also present. (Peter Gloviczki , 2009)

(g) Oral contraceptive and hormonal therapy:

Estrogen (female hormone) replacement, either in oral contraceptive (birth control) or in hormone replacement therapy, has been associated with an increased risk of VTE;the higher the estrogen amount, the higher the risk. Although it is less clear, progestin components in some contraceptives may also be related to an increased risk of VTE. (Peter Gloviczki , 2009)

(h) Pregnancy:

There is an increased risk of DVT and PE in pregnancy, primarily due to a combination of changes in the blood clotting factors and compression of the pelvic veins by the fetus. There is also a risk of VTE after delivery. Once a

mother has had a DVT during pregnancy, she is at increased risk for recurrent DVT during subsequent pregnancies. (Peter Gloviczki , 2009)

2-3-3: Signs and symptoms of DVT:

One of the most feared complications of DVT is pulmonary embolus. PE occurs in about 10 – 25% DVT's. Although, sometimes the only symptoms of DVT experienced by a patient are those of a PE, most PEs may be asymptomatic. The symptoms of PE include a sudden onset chest pain, shortness of breath (breathing very fast) and increased heart rate. (Peter Gloviczki , 2009)

2-3-4: Varicose veins:

Varicose veins are twisted, enlarged veins near the surface of the skin. They are most common in the legs and ankles. They usually aren't serious, but they can sometimes lead to other problems. Varicose veins are caused by weakened valves and veins in the legs. Normally, one-way valves in the veins keep blood flowing from the legs up toward the heart. When these valves do not work as they should, blood collects in the legs, and pressure builds up. The veins become weak, large and twisted.(http://www.webmd.com , 2014)

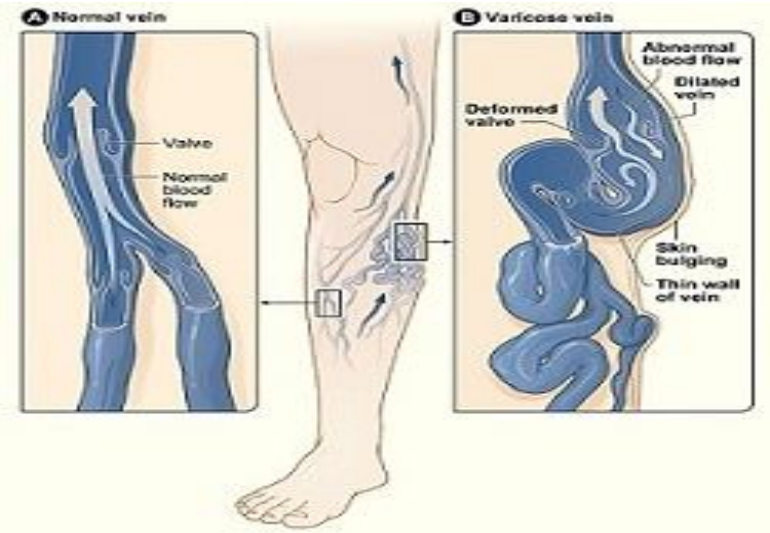


Figure (10): Normal flow in normal vein and abnormal flow in varicose vein.(http://www.bing.com , 2014)

Varicose veins look dark blue, swollen, and twisted under the skin. Some people do not have any symptoms. Mild symptoms may include:

Heaviness, burning, aching, tiredness, or pain in your legs. Symptoms may be worse after you stand or sit for long periods of time , Swelling in your feet and ankles , Itching over the vein , More serious symptoms include Leg swelling , Swelling and calf pain after sit or stand for long periods of time , Skin changes, such as: Color changes , Dry, thinned skin , Inflammation , Scaling and Open sores, or you may bleed after a minor injury.(http://en.wikipedia.org , 2014)

2-4: Ultrasound evaluation of DVT:

Over the past 2 decades, venous ultrasonography (US) has become the standard primary imaging technique for initial evaluation of patients for whom there is clinical suspicion of deep venous thrombosis (DVT) of the lower extremity veins. It has replaced the venogram and other diagnostic studies such as impedance plethysmography, various radionuclide studies, and conventional CT because of its noninvasive nature, the ease with which it can be performed in skilled hands, and its proven efficiency. Compression US first was described as a means of diagnosing DVT in 1986 by Raghavendra and colleagues from the United States and a Ppleman and colleagues from the Netherlands.(http://www.bing.com , 2014)

The use of Doppler ultrasound to evaluate blood flow within the body is steadily expanding. Peripheral vascular Doppler investigation of the carotid arteries and the deep veins of the legs are well established procedures.(Devin Dean . 2005)

Duplex scanning (Doppler and B mode) is considered to be the method of choice for the imaging of (DVT), with venography reserved for technically incomplete or difficult duplex examinations. Duplex scanning can be used for serial investigations to monitor the progression and outcome of thrombosis. In addition, duplex scanning can be useful for assessing the long-term damage to veins and

valve function as a result of chronic post-thrombotic syndrome. This can lead to the development of lower limb venous hypertension and possible leg ulceration.(Abigail Trush , 2005)

Color duplex ultrasonography has developed as a noninvasive test that can be repeated any time, sonography is increasingly replacing conventional diagnostic modalities that cause more discomfort to the patient.

The combination of gray-scale sonographic information for evaluating topographic relationships and morphologic features of vessels with the qualitative and quantitative data obtained with the Doppler technique enables fine diagnostic differentiation of vascular disorders. In particular, the hemodynamic Doppler information is a useful supplement to the findings obtained with radiologic modalities. Being noninvasive and easy to perform any time; duplex sonographyproceeds more invasive, stressful, and expensive diagnostic tests in the step by step diagnostic workup of patients with vascular disease. It provides crucial information for optimal therapy and will replace invasive modalities such as angiography and venography. Pulsed and color Doppler (PD, CD) studies add significant information for the diagnosis and characterization of the colt.

(CD) quickly determines whether the colt is occlusive or non-occlusive. It can readily characterize a hematoma, lymph node, baker's cyst or differentiate between a vascular and nonvascular mass.(Devin Dean , 2005)

Previous Studies:

Asha Gader and others in April 2009 study "Deep venous thrombosis (DVT) and venous thromboembolism (VTE) is a major health problem with high mortality worldwide. Patients at risk must be identified and given appropriate prophylaxis in order to decrease the mortality. Aimed To investigate the prevalence of DVT in pregnancy and the puerperium and to identify risk factors for DVT at Khartoum and Khartoum North Teaching hospitals, Sudan.

They found During the study period (April 2007–March 2008), 65 patients presented with DVT as confirmed by Doppler ultrasound. A total of 14,490 deliveries occurred during the study period. The rate was 448 DVT per 100,000 births/year. Only four of these 65 patients were pregnant and the rest presented at postpartum. DVT occurred in the left lower extremity in 51 (78.4%), in the right in 13 (20.0%), and in one (1.5%) woman in both legs. In univarite and multivariate analyses, family history of DVT, primigravidae and cesarean section deliveries showed an higher risk of DVT.

In their study They showed a high prevalence of DVT, most of these events occurred in the postpartum period. Primiparae, family history of DVT and cesarean section deliveries were important risk factors and these groups are candidate for prophylaxis measures against DVT.

Ray, J. G.; Chan In November 1999 – they performed a meta-analysis of all published studies of deep vein thrombosis during pregnancy and the puerperium using MEDLINE between 1966 and May 1998. Fourteen studies included relevant information on deep vein thrombosis in pregnancy or the puerperium, and used objective testing to diagnose deep vein thrombosis. The pooled event rate for left sided or bilateral deep vein thrombosis was 82.2 percent. There was no statistical evidence of heterogeneity for this figure (P = .08). Nine studies compared deep vein thrombosis events between the antepartum and puerperium periods, with 65.5 percent (95 percent CI 58.1 to 72.1) arising during pregnancy, and 34.5 percent (95 percent CI 27.9 to 41.9) postpartum (P = .08, not heterogeneous). Using these figures, the estimated relative distribution of 100 deep vein thrombosis events during pregnancy and the puerperium would be 0.23 per day during pregnancy, and 0.82 per day in the postpartum period. During pregnancy and the puerperium, deep vein thrombosis is more likely to arise in the left leg. More than half of all deep vein thromboses during pregnancy occur during the first and second trimesters. Furthermore, during the puerperium, the risk of developing deep vein thrombosis is significantly higher than antepartum.

E.LSimpson in 1997 To determine the incidence of venous thromboembolism in pregnancy and the puerperium and to identify risk factors for pregnancy-related venous thromboembolism. At London, UK.

They found The incidence of venous thromboembolism was 85/100,000 maternities. There were approximately twice as many postpartum as antepartum events. Blood group A, multiple pregnancy, caesarean section, cardiac disease, delivery at gestational age of <36 weeks, a body mass index of ≥25, or more and maternal age of 35 or over were all found to increase incidence of venous thromboembolism. Although venous thromboembolism is the leading cause of maternal deaths in the UK, it is still a rare event. Most of these events are deep vein thromboses occurring in the postpartum period. Antenatally multiple birth is an important risk factor. Postnatally women who have had a caesarean section, premature delivery or history of cardiac disease should be assessed carefully for venous thromboembolism.

Material and Method

3.1 Materials

3-1-1 Instrumentation:

Ultrasound machine SEMIENS model 10033322, linear probe, ultrasound machine LINDWIND linear probe and MINDARY model DC-N3 linear probe, ultrasound gel.

3-2 Method

3-2-1 Study design:

Retrospective, cross-sectional descriptive (observational) hospital based study.

3-2-2 Study area:

The study done at Wad MadaniMaternity Teaching Hospital in Wad Madani city.

3-2-3 Study duration:

The study was conducted between July 2016 and March 2017.

3-2-4 Study population:

The study was carried out on all patients attending to ante natal clinic during pregnancy, puerperium and patients who had caesarean sections with symptoms and signs of deep vein thrombosis and also those admitted from outpatient clinic.

Inclusion criteria:

Pregnant patients and patients in pureperuim with symptoms include inability to walk, pain in the lower limb, swelling of one or both lower limbs and the signs include the change in the color of limb, tenderness in lower limbs and who confirmed by Doppler scan.

Exclusion criteria:

All patients admitted to hospital as cases of deep vein thrombosis and were negative Doppler scan.

3-2-5 Sample:

All patients with lower limb pain, swelling or tenderness during pregnancy and puerperium, the sample size include 50 cases.

3-2-6 Tools of data collection:

- Primary data was collected from data collection sheets and Doppler ultrasound examinations.
- Secondary data was collected from books and internet.

3-2-7 Investigation:

General investigation:

Include: complete haemogram, urine analysis, Doppler ultrasound for diagnoses of deep vein thrombosis.

Coagulation profile (PT, PTT, INR).

Other investigation: include chest X-Ray, and electro cardiograph (ECG).

3-2-8 Data analysis:

The data was analyzed by software programs, EXCEL, and statistical program (SPSS).

3-2-9 Data presentation:

The data was presented in tables and figures.

3-2-10 Ethical Consideration

- No identification or individual will be published .
- No information or patients details will be disclosed or use for other reasons than the study .

3-2-10 Technique:

All patients was scanned by Doppler ultrasound machine high frequency linear transducer from upper thigh till foot with longitudinal scans and transverse scans to exam the iliac vein common, femoral vein, saphenous vein, popliteal vein, posterior tibial vein, anterior tibial vein and dorsal rete.

3-2-11 Examination protocol:

a) Iliac vein:

The patient lie spine, with low frequency convex probe the external iliac vein is identified at the groin and is followed up by the transducer lateral to the rectus muscle. And the pressure applied by the transducer to better visualization of this region. It then divided into internal and an external iliac vein in the iliac fossa the confluence is not always identified.

b) Femoral segment:

Change to higher frequency and return to the groin region. The patient is supine with hip slightly externally rotated. Visualize common femoral vein with longitudinal plane and differentiate between the vein and artery by the color Doppler.

The SFJ was evaluated by spectral analysis and check for spontaneous, phasic flow, normal valsava response and augmentation with calf compression. Proceed distally along the femoral vein to junction of superficial and deep femoral vein.

and then return to the CFV level and begin transverse examination with color Doppler.

c) Popliteal vein:

Patient lies prone with feet elevated by using a billow. The knee flexed slightly 10-15 degree to avoid collapse of the vein. begin with longitudinal view of the superficial femoral vein the distal part of adductor canal continue distally till it bifurcates into peroneal and tibial vein at the inferior end of the popliteal fossa. And then exam in the transverse plane.

d) Calf vein:

Patient supine or sitting with affected leg hanging over the side of the bed. The paired posterior tibial veins are identified posteriorly to the medial malleolus at the ankle superficially and on the either side of the posterior tibial artery.

Paired peroneal veins lie laterally in the lower leg just posterior to the fibula at the level of ankle. The anterior tibial veins originate at the dorsum of the foot just anteromedial to the tibia. They continue proximally coursing lateral to tibia and deep to the tibialis anterior and extensor muscle.

The three groups of paired calf veins are evaluated by using compression ultrasonography and augmentation with manual compression and color flow imaging of lower calf is useful to localize and evaluate the veins for flow.

4. Results

Table (4.1): Shows frequency distribution of age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
25-29	17	34.0	34.0	34.0
30-34	12	24.0	24.0	58.0
35-39	13	26.0	26.0	84.0
>=40	8	16.0	16.0	100.0
Total	50	100.0	100.0	

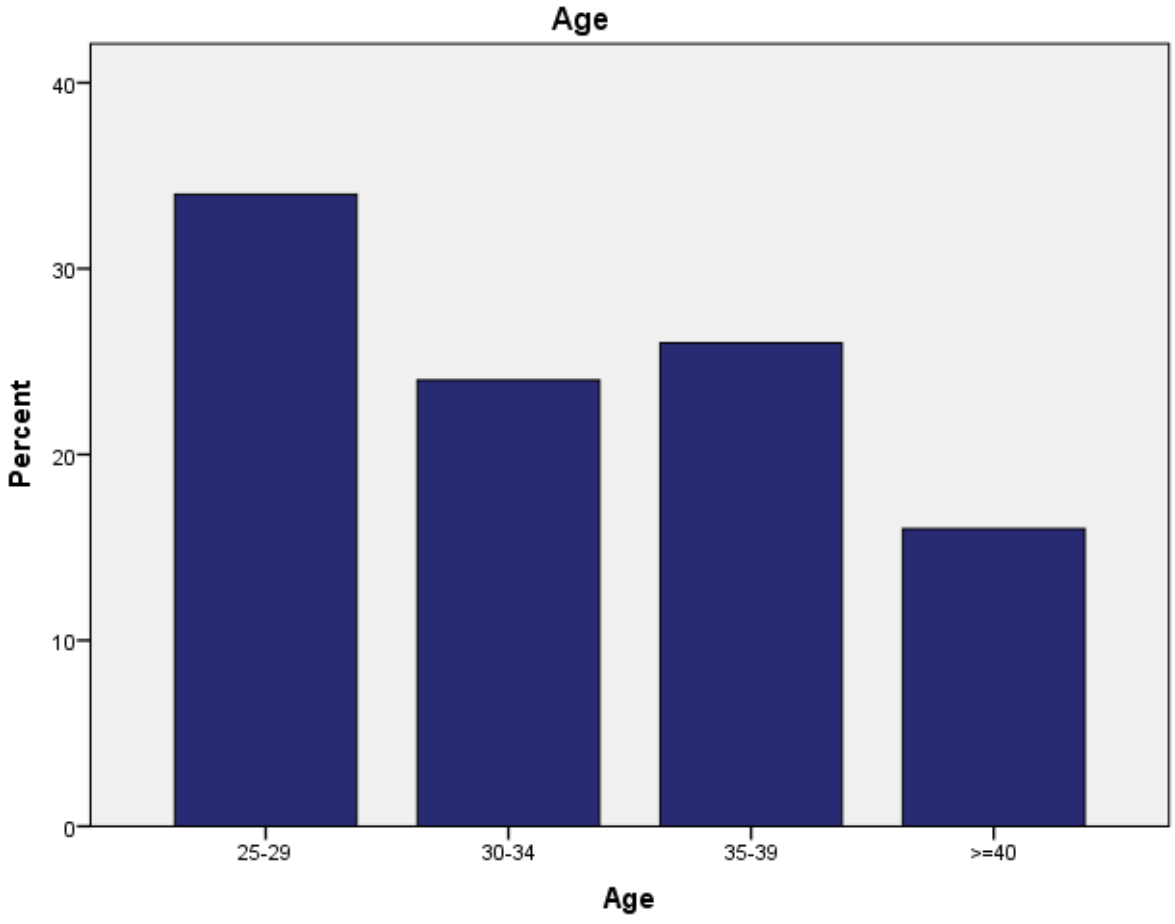


Figure (4.1): Shows frequency distribution of age

Table (4.2): Shows frequency distribution of occupational status

Occupation	Frequency	Percent	Valid Percent	Cumulative Percent
Housewife	15	30.0	30.0	30.0
Employer	35	70.0	70.0	100.0
Total	50	100.0	100.0	

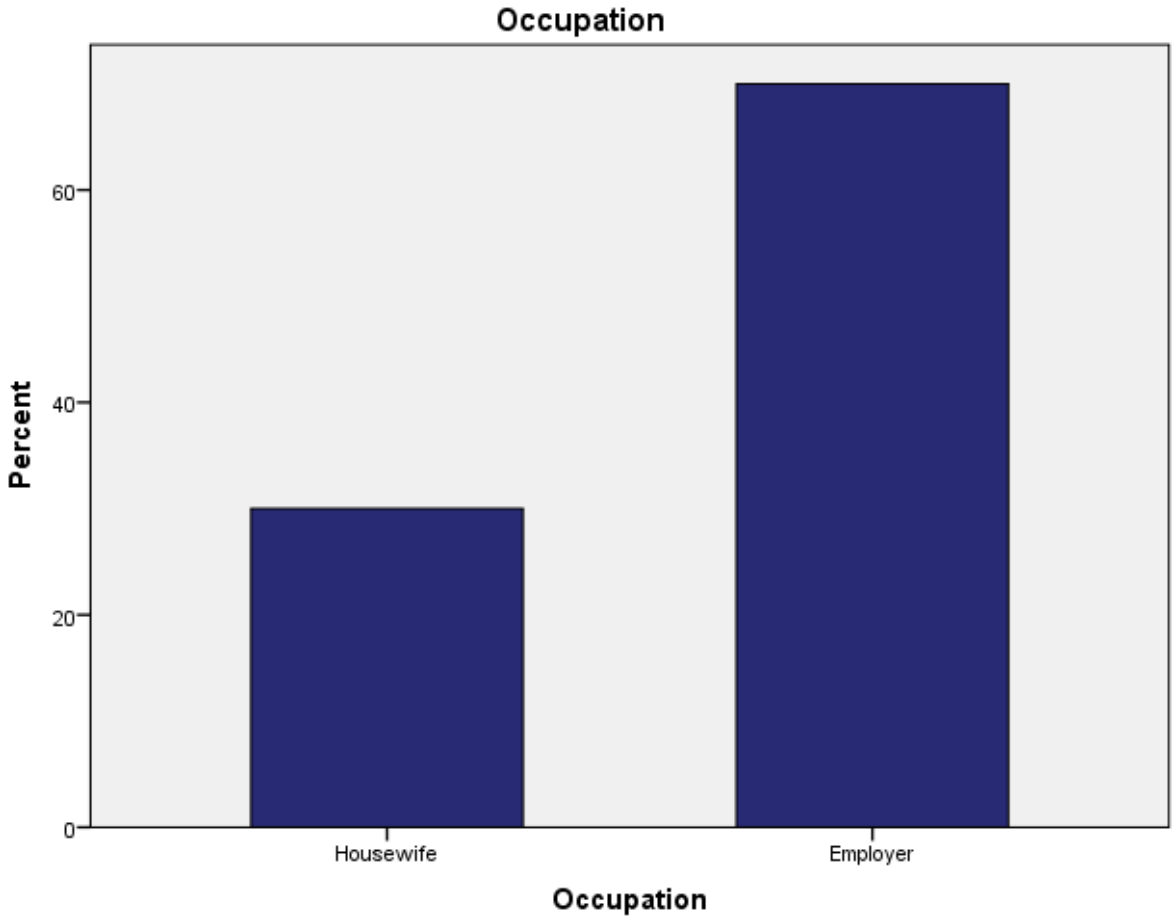


Figure (4.2): Shows frequency distribution of occupational status

Table (4.3): Shows frequency distribution of address

Address	Frequency	Percent	Valid Percent	Cumulative Percent
Urban	13	26.0	26.0	26.0
Rural	37	74.0	74.0	100.0
Total	50	100.0	100.0	

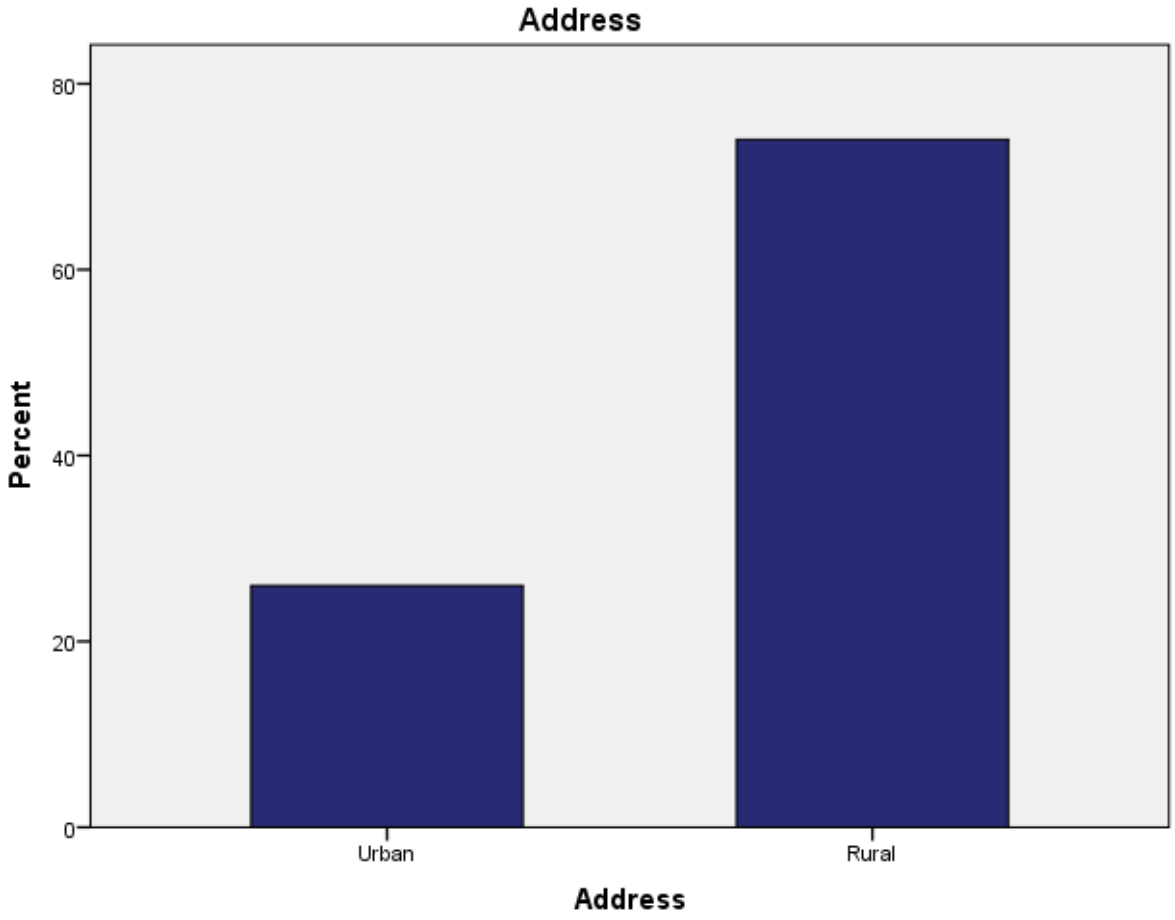


Figure (4.3): Shows frequency distribution of address

Table (4.4): Shows frequency distribution ofObstetrical history

Obstetrical history	Frequency	Percent	Valid Percent	Cumulative Percent
Gravity	12	24.0	24.0	24.0
Parity	21	42.0	42.0	66.0
Abortion	15	30.0	30.0	96.0
None	2	4.0	4.0	100.0
Total	50	100.0	100.0	

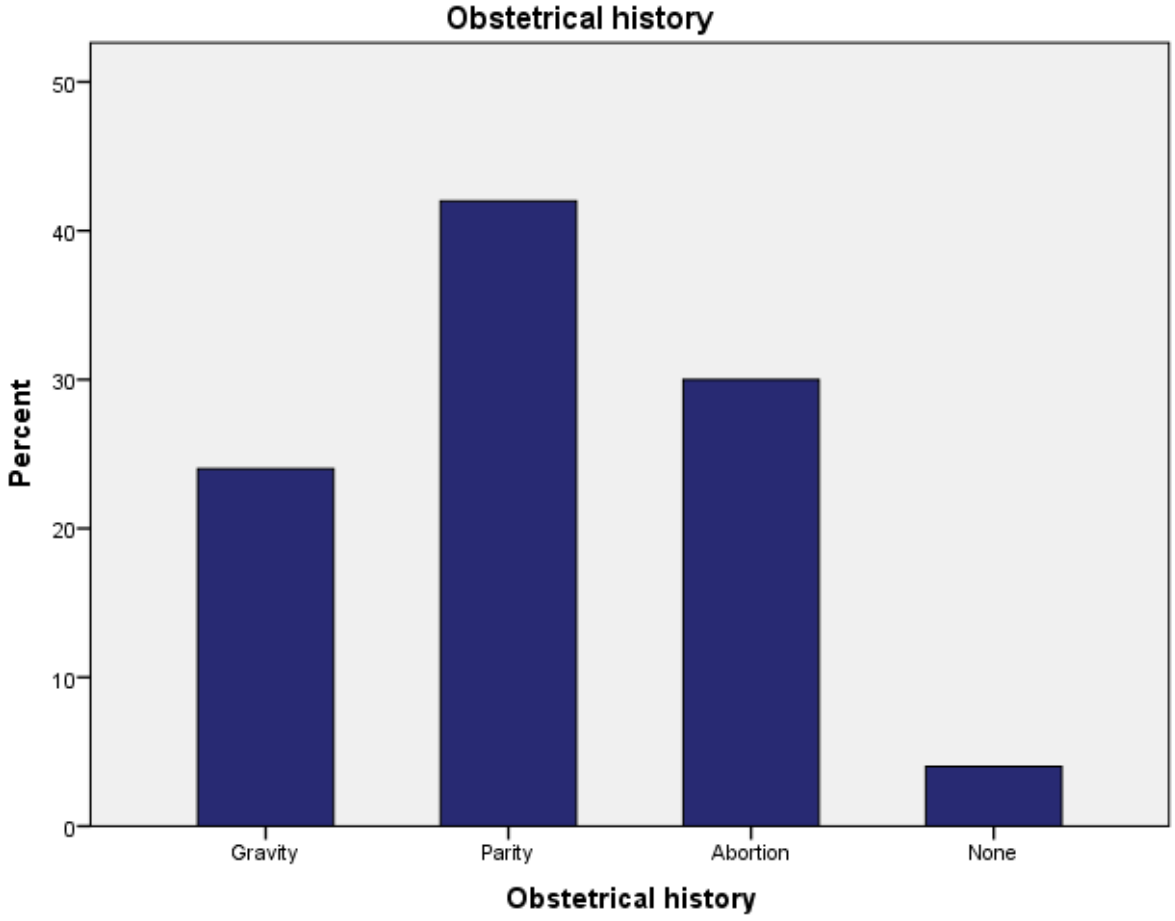


Figure (4.4): Shows frequency distribution ofObstetrical history

Table (4.5): Shows frequency distribution ofGynaecological history

Gynaecological history	Frequency	Percent	Valid Percent	Cumulative Percent
GA	21	42.0	42.0	42.0
History of pills	26	52.0	52.0	94.0
None	3	6.0	6.0	100.0
Total	50	100.0	100.0	

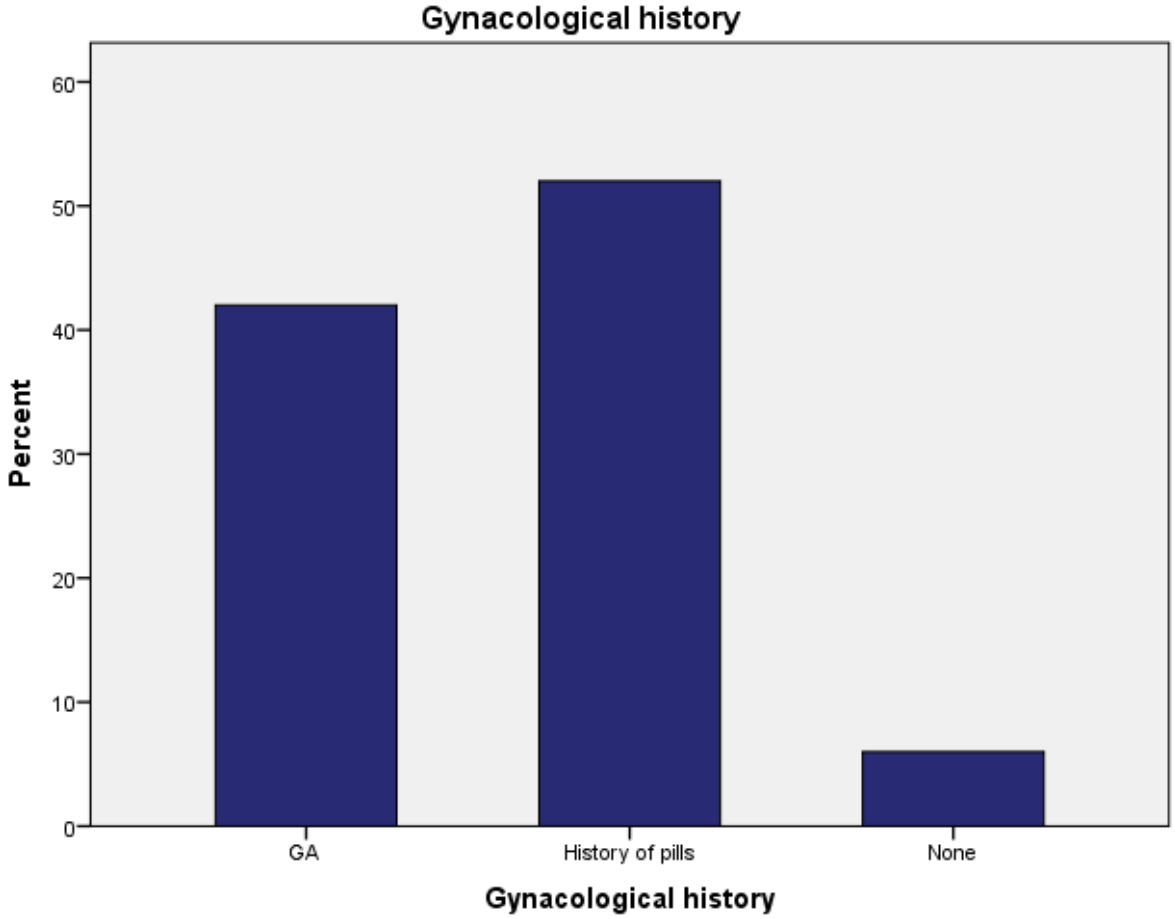


Figure (4.5): Shows frequency distribution ofGynaecological history

Table (4.6): Shows frequency distribution of past medical history

Past medical history	Frequency	Percent	Valid Percent	Cumulative Percent
DVT varicose vain	6	12.0	12.0	12.0
DVT varicose vain + Hypertension + Diabetes	2	4.0	4.0	16.0
Preeclamsia + Diabetes	3	6.0	6.0	22.0
Preeclamsia + Heart disease	2	4.0	4.0	26.0
Hypertension + Heart disease	4	8.0	8.0	34.0
Hypertension + Diabetes + Heart disease	1	2.0	2.0	36.0
DVT varicose vain + Heart disease	1	2.0	2.0	38.0
Hypertension	5	10.0	10.0	48.0
Preeclamsia	4	8.0	8.0	56.0
Diabetes	1	2.0	2.0	58.0
Heart disease	3	6.0	6.0	64.0
DVT varicose vain + Diabetes	4	8.0	8.0	72.0
DVT varicose vain + Preeclamsia	4	8.0	8.0	80.0
Hypertension + Diabetes	7	14.0	14.0	94.0
DVT varicose vain + Hypertension	3	6.0	6.0	100.0
Total	50	100.0	100.0	

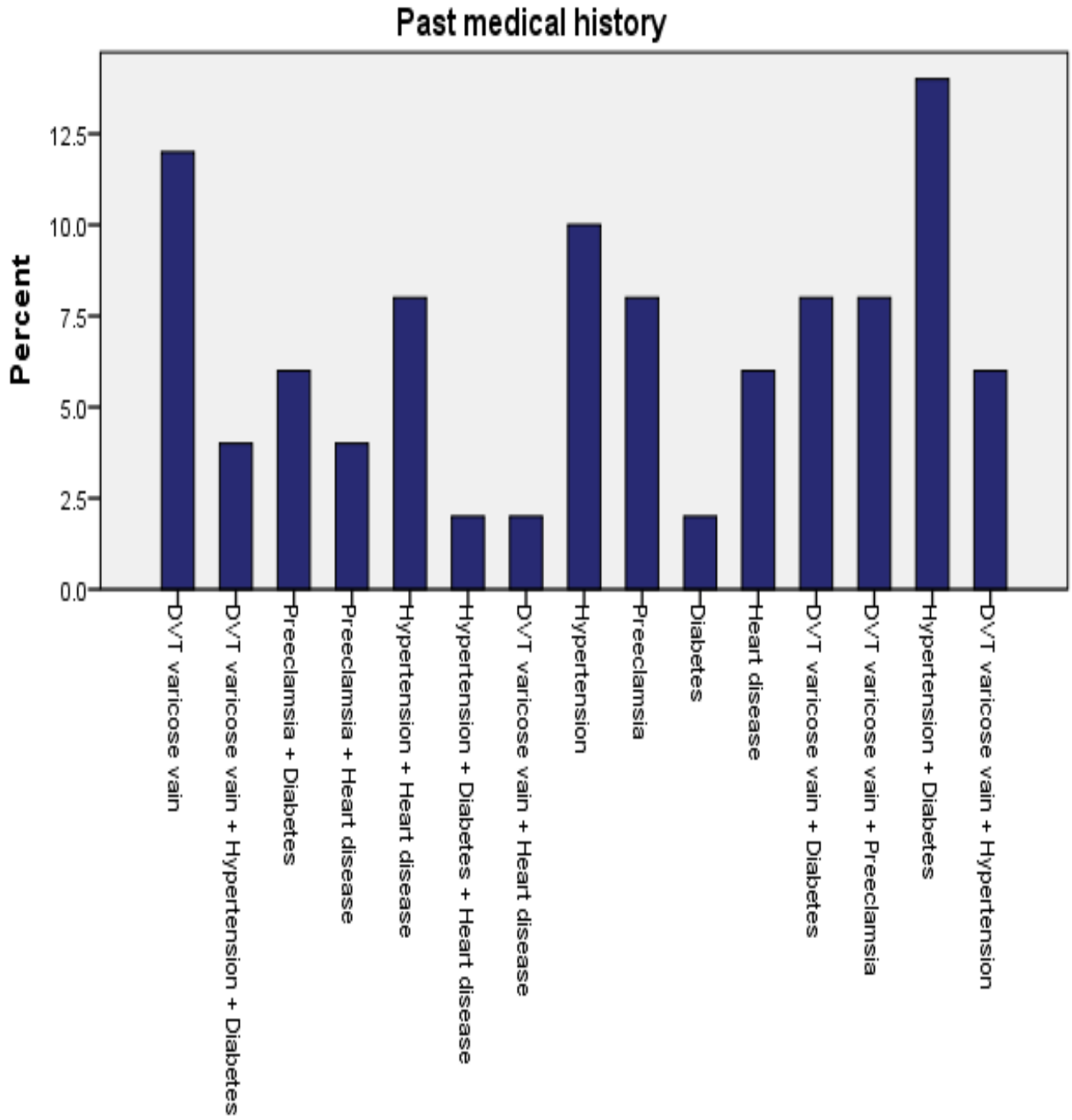


Figure (4.6): Shows frequency distribution of past medical history

Table (4.7): Shows frequency distribution of familyhistory

Family history	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	16	32.0	32.0	32.0
No	34	68.0	68.0	100.0
Total	50	100.0	100.0	

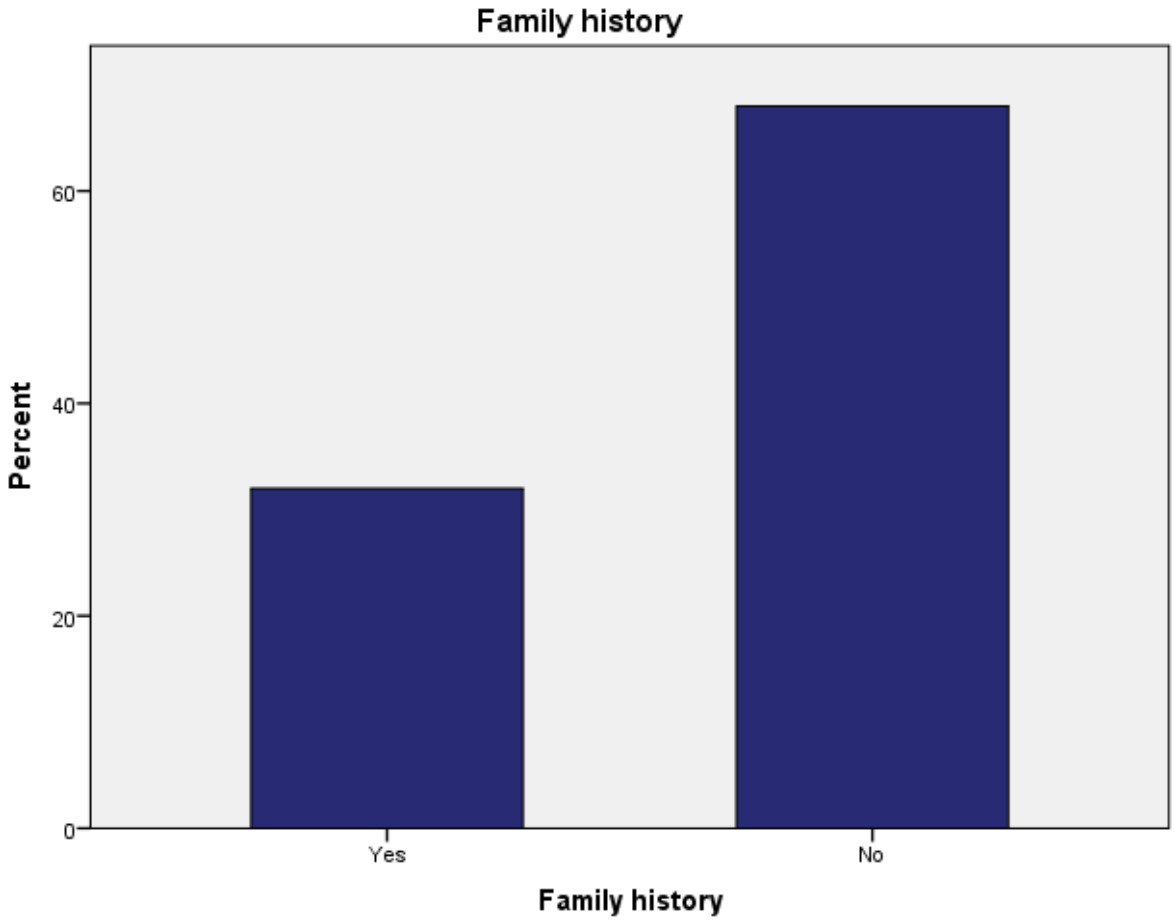


Figure (4.7): Shows frequency distribution of family history.

Table (4.8): Shows frequency distribution of mode of delivery

Mode of Delivery	Frequency	Percent	Valid Percent	Cumulative Percent
C/S	25	50.0	50.0	50.0
Vaginal delivery	19	38.0	38.0	88.0
Assisted vaginal delivery	6	12.0	12.0	100.0
Total	50	100.0	100.0	

Figure (4.8): Shows frequency distribution of mode of delivery

Table (4.9) : Show Frequency distribution of deep vein thrombosis occurrence

Deep vein thrombosis	Frequency	Percent	Valid Percent	Cumulative Percent
Occurrence during pregnancy	8	16	16	16
Occurrence during puerperium	42	84	84	84
Total	50	100	100	8

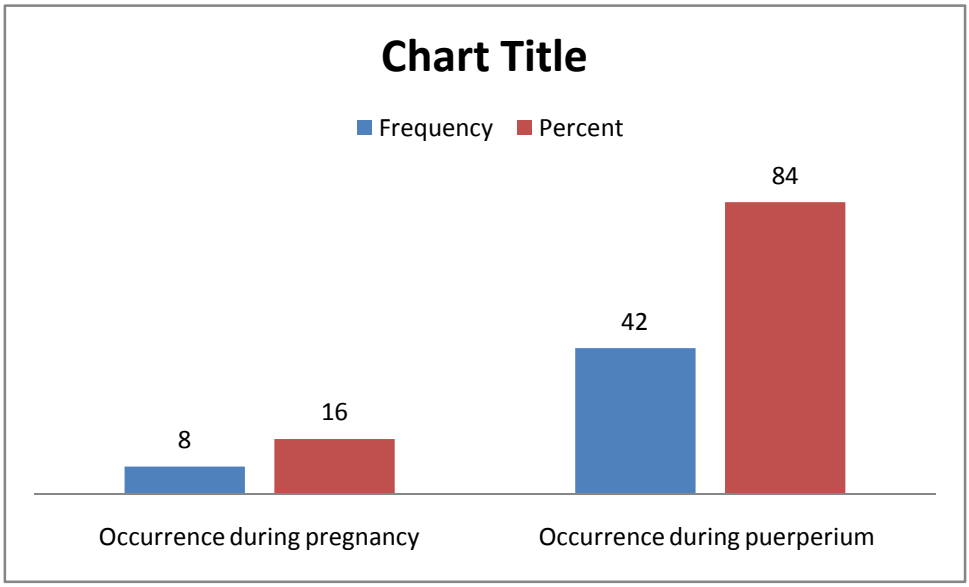


Figure (4.9) : Show Frequency distribution of deep vein thrombosis occurrence

Table (4.10): Shows frequency distribution ofsymptoms

Symptoms	Frequency	Percent	Valid Percent	Cumulative Percent
Inability to walk	4	8.0	8.0	8.0
Inability to walk+ Fever + Leg pain	6	12.0	12.0	20.0
Fever + Leg pain	5	10.0	10.0	30.0
Inability to walk + Leg pain + Chest pain	1	2.0	2.0	32.0
Inability to walk + Breathlessness	7	14.0	14.0	46.0
Fever + Breathlessness	4	8.0	8.0	54.0
Fever + Cough	1	2.0	2.0	56.0
Inability to walk+ Fever	4	8.0	8.0	64.0
Fever + Leg pain + Chest pain	1	2.0	2.0	66.0
Fever	1	2.0	2.0	68.0
Leg pain	4	8.0	8.0	76.0
Inability to walk + Breathlessness + Leg pain	2	4.0	4.0	80.0
Breathlessness + Leg pain	3	6.0	6.0	86.0
Inability to walk + Leg pain	7	14.0	14.0	100.0
Total	50	100.0	100.0	

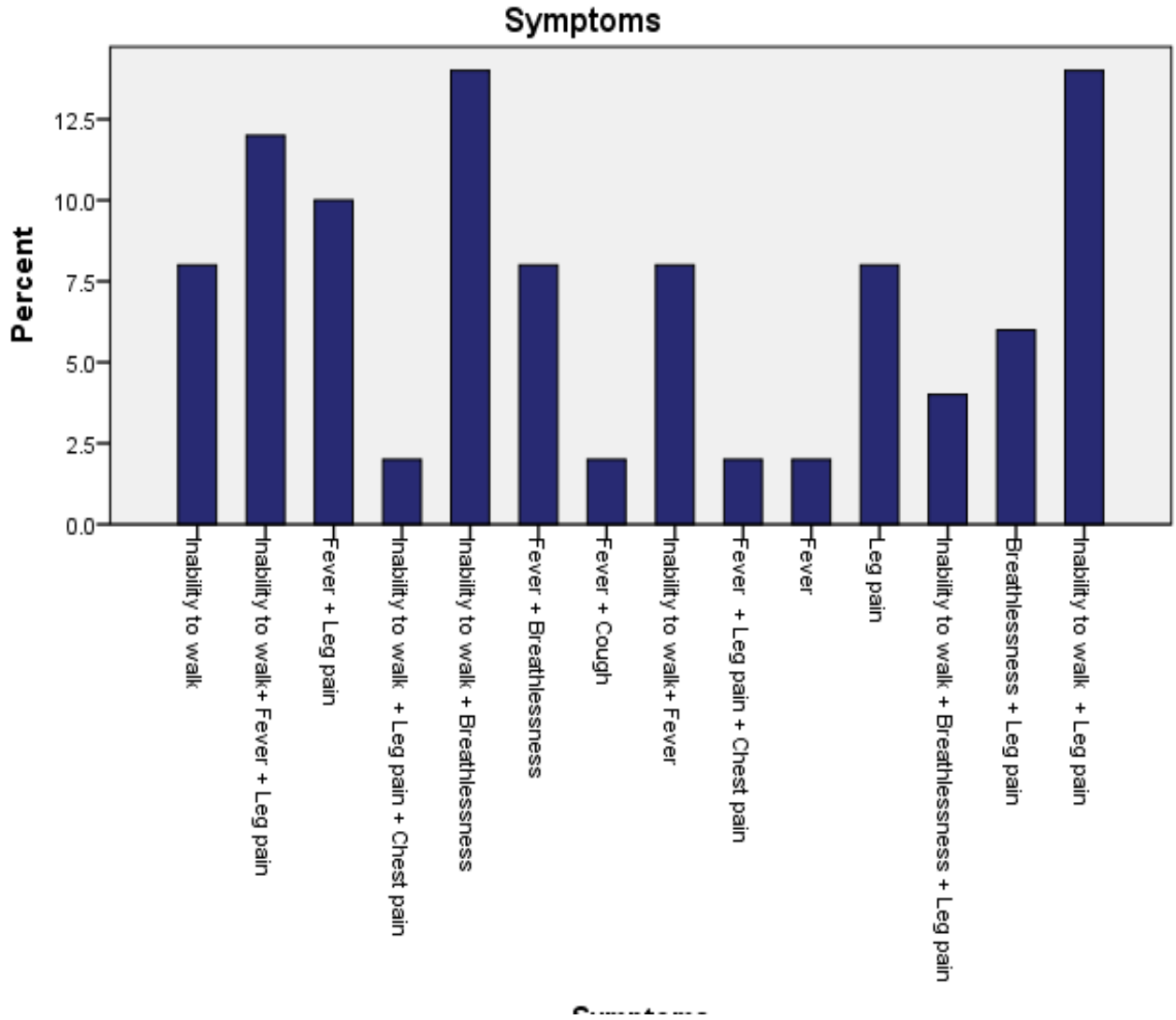


Figure (4.10): Shows frequency distribution ofsymptoms

Table (4.11): Shows frequency distribution ofsigns

	Frequency	Percent	Valid Percent	Cumulative Percent
Tenderness	1	2.0	2.0	2.0
Tenderness + Limping + Varicosity	4	8.0	8.0	10.0
Swelling	1	2.0	2.0	12.0
Tenderness + Swelling	10	20.0	20.0	32.0
Tenderness + Swelling + Varicosity	8	16.0	16.0	48.0
Tenderness + Limping	4	8.0	8.0	56.0
Tenderness + Swelling + Limping	20	40.0	40.0	96.0
Tenderness + Swelling + Limping + Varicosity	2	4.0	4.0	100.0
Total	50	100.0	100.0	

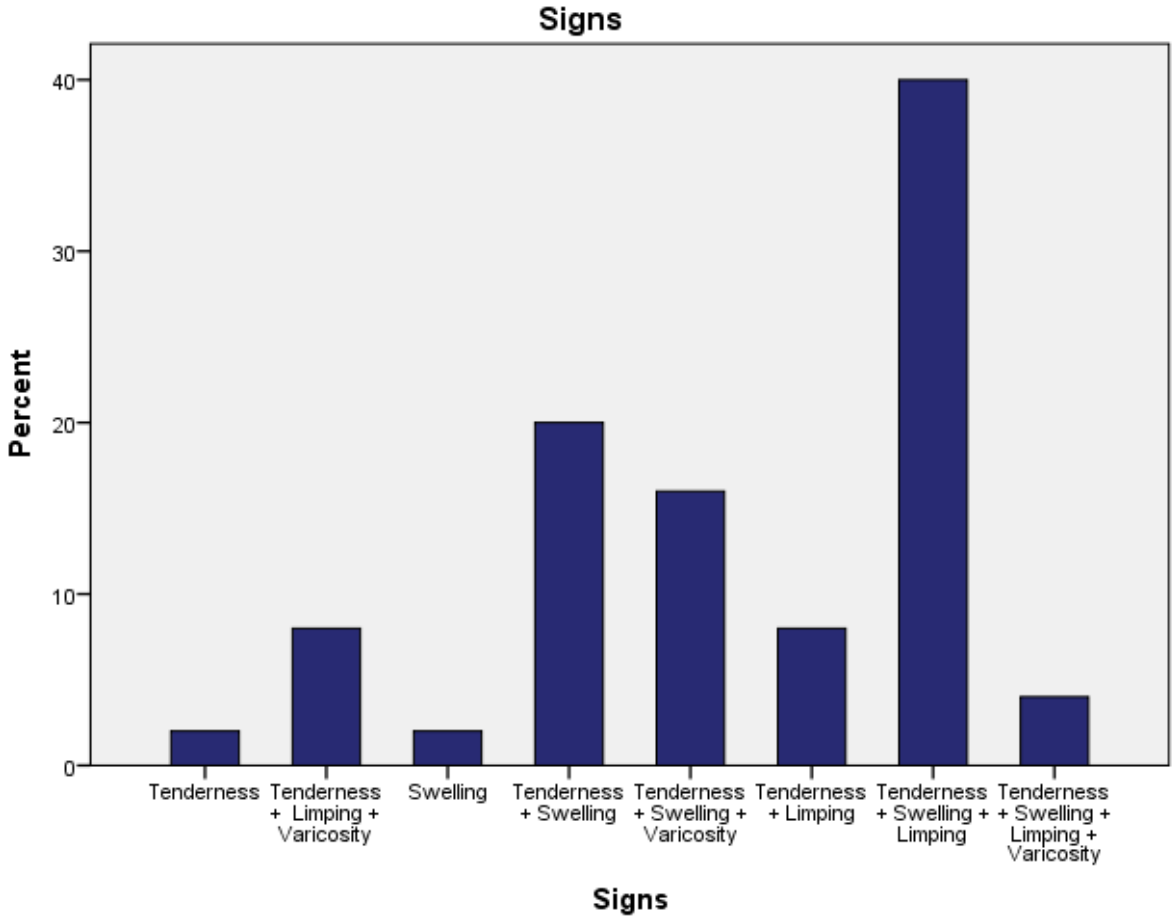


Figure (4.11): Shows frequency distribution ofsigns

Table (4.12) : Show Frequency distribution examination site in lower limb

Exam site	Frequency	Percent	Valid Percent	Cumulative Percent
Right	14	28	28	28
Left	30	60	60	60
Both	6	12	12	12
Total	50	100	100	8

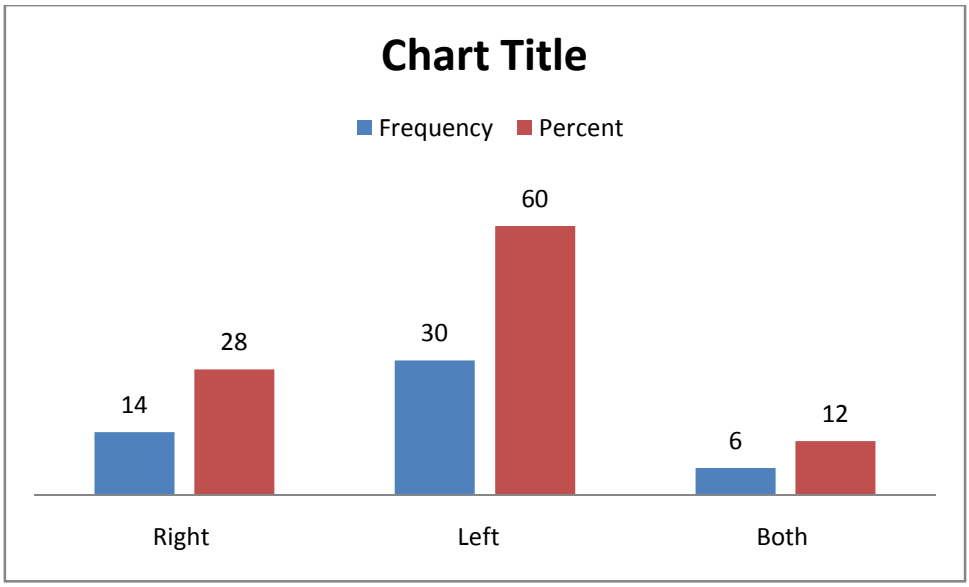


Figure (4.12) : Show Frequency distribution examination site in lower limb

Table (4.13): Shows frequency distribution of anatomical site in lower limb.

Anatomical Site	Frequency	Percent	Valid Percent	Cumulative Percent
Whole limb	14	28.0	28.0	28.0
Thigh alone	14	28.0	28.0	56.0
Calf alone	22	44.0	44.0	100.0
Total	50	100.0	100.0	

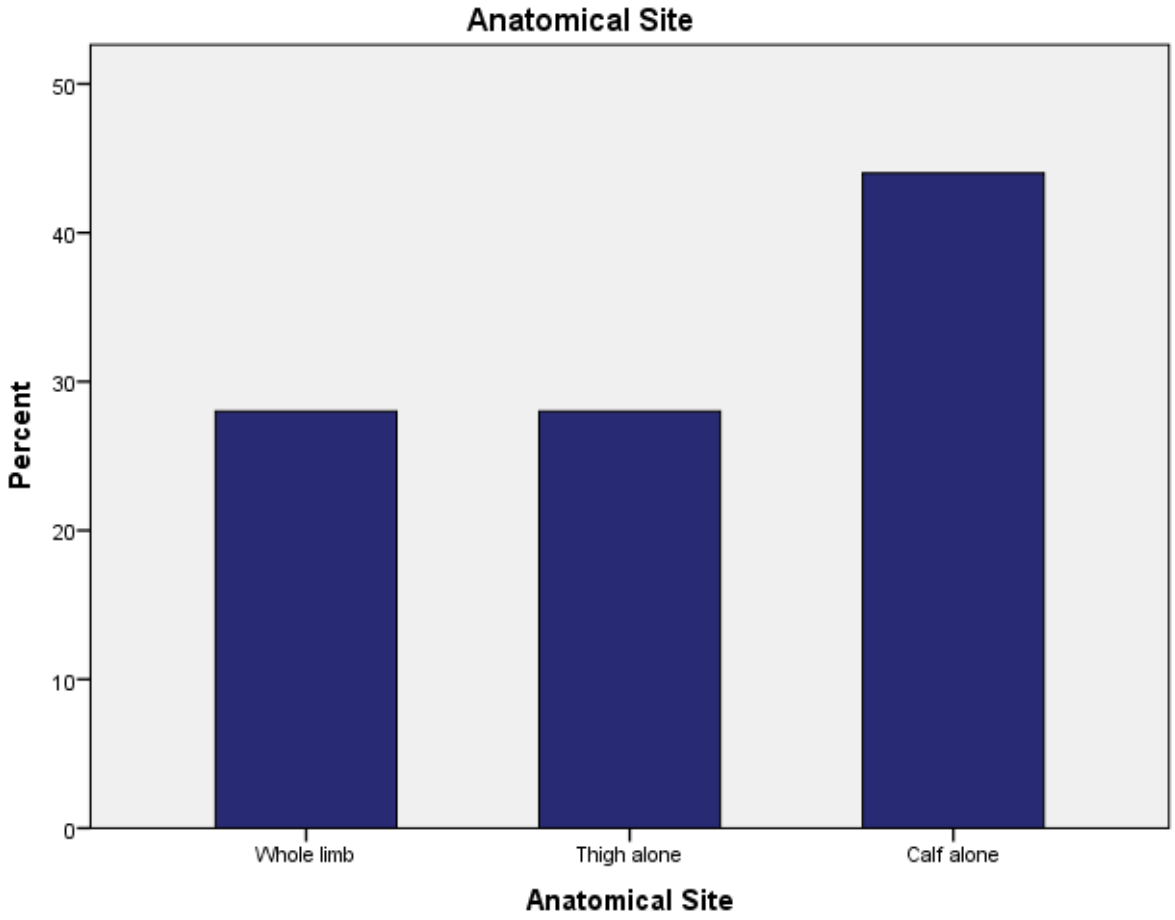


Figure (4.13): Shows frequency distribution of anatomical site in lower limb.

Table (4.14): Shows frequency distribution of lab investigation done.

Lab investigation	Frequency	Percent	Valid Percent	Cumulative Percent
CBC	19	38.0	38.0	38.0
Coagulation profile	6	12.0	12.0	50.0
CBC + Coagulation profile	5	10.0	10.0	60.0
None	20	40.0	40.0	100.0
Total	50	100.0	100.0	

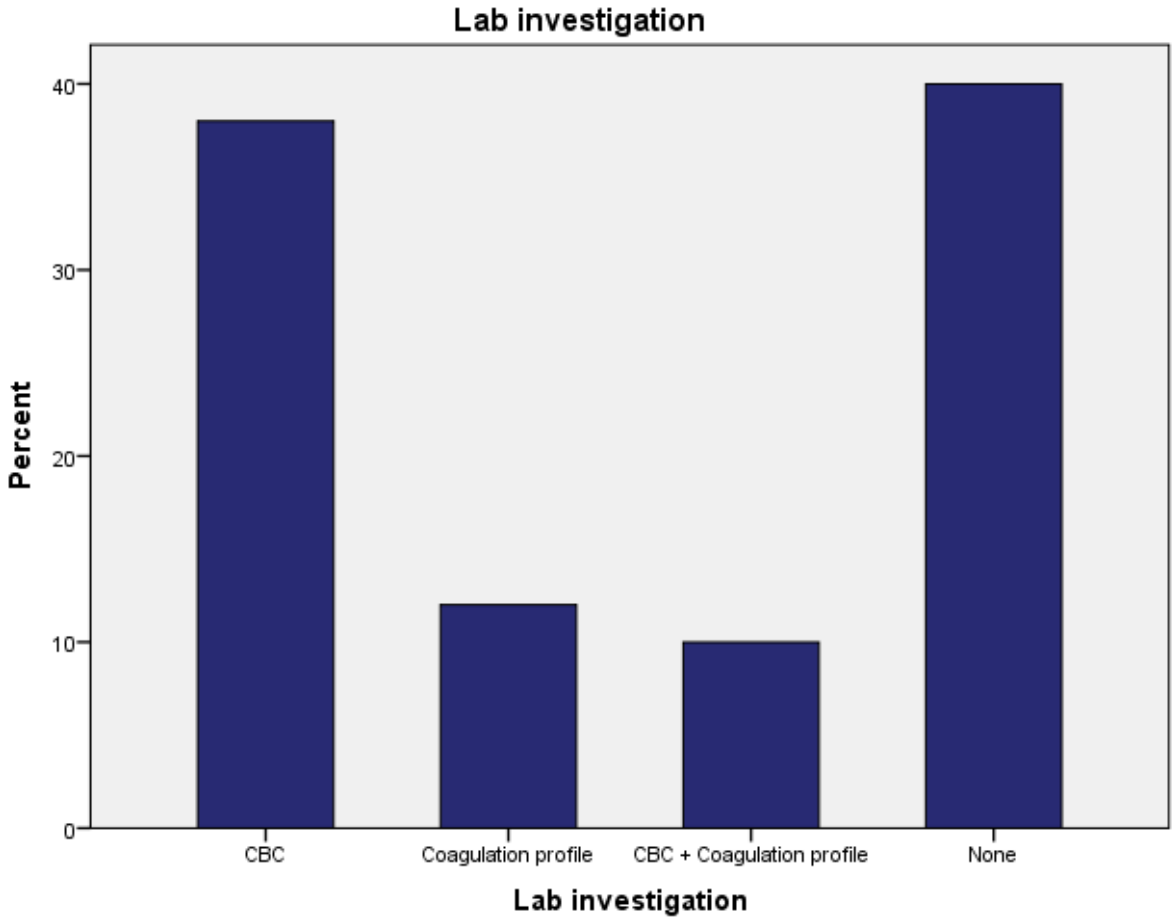


Figure (4.14): Shows frequency distribution of lab investigation done.

Table (4.15): Shows frequency distribution of radiological investigation done.

Radiological investigation	Frequency	Percent	Valid Percent	Cumulative Percent
Doppler U/S	27	54.0	54.0	54.0
Doppler U/S + CXR	23	46.0	46.0	100.0
Total	50	100.0	100.0	

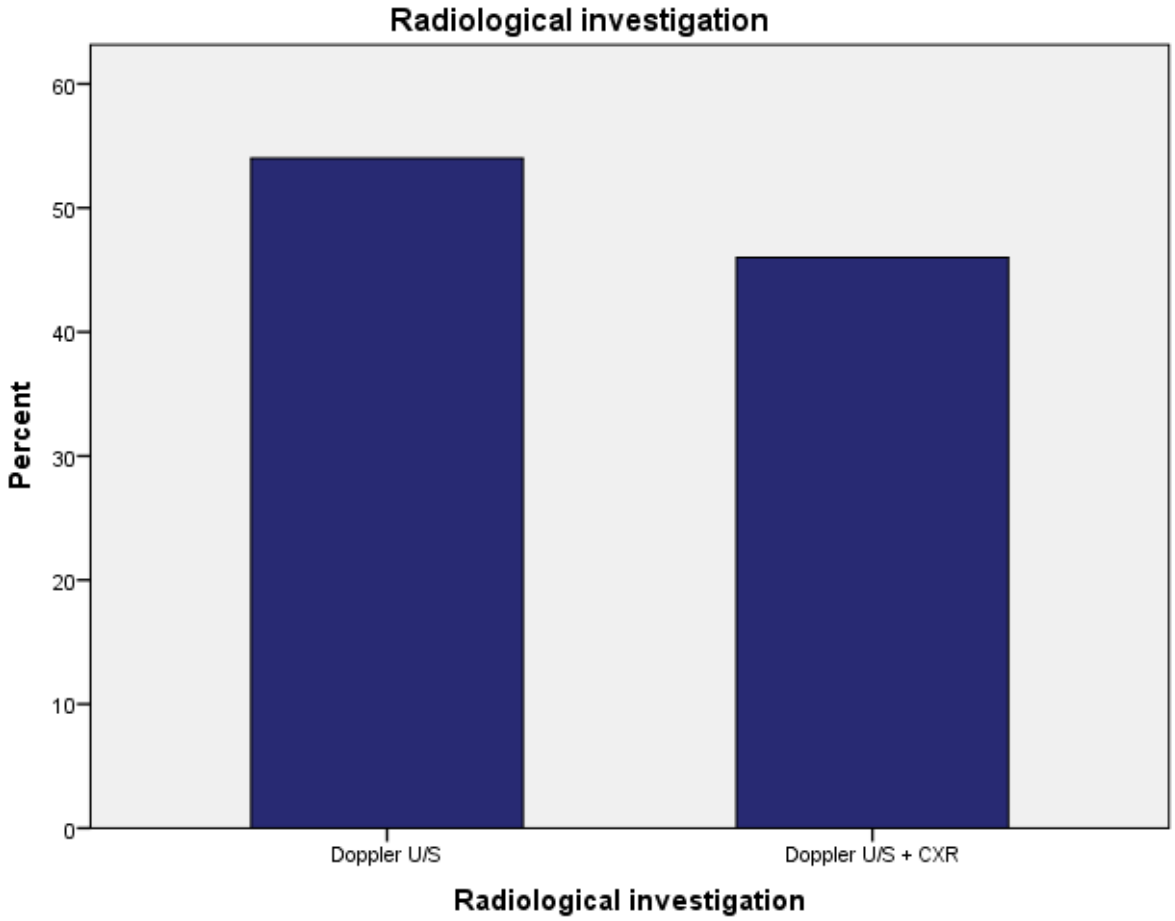


Figure (4.15): Shows frequency distribution of radiological investigation done.

Table (4.16): Shows frequency distribution of ECG done.

ECG	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	32	64.0	64.0	64.0
No	18	36.0	36.0	100.0
Total	50	100.0	100.0	

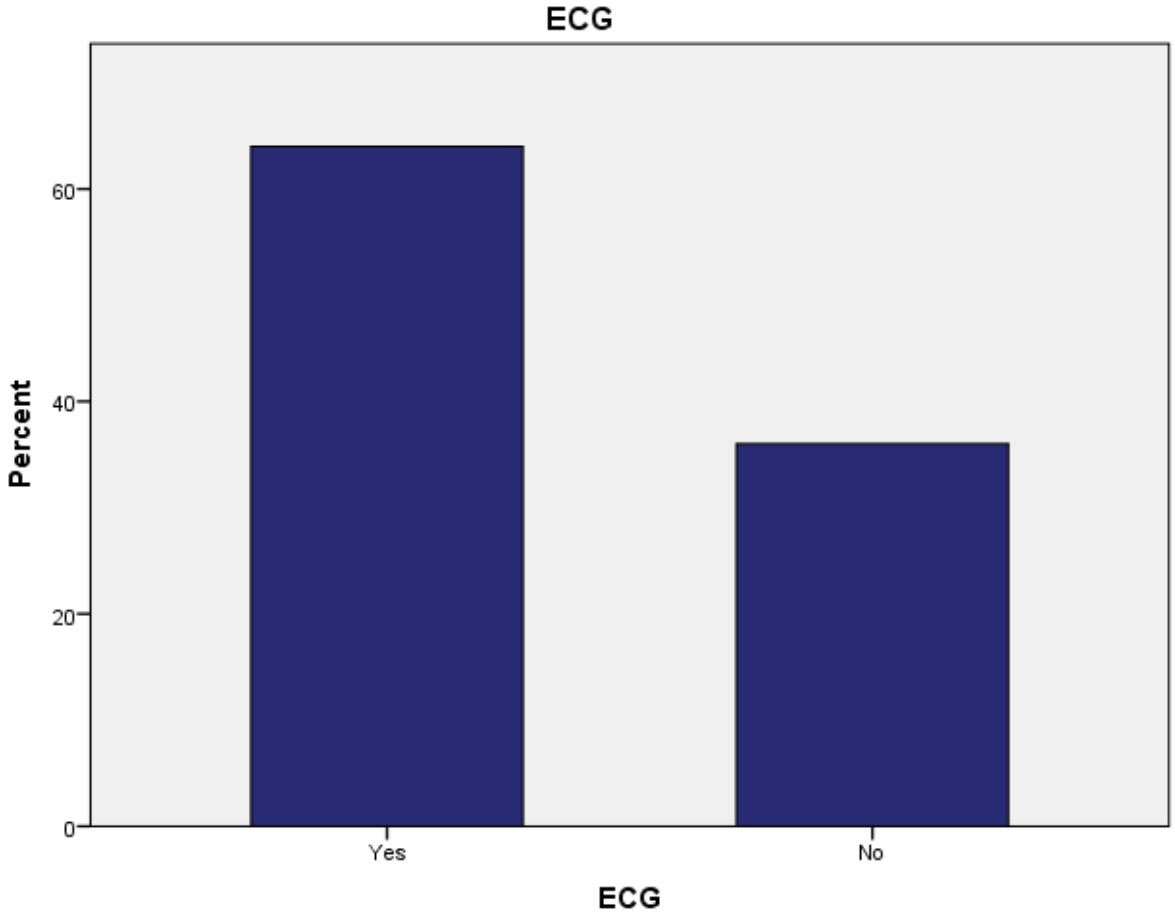


Figure (4.16): Shows frequency distribution of ECG done.

Table (4.17) : show Frequency distribution of Result of Doppler U/S

Result of Doppler U/S	Frequency	Percent	Valid Percent	Cumulative Percent
Reduced blood flow	46	92	92	92
Absent blood flow	4	8	8	8
Total	50	100	100	8

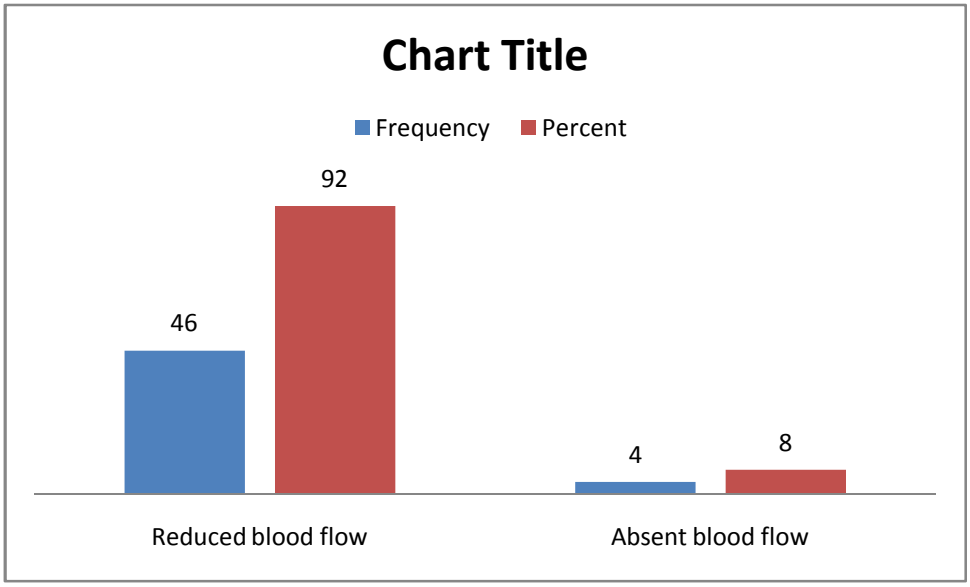


Figure (4.17) : show Frequency distribution of Result of Doppler U/S

Table (4.18): shows relation between age and result of Doppler U/S in cross table

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Age	25-29	8	9	17
	30-34	7	5	12
	35-39	6	7	13
	>=40	5	3	8
Total		26	24	50
P value = 0.828				

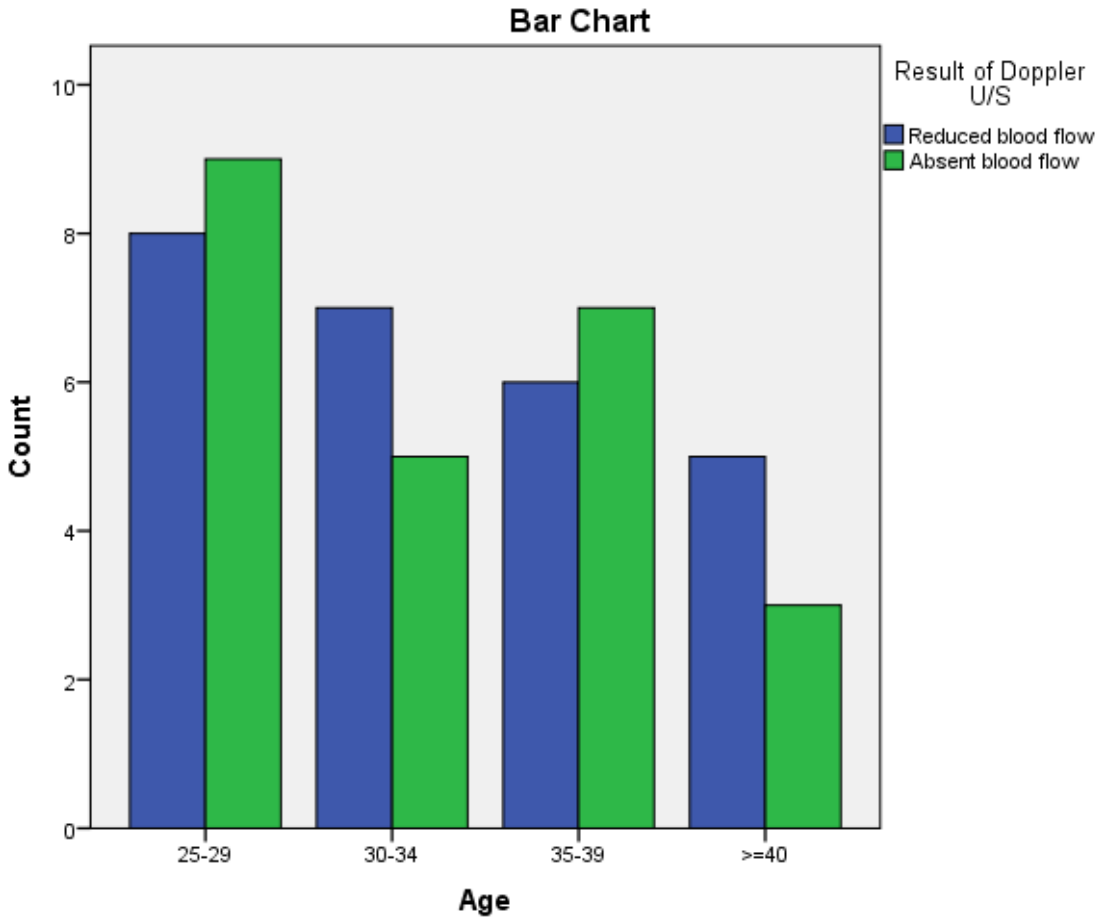


Figure (4.18): shows relation between age and result of Doppler U/S.

Table (4.18): shows relation between occupation and result of Doppler U/S in cross table

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Occupation	Housewife	7	8	15
	Employer	19	16	35
Total		26	24	50
P value = 0.621				

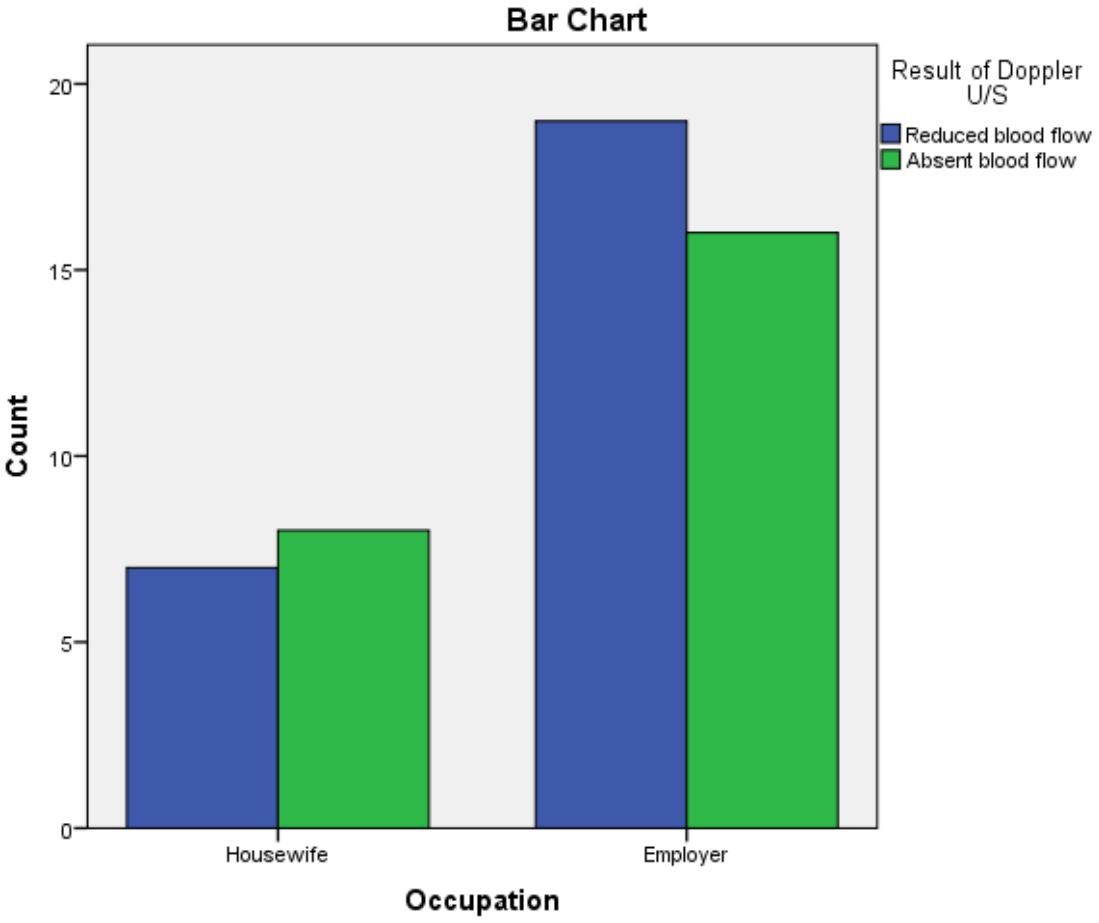


Figure (4.18): shows relation between occupation and result of Doppler U/S.

Table (4.19): shows relation between address and result of Doppler U/S in cross table

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Address	Urban	4	9	13
	Rural	22	15	37
Total		26	24	50
P value = 0.075				

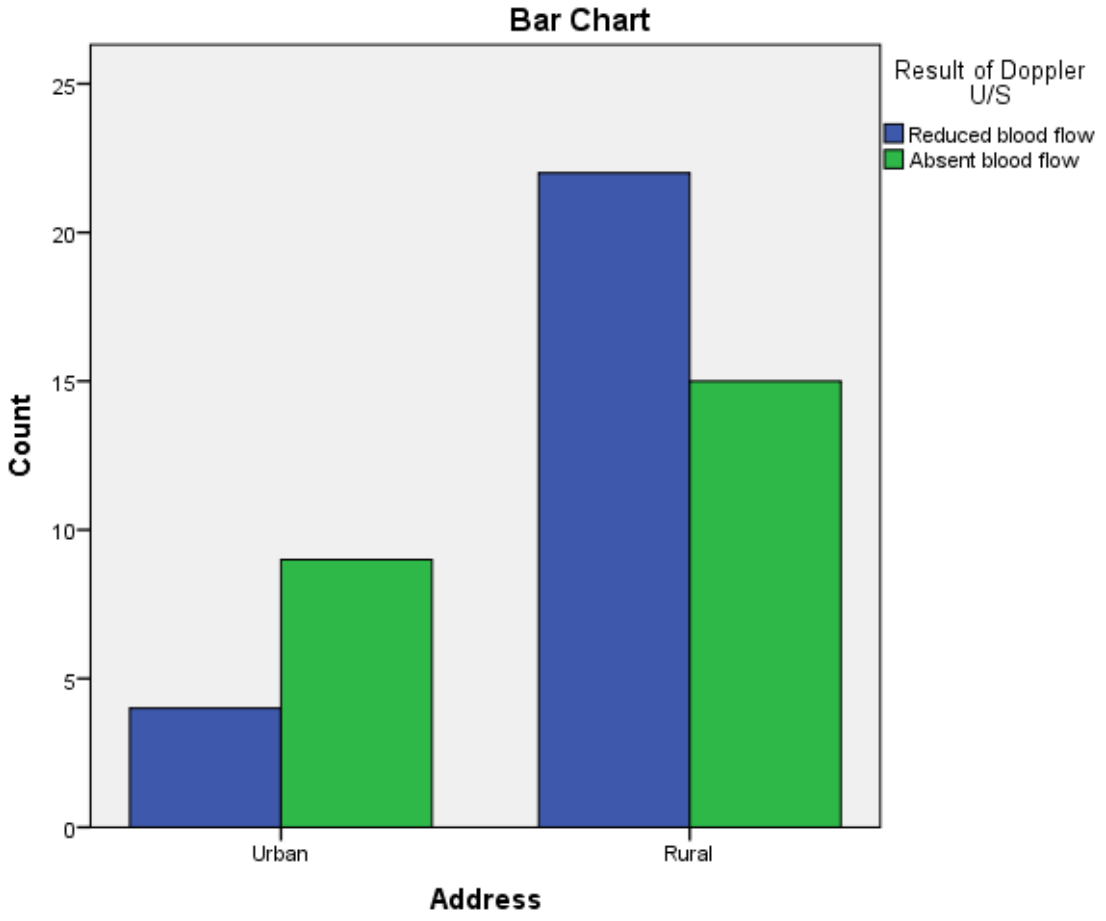


Figure (4.19): shows relation between address and result of Doppler U/S.

Table (4.20): shows relation between obstetrical history and result of Doppler U/S in cross table

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Obstetrical history	Gravity	3	9	12
	Parity	15	6	21
	Abortion	8	7	15
	None	0	2	2
Total		26	24	50
P value = 0.031				

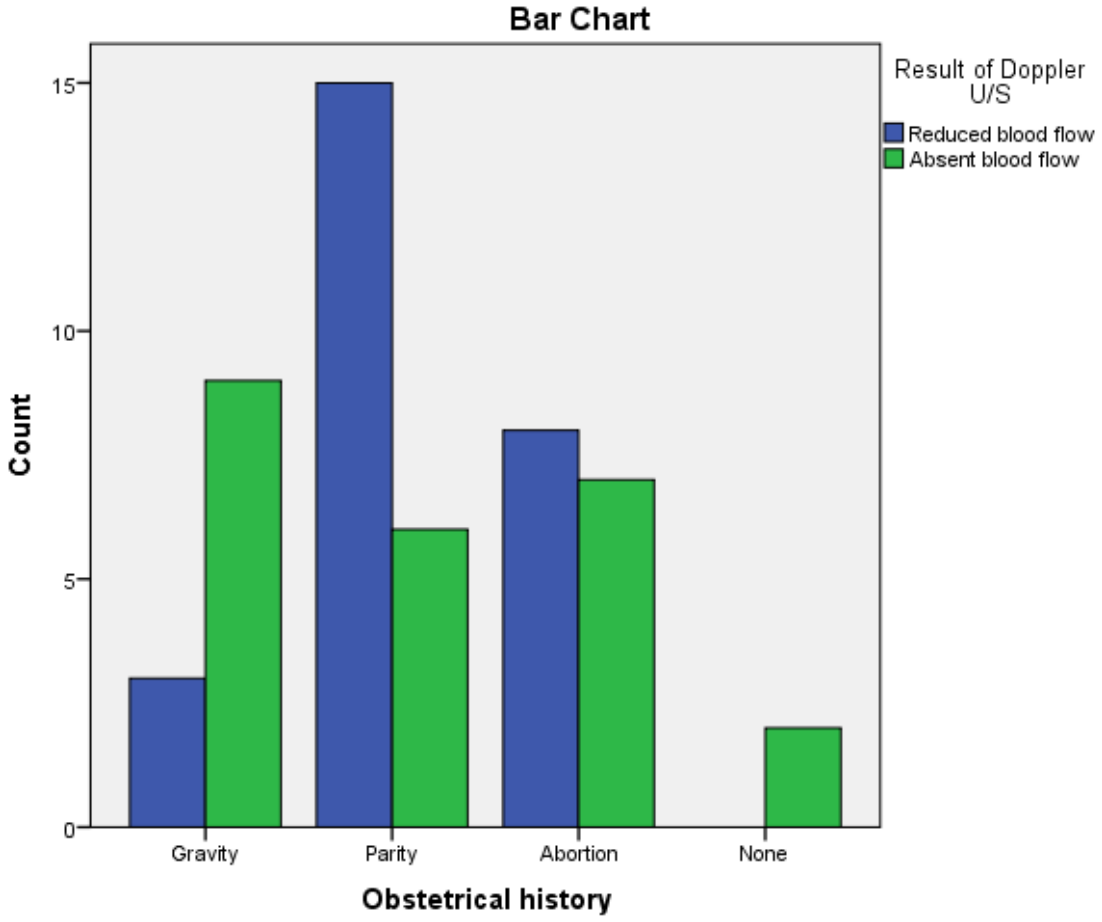


Figure (4.20): shows relation between obstetrical history and result of Doppler U/S.

Table (4.20): shows relation between gynaecological history and result of Doppler U/S in cross table

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Gynaecological history	GA	7	14	21
	History of pills	18	8	26
	None	1	2	3
Total		26	24	50
P value = 0.040				

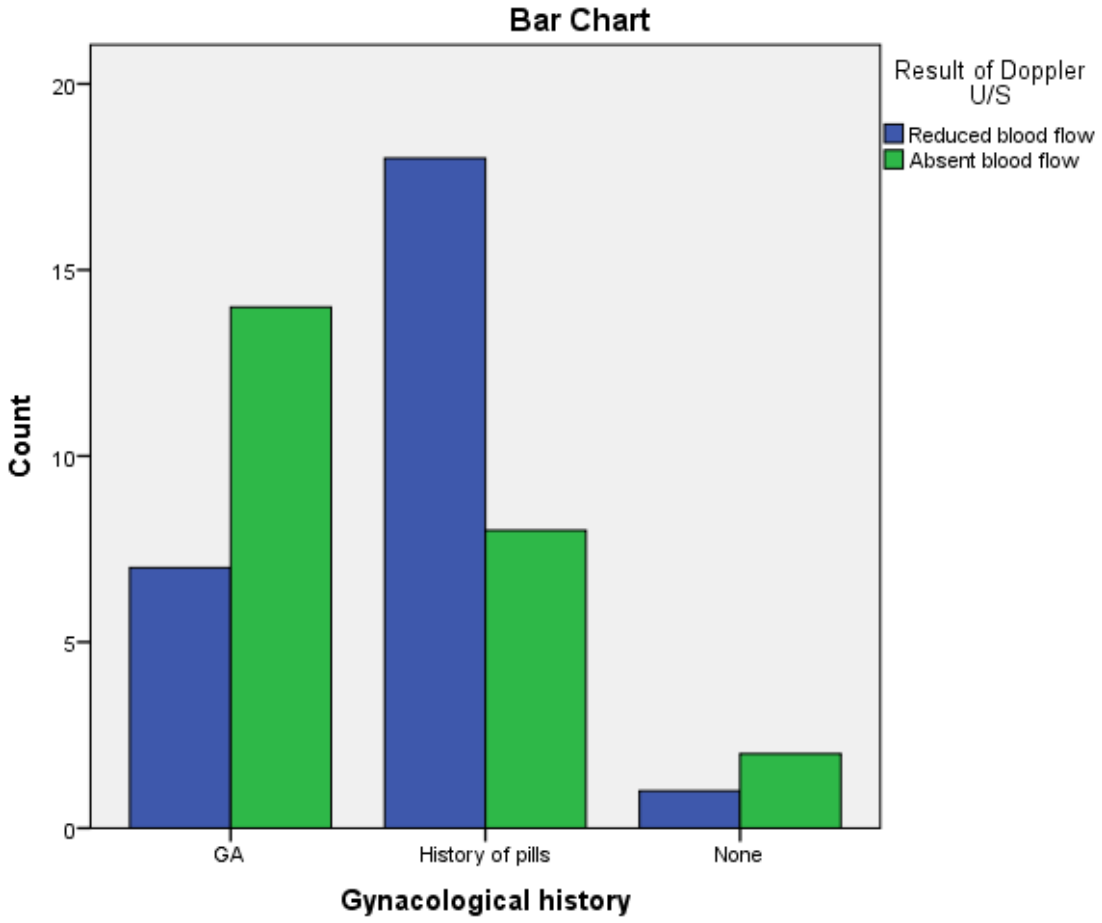


Figure (4.20): shows relation between gynaecological history and result of Doppler U/S.

Table (4.21): shows relation between past medical history and result of Doppler U/S in cross table

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Past medical history	DVT varicose vain	4	2	6
	DVT varicose vain + Hypertension + Diabetes	1	1	2
	Preeclampsia + Diabetes	2	1	3
	Preeclampsia + Heart disease	0	2	2
	Hypertension + Heart disease	4	0	4
	Hypertension + Diabetes + Heart disease	0	1	1
	DVT varicose vain + Heart disease	0	1	1
	Hypertension	2	3	5
	Preeclampsia	2	2	4
	Diabetes	1	0	1
	Heart disease	0	3	3
	DVT varicose vain + Diabetes	1	3	4
	DVT varicose vain + Preeclampsia	3	1	4
	Hypertension + Diabetes	5	2	7
	DVT varicose vain + Hypertension	1	2	3
Total		26	24	50
P value = 0.269				

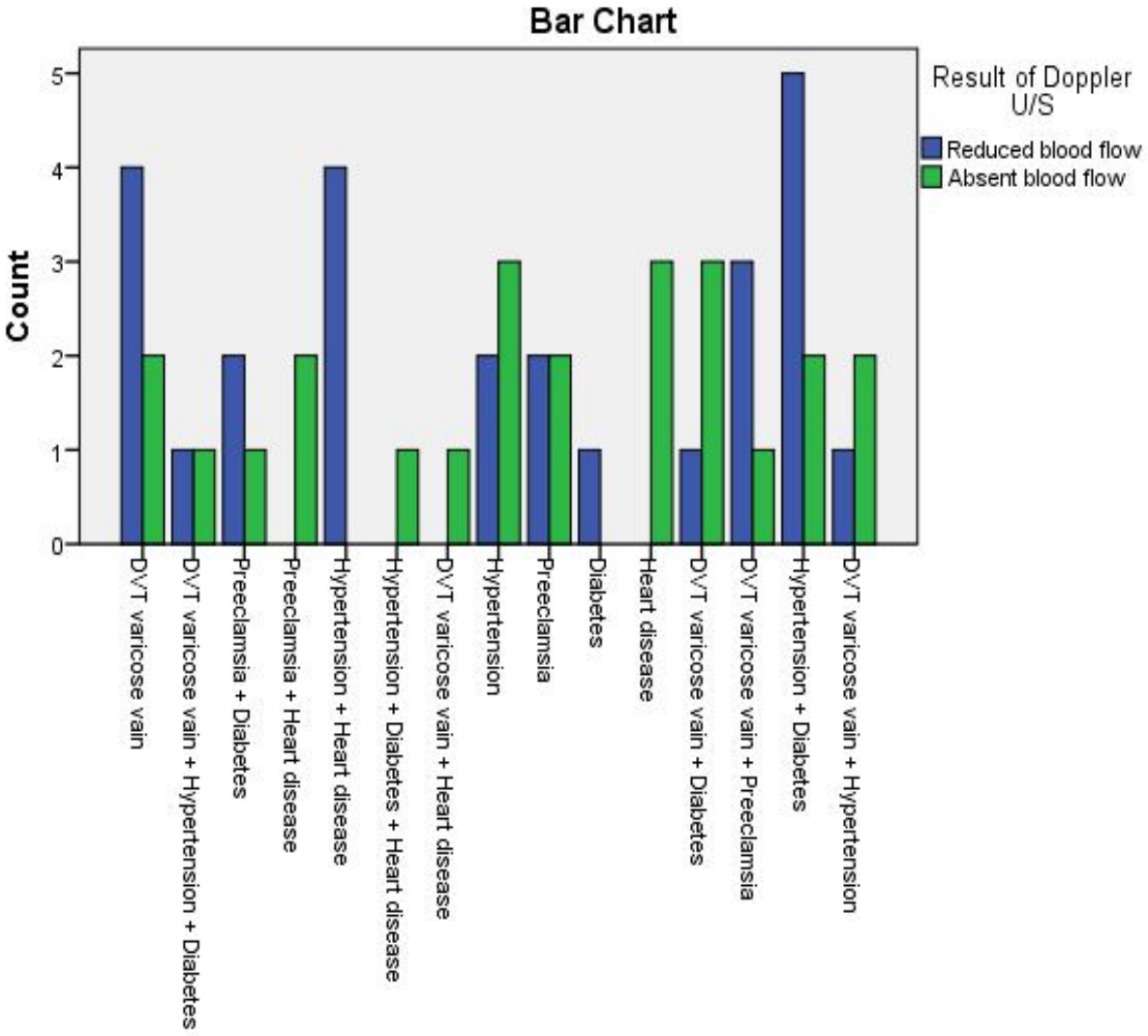


Figure (4.21): shows relation between past medical history and result of Doppler U/S.

Table (4.22): shows relation between family history and result of Doppler U/S in cross table.

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Family history	Yes	6	10	16
	No	20	14	34
Total		26	24	50
P value = 0.159				

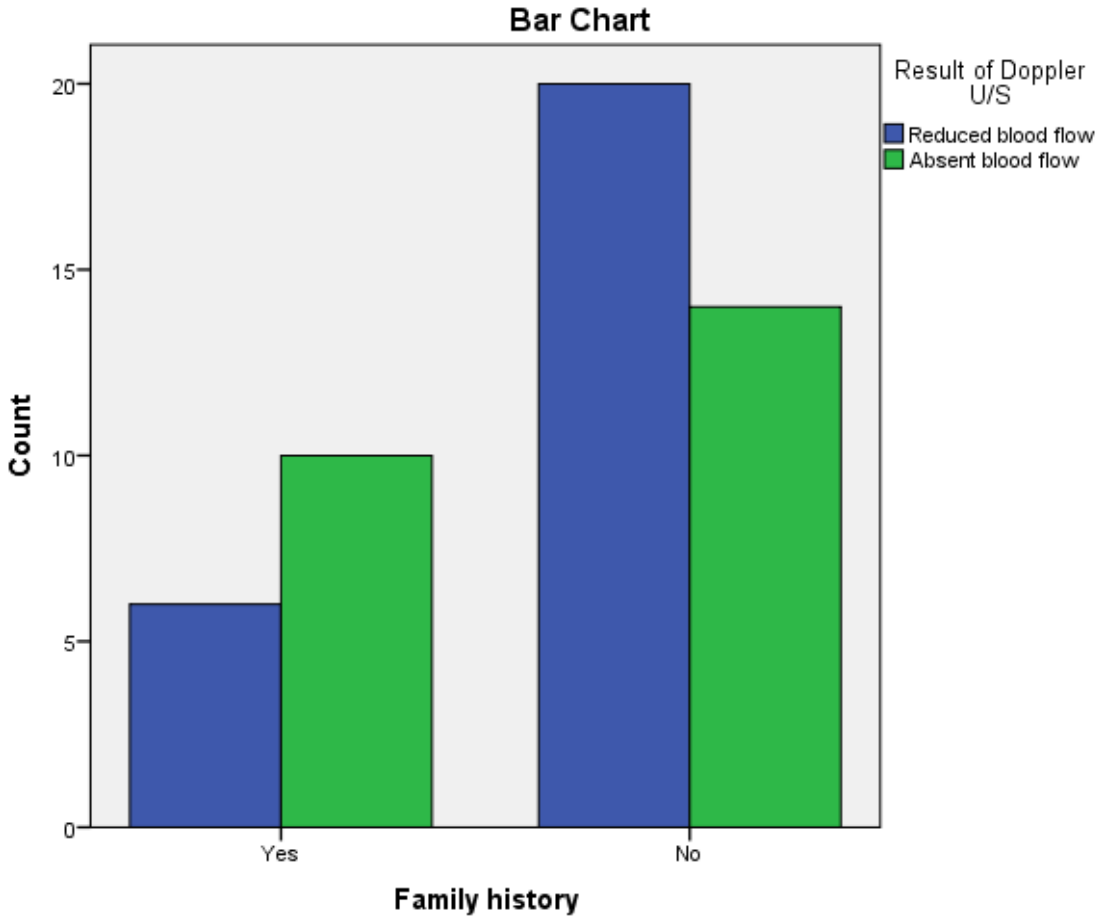


Figure (4.22): shows relation between family history and result of Doppler U/S.

Table (4.23): shows relation between mode of deliveryand result of Doppler U/S in cross table.

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Mode of Delivery	C/S	13	12	25
	Vaginal delivery	9	10	19
	Assisted vaginal delivery	4	2	6
Total		26	24	50
P value = 0.712				

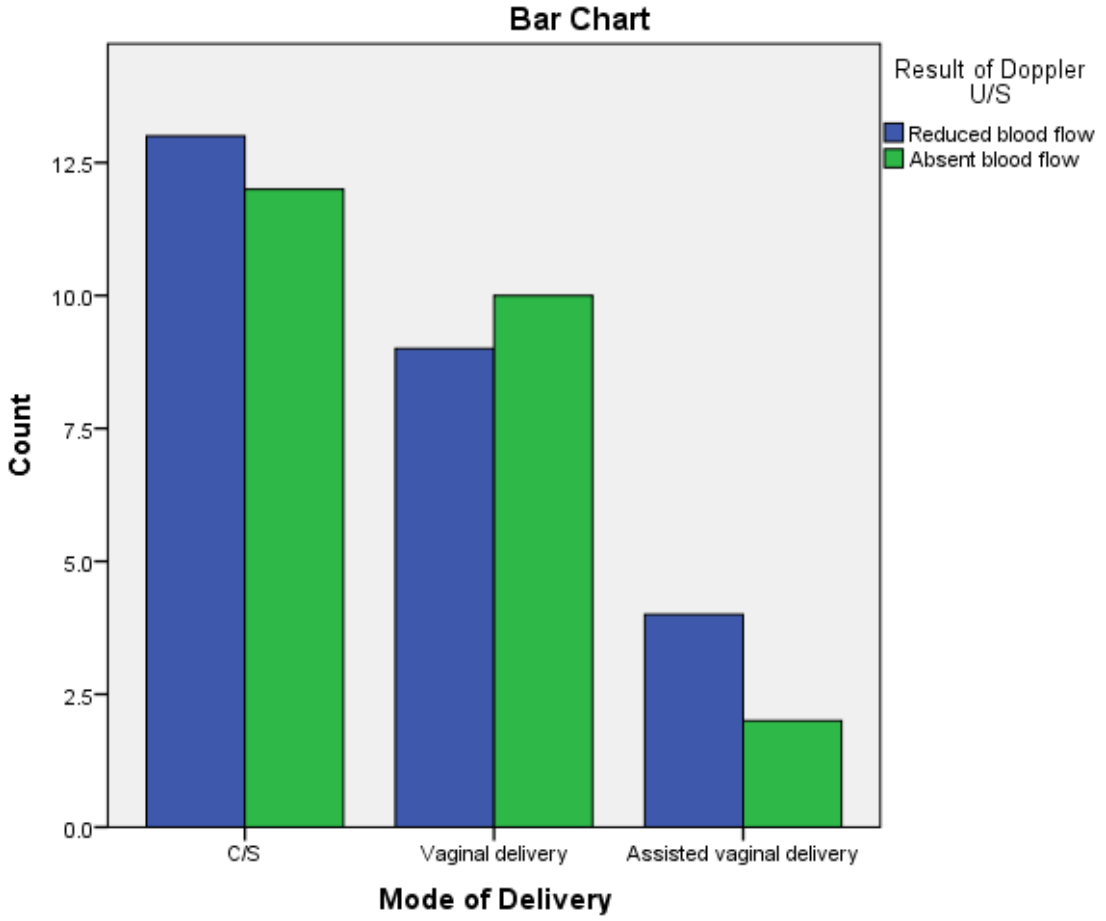


Figure (4.23): shows relation between mode of deliveryand result of Doppler U/S.

Table (4.24): shows relation between symptomsand result of Doppler U/S in cross table.

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Symptoms	Inability to walk	0	4	4
	Inability to walk+ Fever + Leg pain	4	2	6
	Fever + Leg pain	2	3	5
	Inability to walk + Leg pain + Chest pain	1	0	1
	Inability to walk + Breathlessness	5	2	7
	Fever + Breathlessness	2	2	4
	Fever + Cough	0	1	1
	Inability to walk+ Fever	3	1	4
	Fever + Leg pain + Chest pain	1	0	1
	Fever	1	0	1
	Leg pain	2	2	4
	Inability to walk + Breathlessness + Leg pain	1	1	2
	Breathlessness + Leg pain	1	2	3
	Inability to walk + Leg pain	3	4	7
Total		26	24	50
P value = 0.563				

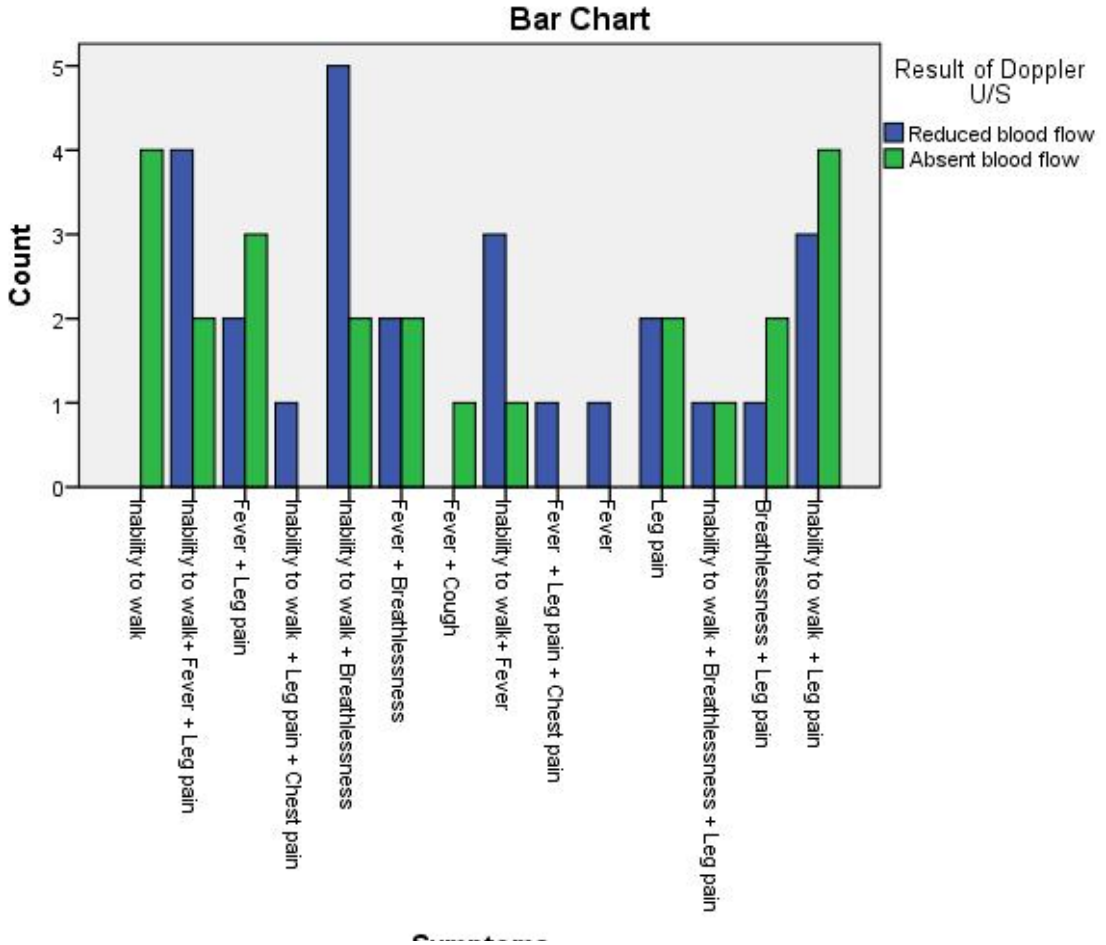


Figure (4.24): shows relation between symptomsand result of Doppler U/S.

Table(4.25):shows relation between signs and result of Doppler U/S in cross table.

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Signs	Tenderness	1	0	1
	Tenderness + Limping + Varicosity	2	2	4
	Swelling	1	0	1
	Tenderness + Swelling	6	4	10
	Tenderness + Swelling + Varicosity	4	4	8
	Tenderness + Limping	3	1	4
	Tenderness + Swelling + Limping	7	13	20
	Tenderness + Swelling + Limping + Varicosity	2	0	2
Total		26	24	50
P value = 0.415				

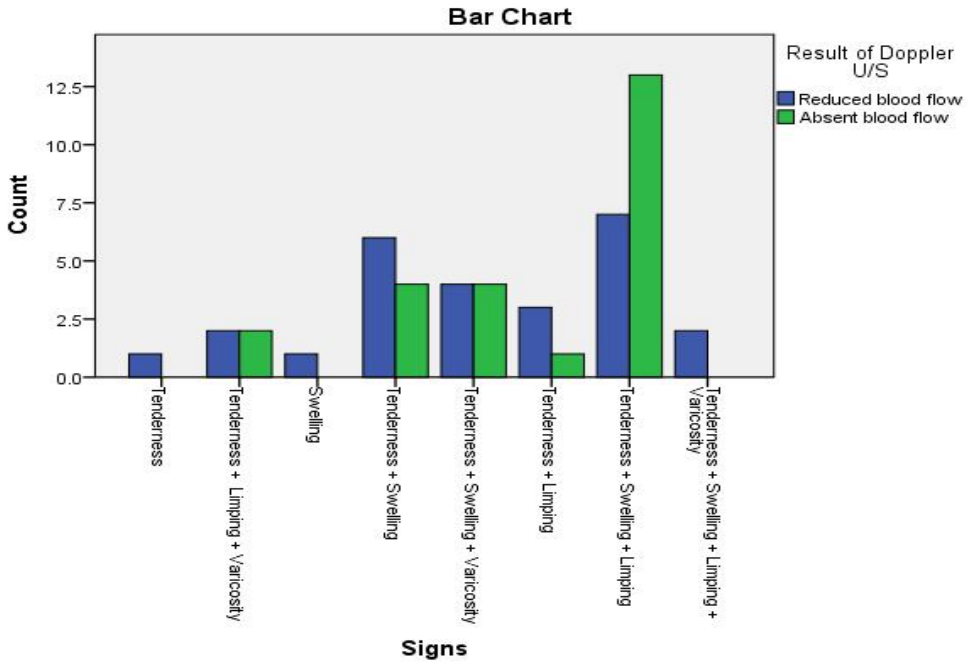


Figure (4.25): shows relation between signsand result of Doppler U/S.

Table (4.26): shows relation between anatomical Site and result of Doppler U/S in cross table.

		Result of Doppler U/S		Total
		Reduced blood flow	Absent blood flow	
Anatomical Site	Whole limb	10	4	14
	Thigh alone	7	7	14
	Calf alone	9	13	22
Total		26	24	50
P value = 0.200				

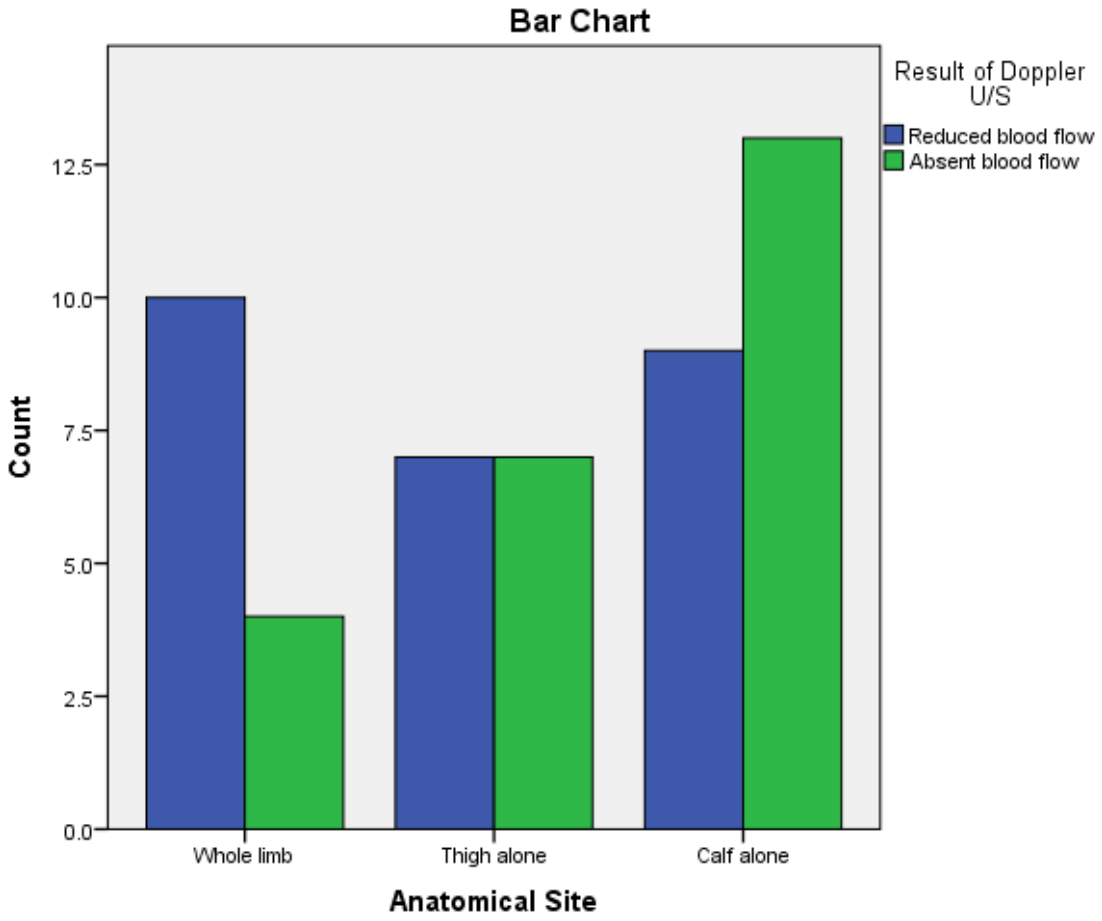


Figure (4.26): shows relation between anatomical Site and result of Doppler U/S.

5.1 Discussion

This was cross sectional descriptive study done to assess the role of Doppler in diagnosis of DVT in pregnant female.

Concerning the age group, the study found that most of age group affected by DVT were 25-29 years (34%) followed by 35-39 (26%), most of them were employee (70%), most of them from rural area (74%)

Regarding the history the study found that 52% had history of pills, the study found that 14% of them were hypertensive and diabetic,12% had hypertension and varicose vein ,10% hypertension,12% DVT and varicose vein, 20% had DVT , 5% had preeclampsia .

The study found that 32% of patients had family history of DVT.

Regarding the mode of delivery, the study found that 50% deliver by C\S, 38% normal vaginal delivery and 12% deliver by assisted vaginal delivery.

The study found that 16% of DVT occurs during pregnancy while 84% occurs during puerperium.76% came with leg pain and inability to walk and inability to walk and breathlessness respectively, 80% inability to walk and fever ,68% fever and leg pain ,8% leg pain , inability to walk , fever and breathlessness respectively.

Concerning the sign most of them had tenderness, swelling and limping (40%) followed by tenderness and swelling (20%) followed by tenderness ,swelling and varicosity (16%).

All these results are chive by Asha Gader and others and Ray, J. G.; Chan .

Regarding the side of DVT the study found that (50%) of DVT affecting both limb , 28% right and 22% left side. Most of them occurs in calf alone 44% and then whole limb and thigh alone 28% respectively.

Regarding the clinical laboratory test the study found that 22% of those patients had coagulation profile, 38% had CBC only.

The study found that 46% of the patients had Doppler us and CXR and 54% hadDoppler only to diagnose the DVT, 64% had ECG.

Concerning the results of Doppler the study found that 52% had reduce blood flow while 48% had no blood flow.

The study found that there was no significant correlation between Doppler results and age, past history, family history , mode of delivery , symptoms , sign, anatomical site and results of Doppler p value = 0828, 0.269, 0.159,0.712, 0.563, 0.415 , 0.200 respectively but there was significant correlation between gynecological history and Doppler results p value =0.040.

The study agreed with previous study did by Ray, J. G.; Chan, W. S. Obstetrical & Gynecological Survey: November 1999 , that The pooled event rate for left sided or bilateral deep vein thrombosis was 82.2 percent (95 percent CI 75.1 to 87.5) . But different in occurring in pregnancy and puerperium .

The study agreed with previous study did by Asha Gader and others .

5.2Conclusion

The study found that the common age group affected by DVT were 25-29 years followed by 35-39 years. Most of patients had history of pills.

Concerning the medical history DVT occurs in hypertensive and diabetic, hypertension and varicose vein , DVT and varicose vein and preeclampsia.

More than halve occurs during puerperium .Concerning the sign most of them had tenderness, swelling and limping .

The DVT affecting both limb more commonly then right , in calf alone then whole limb and thigh alone.

Concerning the results of Doppler the study found that the DVT may cause reduce blood flow or no blood flow.

The study found that there was no significant correlation between Doppler results and age, past history, family history , mode of delivery , symptoms , sign, anatomical site and results of Doppler respectively but there was significant correlation between gynecological history and Doppler results.

Recommendations :

- The Doppler U/S machine must be in all hospital in Sudan.
- Use Doppler U/S to detect the feature of patients with symptom's of DVT.
- For the diagnosis of deep vein thrombosis, ultrasonography is recommended, and should be repeated at least once over 7 days if the initial study is negative.
- Further studies should be done .

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  - http://en.wikipedia.org/wiki/varicose_veins 8-6-2014 10:15am.
- Varicose veins Doppler images from:
  - http://www.bing.com/images/search?q=doppler+evaluation+of+varicose+vein&FORM=HDRSC2#view=detail&id=D9F0CE6E09479B3EF6B6505960B0120C9654350F&selectedIndex=11 8-6-2014 10:45am.

Appendix I

Sudan University for Sciences and technology

Deep vein thrombosis in pregnancy and puerperium in (WMTH)

Identification

1. Age: a, 25 - 29 ( ) b. 30 – 34 ( ) c. 35 – 39 ( ) d. > ( )

2. Occupation:

a. housewife ( ) b. employer ( )

3. Education:

a. illiterate ( ) b. primary school ( ) c. secondary school ( ) d. university ( )

4. Address: a. Urban ( ) b. rural ( )

5. Obstetrical history:

a. Gravity ( ) b. Parity ( ) b. Abortion ( )

6. Gynacological history:

a. GA ( ) b. history of pill ( )

7. past medical history:

a. DVT varicose vein ( ) b. Hypertension ( ) c. preeclamsia ( )
d. Diabetes ( ) e. Heart disease.

8. Family history of DVT:

a. yes ( ) b. No ( )

9. Mode of delivery:

a. C/S ( ) b. Vaginal delivery ( ) c. Assisted veginal delivery ( )

10. Deep vein thrombosis:

a. Occurs during pregnancy ( ) b. Occur during puerperium ( )

11. Symptoms:

a. Inability to walk ( ) b. Fever ( ) c. Cough d. Breathlessness ( )

e. Leg pain ( ) f. Leg swelling ( ) g. Chest pain.

12. sign:

a. tenderness ( ) b. swelling ( ) c. Iimping ( ) d. varicosity ( )

13. Examination of lower limb:

a. Right ( ) b.Left ( ) c. both

14. Anatomical site:

a.whole limp ( ) b. thigh alone c. calf alone ( )

15. Investigation:

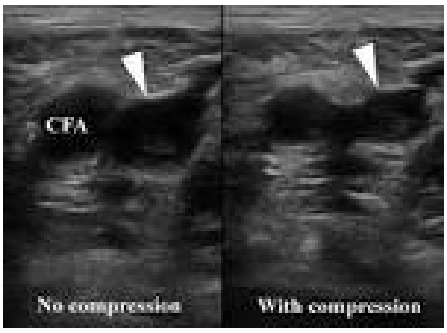
a. CBC ( ) b. Coagulation profile ( ) c. Doppler ultrasound ( )

d. Chest Xray ( ) e. ECG.

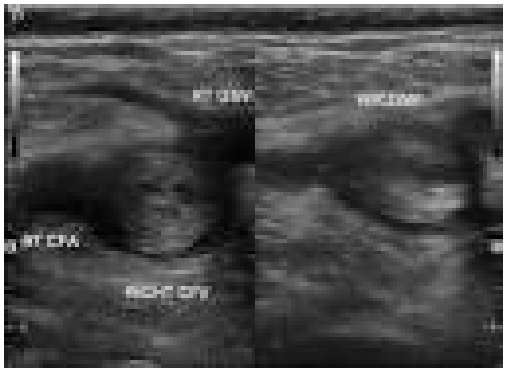
16. Result of Doopler ultrasound:

a. normal blood flow ( ) b. reduced blood flow ( ) c. absent blood flow ( )

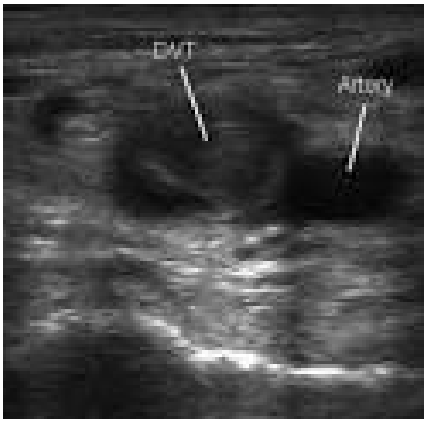
Appendix II



25 years old



37 years old



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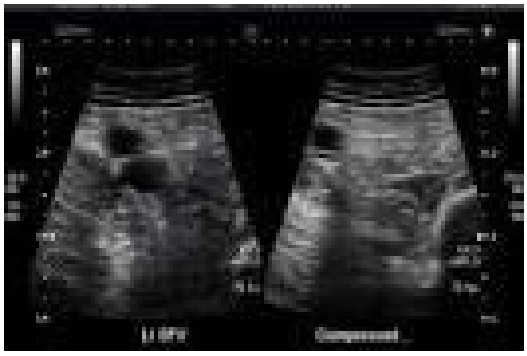
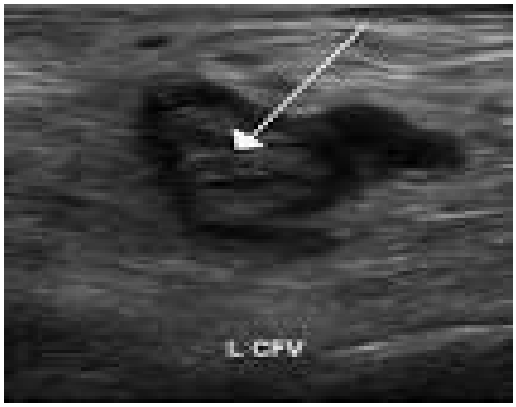
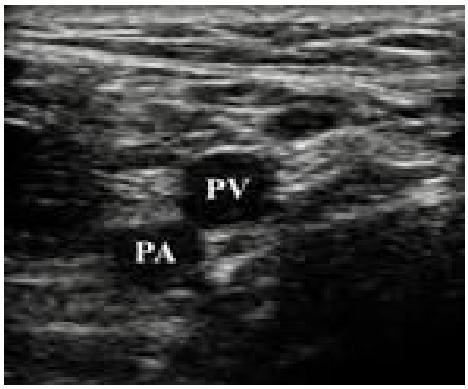


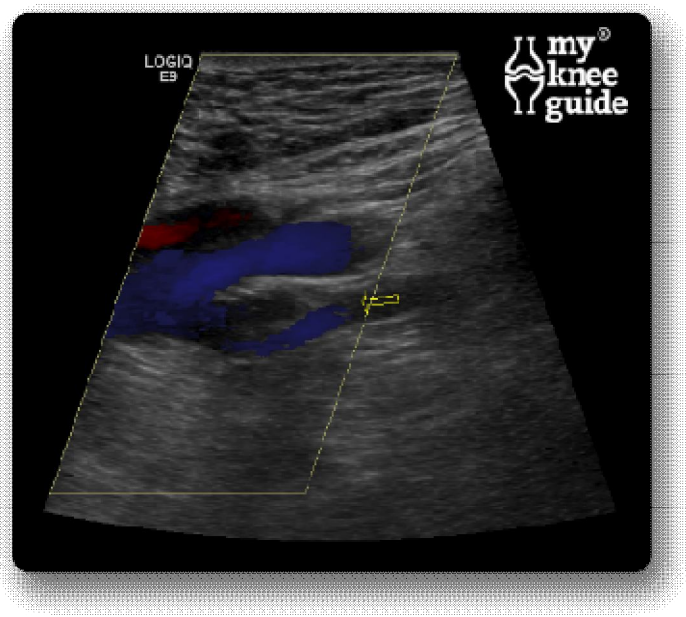
30 years old



35 years old



32 years old



25 years old