ULTRASONOGRAPHIC FINDINGS AND ASSOCIATED FACTORS OF DEEP VEIN THROMBOSIS AMONG ADULT PATIENTS ATTENDING MUHIMBILI HOSPITALS, DAR ES SALAAM, TANZANIA

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By

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A Dissertation Submitted in (Partial) Fulfillment of the Requirement for the Degree of Master of Medicine (Radiology) of Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Science a dissertation entitled; ***Ultrasonographic findings and associated factors of Deep vein thrombosis among adult patients attending Muhimbili Hospitals, Dar es Salaam, Tanzania,*** in (partial) fulfillment of the requirements for the degree of Master of Medicine (Radiology) of Muhimbili University of Health and Allied Sciences.

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Dr. Balowa Mussa

(Supervisor)

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Date

DECLARATION AND COPYRIGHT

I, **Ugumba M. Kwikima**, declare that, this **dissertation** is my own original work and that it has not been presented and will not be presented to any other University for similar or any other degree award.

Signature…… Date…….

ACKNOWLEDGEMENT

First of all, I thank Allah, the Almighty for keeping me healthy enough to be able to bring this work to completion.

With all my heart, I just want to thank my supervisor Dr. Balowa Musa, for being so kind and dedicated, who through tireless efforts of training, guidance, motivation, and most importantly for his encouragement that has brought me so far in the whole exercise of bringing this thesis to completion. I would also like to thank my fellow students and all who assisted me in making this study a reality.

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DEDICATION

“Any achievement is possible when you focus on your goals, you just need to have a strong faith and submission to Allah the Almighty”

This work is dedicated to my beloved mother Mrs Halima Athuman Katunzi

ABSTRACT

Background

Deep vein thrombosis of the lower limbs is a global problem and affects mostly hospitalized immobilized patients including women who are pregnant or in peuperium. The initial modality of choice for imaging this disease is Duplex Doppler Ultrasound scan.

Objective: Assessment of ultrasonographic findings and associated factors of deep vein thrombosis among adult patients attending Muhimbili Hospitals from June-December 2015.

Methodology: A descriptive cross-sectional study involved 89 patients with symptoms suggesting DVT referred for Doppler USS at Muhimbili National hospital and Muhimbili Orthopedic Institute. A questionnaire was used to collect demographic data, associated factors, and clinical information. Lower limb Duplex USS scans were performed in both transverse and longitudinal planes, with patients in both supine and prone positions; from the groin to the foot, for the two lower limbs. Sonographic findings were filled in special ultrasonographic findings recording form. Statistical analysis was performed using computer program statistical package for social sciences (SPSS) version 20; Chi-square test was performed and a p-value of <0.05 was used as a measure of statistical significance.

Results

Lower limb swelling and tenderness were the most prevalent symptoms (95.5%). DVT was found in 22 (24.7%) of participants by Duplex USS; Acute, chronic, and acute on chronic DVT occurred in 6 (27.3%), 15 (68.2%), and 1(4.5%) respectively. DVT sonographic findings were vascular incompressibility (19.1%), flow abnormalities (24.7%), absence of respiratory phasicity (24.7%), non augmentation (23.6%), and maintained blood flow with valsava maneuver (24.7%). Thrombus occurred most commonly in the common femoral vein (30.3%) and least in popliteal vein (15.2%).

Prevalence of DVT was significantly higher among women who were pregnant or in the puperium period (55.6% vs 13.0%, p=0.004), and in immobilized patients (53.8% vs 12.7%, p=0.000).

DVT was not significantly higher among males (32.4% vs. 20.0%, p=0.189) and in patients aged less than 60 years (26.2% vs. 21.4%, p=0.626).

Oral contraceptives use or its duration, previous surgery, and stroke were not risk factors for DVT.

Acute DVT was significantly found in popliteal vein (60.0% vs. 9.1%, p=0.024), anterior tibial veins (100.0% vs. 22.2%, p=0.026), posterior tibial vein (100.0% vs. 22.2%, p=0.026), and peroneal veins (100.0% vs. 22.2%, p=0.026). Chronic DVT was significantly not found in anterior tibial vein (100.0% vs. 15.8%, p=0.013), posterior tibial vein (100.0% vs. 15.8%, p=0.013), and peroneal veins (100.0% vs. 15.8%, p=0.013) .

Conclusion

DVT was observed in 24.7% of participants and were significantly associated with history pregnancy or in puperium period (55.6% vs. 13.0%, p=0.004), and in immobilized patients (53.8% vs. 12.7%, p=0.000). Chronic thrombus was the most frequent type (68%). The most frequent location of acute DVT were popliteal vein (p=0.024), anterior tibial veins (p=0.026), and peroneal veins (p=0.026). There was no venous anatomical location which was significantly associated with chronic DVT.

DVT was significantly observed among women either pregnant or in puperium period (p=0.004) and immobilized patients (p=0.000)

Recommendations: The study used a small sample and was conducted at tertiary hospitals in Tanzania; hence results cannot be generalized to general community signifying the need for large, multicentre study.

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ACRONYMS

USS	Ultrasonography
DVT	Deep vein thrombosis
MNH	Muhimbili National Hospital
MOI	Muhimbili orthopedic Institute
MD	Doctor of Medicine
Mmed	Masters of Medicine
SPSS	Statistical Package for Social Sciences
PE	Pulmonary embolism
PTS	Post thrombotic syndrome
MI	Myocardial infarction
CHF	Congestive heart failure
VTE	Venous thrombo embolism
HRT	Hormone replacement therapy
DUS	Doppler ultrasound

DEFINITION OF TERMS

D-dimer- is a fibrin degradation product, a small protein fragment present in the blood after a blood clot is degraded by fibrinolysis. It is so named because it contains two D fragments of the fibrin protein joined by a cross-link.

Immobilization- Tendency of being unable to move following paralysis\paresis, recently bedridden for more than 2 days due to debilitating disease, and plaster cast immobilization of leg.

Totally compressed- Vein collapses\disappears when compressed with the ultrasound probe.

Intermittent compression- transverse diameter of the vein is reduced following compression with ultrasound probe.

Non-compressible- vein fails to collapse\disappear when compressed with the ultrasound probe.

CHAPTER ONE

1.0 INTRODUCTIION

1.1 Background

Deep vein thrombosis (DVT) is a global health problem affecting mostly prolonged immobilized patients and when dislodged can cause potentially life threatening conditions such as pulmonary embolism. [1] DVT is the phenomenon whereby a blood clot is formed within the deep veins of the body mainly of the lower extremities and pelvis but can occur in any other large veins of the body.[1] Thrombosis in deep veins primarily results from three postulated processes of the Virchow's triad, which is decreased blood flow rates, increased tendency to clot and changes to the blood vessel wall.[2] Most of times thrombus formation typically starts at valves of the calf veins and grows in the direction of venous blood flow towards the heart.[2]

1.1.1 Symptoms associated with DVT

Deep vein clot causes venous blockage resulting to lower limb pain and swelling.[3] The affected limb may be tender, edematous, warm, red or discolored, and associated with distended surface superficial veins.[1] Complications occur if the clot is dislodged, this can lead to potentially fatal condition such as pulmonary embolism (PE).[1] It was observed that about 25% of patients with these symptoms have a thrombus. [4]

Thus presence of conditions with similar symptoms e.g. cellulitis, Bakers cyst, musculoskeletal injury or lymphedema cannot be ruled out.[5] Therefore signs and symptoms alone are neither sufficiently sensitive nor specific to make DVT diagnosis, however their presence in conjunction with known risk factors can be a determination of DVT.[1]

Duplex USS is the mostly used imaging modality. Duplex USS is non invasive; easily available and cost effective; and safe as compared to conventional venography and MR venography, it has neither radiation nor magnetization hazards.[4,1,6] Color Doppler USS has higher specificity and sensitivity approaching 95% to 99% [14]; as compared to D-dimer which is highly sensitive (99%) but less specific (50%).[7] Therefore use of Duplex Doppler for DVT evaluation can lead to preventable morbidity and mortality. [1]

Ultrasonographic features of DVT are variable depending on duration of thrombus, and their detection is crucial in the management of these patients.[8] The most important sonographic feature for DVT is loss of venous compressibility nature; therefore full compressibility of deep veins excludes DVT.[9,10,11] Other findings are absence of phasicity, negative augmentation test, and positive valsava responses.[12,13]

Acutely thrombosed veins are substantially dilated compared to the accompanying artery; [12, 13] there is no blood flow in Doppler waveform [11]; and the thrombus appears anechoic [12,13]. When DVT is chronic, the walls of the veins appear thickened, irregular and may appear echogenic with echogenic thrombus [14]. There may or may not be echogenic (fibrin) strands in the lumen of the vein. There is collateral vessels and recanalization in the thrombus. [14]

It is of paramount importance to examine the deep vein waveform and 2D mode of the whole of the lower limb and contralateral limb from the inguinal region to the ankle for exclusion of DVT [15]

1.2 Literature review

Deep vein thrombosis is a worldwide problem with high morbidity and mortality [16, 17]. It accounts for a significant number of hospitalized patients per year [16, 17]. Prevalence of DVT is higher in men than in women, with the ratio of 2:1. [6, 18] The incidence of DVT increases with age, with the peak age of incidence ranges from 70 to 80 years, which occur due to the fact that procoagulant factors levels, venous stasis, and venous wall stiffness increases with age. [19]

1.2.1 Sonographic features of types of DVT

Acute vein thrombosis has been associated with increased diameter of affected vein compared to adjacent artery or contralateral vein [12, 13], however vein dilatation was not solely due to acute DVT in previous studies. [10, 11]

1.2.2 Associated factors of DVT

DVT has been associated with increased age across both sexes [16]. The probability of DVT has been observed to be lower in patients below 40 years [16, 18] and the incidence increases with age with a peak ranging from 70 to 80 years [16]. The association of age and DVT has been associated with increased levels of procoagulant factors, vein wall stiffness increases with age and venous stasis is also often encountered in elderly [16].

Incidence of DVT has been observed to occur differently among different sexes [6]. Women of child bearing age have been frequently observed to have DVT when are pregnant or at peurperium period [17, 20]; and also when they are using oral contraceptives [21]. However other studies found no significant differences between sexes [18, 21, 22]

i. Inactivity and immobilization is also an important risk factor for DVT, this is because immobility interferes with calf muscle activity which pumps blood through veins against gravity. There is a 2.5 times risk of developing DVT in an inactive or immobile patient. [23]
ii. The risk of DVT is particularly high following abdominal and pelvic surgery and is even higher after the operation of the hip, knee or femur, and the risk is greater if there

is associated MI or CHF [18]. The risk of developing DVT is 2.5 times higher in surgeries done within 3 previous months**.** **[16,18,23]**

iii. Cancer can grow in and around veins hence causing venous stasis and it can also stimulate increased levels of tissue factor. Cancer patients also have 2.5 times risk of developing DVT.[16,23]

iv. In women of the same reproductive age, pregnant women and those in puerperium have high risk of developing DVT; this is explained by multiple changes in coagulation system during pregnancy. [17] During Pregnancy there is reported increased risk of developing DVT from the third trimester because of resulted venous stasis due to compression of the common iliac vein by a growing fetus. The risk of DVT also increases in postpartum period because placenta tearing releases substance that favors clotting. The risk of DVT during pregnancy and pueperium is 3.2 times higher. [17,20,23]

v. Patients with a previous history of VTE have a 2.5 times more risk of developing DVT. [16,18,23]

vi. Combined oral contraceptives and HRT, increases the risk of developing DVT by 3.2, because of alteration in blood coagulation protein levels and reduction in fibrinolysis. [23,24]

vii. Obesity is defined as body mass index (BMI) above 30 kg/M.(21) Obesity leads to a 2 to 3 fold increase risk of developing DVT in both men and women. The risk is even higher with severe obesity (BMI above 40kg/M^2). Large body size leads to impaired venous return and thus biochemical parameters associated with obesity such as coagulation and inflammation plays a role, though further work is needed to define the mechanism. [23,25]

viii. Trauma also increases the risk of developing DVT through increased activation of clotting mechanism in traumatic states, for example Amputation. [18]

ix. Inflammatory and infectious conditions also increase risk of developing DVT by 2.2 for example inflammatory bowel disease. [18]

1.2.3 Frequency of symptoms in patients with DVT

Some studies have shown that leg swelling is the most common presenting sign of DVT. Lee et al and colleagues did a study on 202 patients who presented with leg swelling alone, 27 patients had sonographic evidence of DVT. [26]

Studies have shown that clinical features differ between men and women with DVT. Swelling of the entire leg occurring about 3 times as often in women with DVT compared with men. [27]

1.2.4 Prevalence of complications associated with DVT

PE is potentially life threatening complication of DVT; it occurs when blood clot breaks off and travel through the blood stream and lodges in the lungs. Recent studies have shown that approximately 50% of proximal vein DVT's causes PE, and approximately 25% of patients with PE will die of which 90% will do so within 1-2 hours of the PE. PTS, which is chronic pain and swelling is another DVT complication, occurs in approximately 40% of persons with DVT. PTS varies from person to person in its severity, in which approximately 10% of patients will have a severe form which is disabling**.** [7, 27]

DVT occurs more frequently in the lower limbs than the upper limbs, this is because thrombus formation starts within calf veins and propagates cephalad following the direction of blood towards the heart. [23]

1.2.5 Prevalence of location of DVT

Recent studies have shown that 70% to 80% of lower limb DVT occurs in the proximal veins, CFV, popliteal vein and SFV, 20% to 30% in the calf veins, anterior tibial vein, peroneal vein and posterior tibial vein.[4,9] Other studies also found that there is strong association between some risk factors with the location of the thrombus. Iliofemoral thrombus is commonly associated with pregnancy and puerperium DVT. [22]

The most common leg affected with pregnancy and puerperium is the left. [17, 21] In recent studies done in Europe and America, it was found that age, sex and immobility are all independently associated with location of DVT, women have higher probability of developing distal DVT than men, presence of mobility was associated with the lower risk of developing

proximal DVT, and younger patients (under 40 years of age) have low probability of developing distal thrombosis. [23]

1.3 Statement of the problem

DVT is the major post medical and surgical complication that can lead to substantial morbidity and mortality. [18]

Prolonged immobilization and various surgical procedures are among the associated factors of DVT. Main presentation of DVT includes lower limb pain or tenderness, swelling, warmth, redness or discoloration, and distention of surface veins. Since some other diseases of the lower limbs may present with these symptoms, knowledge of the factors associated with DVT is vital for immediate diagnosis of DVT and hence prevention of PE which is a fatal complication hence reduction of mortality.

Isolated calf vein thrombi result in pulmonary emboli in less than 1% of cases, whereas thrombi in the proximal veins results in pulmonary emboli in 40% to 60**%.** [28]

DVT is the major public health problem, which accounts for a significant number of hospitalized patients per year.(18) Some studies have shown that the prevalence of DVT is higher in men than in women, with the ratio of 2:1. [6] The incidence of DVT also increases with age, with peak age of incidence from 70 to 80 years.

As it has been shown in literature, DVT accounts for a significant number of hospitalized patients per year. This creates an enormous economic burden on society, as in some patients this can complicate with PTS, PTS varies in severity from person to person in which approximately 10% of patients will have a severe form which is disabling. [28]

Doppler ultrasonography is the most common tool for diagnosing DVT, because it is convenient and non-invasive. DUS has now replaced venography as the method of choice for DVT diagnosis in symptomatic patients; it has an overall sensitivity of 95% to 98%. [3, 29]

1.4 Rationale

Deep vein thrombosis is a poorly researched area worldwide, and this can be far worse in developing country like Tanzania. This is due to inadequate resources for research and health care services. To date there is no published data in Tanzania on this study area. Since sonographic patterns of DVT have not been established, it is poorly diagnosed and hence poorly managed disease. This study was done to establish sonographic features of DVT in patients with symptoms suggesting DVT referred for Duplex ultrasound at Muhimbili hospitals. Duplex compression sonography is one of the best imaging modalities used to reduce morbidity and mortality associated with DVT. In this study Duplex ultrasound was used to diagnose DVT. Advantages of Duplex USS is readily available, cost effective, non invasive, and is not associated with either radiation or magnetic hazards.

With duplex compression ultrasound the location of thrombus can be determined. The aim of this study therefore was to establish sonographic features of DVT by age and sex, prevalence of DVT between sexes, and associated factors among patients with symptoms referred for Duplex USS at Muhimbili hospitals. This study also established common location of thrombus among patients with DVT by associated factors at our set up**.** The results obtained from this study will then play a pivot role in the management of Deep vein thrombosis in our settings. In addition, this study can also be used as reference in future research concerning Deep vein thrombosis in Tanzania, Africa and the world.

1.5 Objectives

1.5.1 Broad objective

To determine ultrasonographic findings and associated factors of DVT among adult patients, attending Muhimbili hospital, Dar es Salaam from June to December 2015.

1.5.2 Specific objectives

i. To determine the proportion of patients with DVT among patients clinically suspected with DVT, attending Muhimbili hospital Dar es Salaam, from June to December 2015.

ii. To determine common sonographic features of DVT among patients clinically suspected with DVT, attending Muhimbili hospital Dar es Salaam, from June to December 2015.

iii. To determine common sonographic features by age and sex among clinically DVT suspected patients, attending Muhimbili hospital Dar es Salaam, from June to December 2015.

iv. To determine risk factors associated with DVT among patients clinically suspected with DVT, attending Muhimbili hospital Dar es Salaam, from June to December 2015.

v. To determine common location of thrombi and their associated risk factors among patients with DVT, attending Muhimbili hospital Dar es Salaam, from June to December 2015.

CHAPTER TWO

2.0 MATERIALS AND METHODS

2.1 Study design

This was a hospital based cross-sectional descriptive study conducted from June to December 2015.

2.2 Study population and Study Area

Study population included all patients above 18 years of age clinically suspected with DVT referred to Radiology department of Muhimbili hospitals with request forms from June to December 2015.

Muhimbili hospitals comprise Muhimbili National hospital and Muhimbili Orthopedic institute. These are largest referral and teaching hospitals in Tanzania located in Dar es Salaam city. They are among few public/government hospitals with Doppler Ultrasound facility. They receive referred patients from all lower level referral hospitals, as well as patients from various hospitals in Dar es Salaam and its surrounding regions.

2.3 Sampling and sample size

All consented patients with symptoms suggesting DVT referred for Doppler USS of the lower limbs were consecutively included in the study.

A total of 115 individuals had Duplex USS scan performed on the lower limbs from June to December 2015, but only 89 who fulfilled the study criterion were studied. The sample size was calculated from the formula

$n=Z^2P(1-P)/E^2$

Where: n=sample size,

Z= (1.96)

P=Prevalence=30%. This was the prevalence of post- operative deep vein thrombosis in Nigerians using ^{125}I labelled fibrinogen.22

95% confidence interval will be used

E=margin of error 10%

Therefore n= $(1.96)^2$ x 0.3 (1-0.3)/$(0.1)^2$=81

We will sample an extra 10% to account for possible non-response.
n=81+8 (10% of 81)
Thus, the sample size in this study was 89 adult patients.

2.4 Inclusion Criteria

Patients above 17 years of age (89) with symptoms suggesting DVT were studied.

2.5 Exclusion criteria

Fifteen patients were excluded from the study; eleven patients had already been diagnosed with DVT and on warfarin treatment, four patients had contraindications for lower limb Doppler ultrasound examination for DVT as per protocol.

2.6 Ethical issues

Ethical clearance to conduct the study was obtained from Muhimbili University ethical committee. Permission to conduct the study at Muhimbili hospitals Radiology department was obtained from MOI and MNH authorities. Written informed consent was used on enrolling study participants. Information recorded in the questionnaires and clinical forms was used only for purpose of the study and not otherwise.

2.7 Research instruments

2.7.1 Questionnaire and USS findings recording form

Self- administered questionnaires (appendix 2) were used to collect socio demographic information such as age, sex and clinical history. In addition USS findings were recorded in special designed form (appendix 3)

2.8 Imaging and evaluation

2.8.1 USS Imaging

Imaging was performed by investigator under supervision of Radiologist. Lower limb Duplex USS scan was done using ultrasound machines; (1) Phillips, HD 11 XE Eindhoven best-Netherlands (2) Siemens, KT.LM 150 XA, Berlin-German with a broad band linear array transducer of 7MHZ and above frequency. The scan consisted of transverse and longitudinal gray scale images, with color Doppler interrogation, and spectral pattern analysis from a pulsed wave Doppler. Patients were examined while in both supine and prone positions. The limb affected was examined from the groin to the foot and then compared with the contralateral limb. Acquired images were printed on thermal paper to be reviewed again by another radiologist.

The variables assessed on Duplex USS imaging were venous compression, vascular blood flow, respiratory phasic variations on spectrum, augmentation technique, valsava response, presence of thrombus, type of thrombus, and location of thrombus in the deep veins of the lower limb.

i) Venous compression: which was graded as totally compressed, non compressible, and intermittent compression

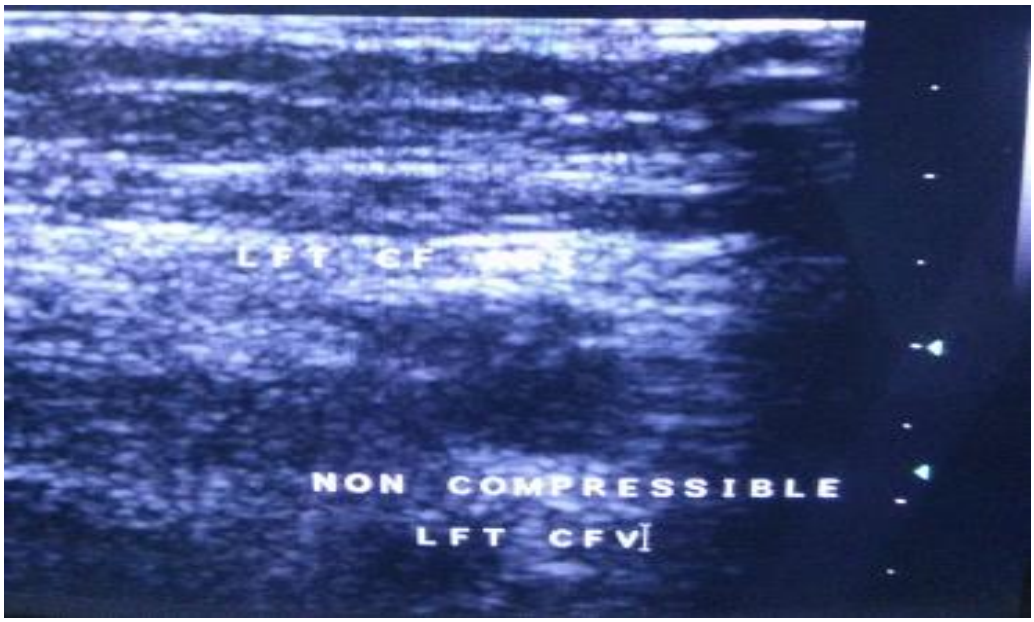


Figure 1: Gray scale USS scans showing non compressible left common femoral vein following compression technique

ii) Vascular blood flow on color Doppler:

Spontaneous flow, slow flow, Absence of flow, and peripheral blood flow

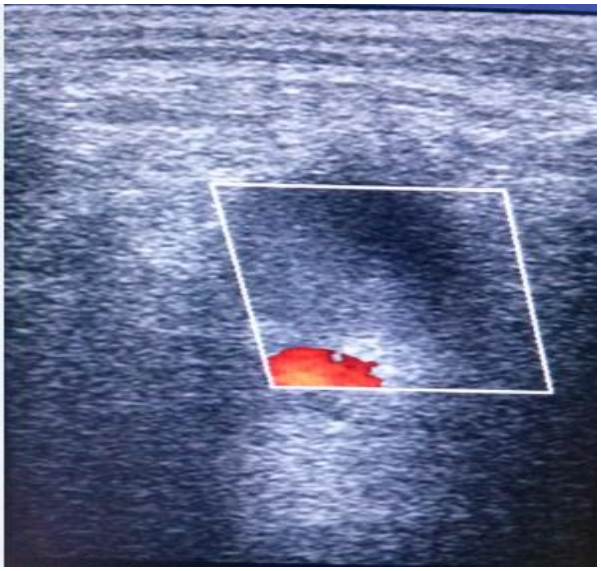


Figure 2: Color Doppler USS scan showing absence of blood flow in the popliteal vein (note echogenic thrombus within the lumen of the vein)

iii) Phasicity:

Assessment of respiratory phasic variation on pulsed Doppler waveform.

Graded as present, and absent.

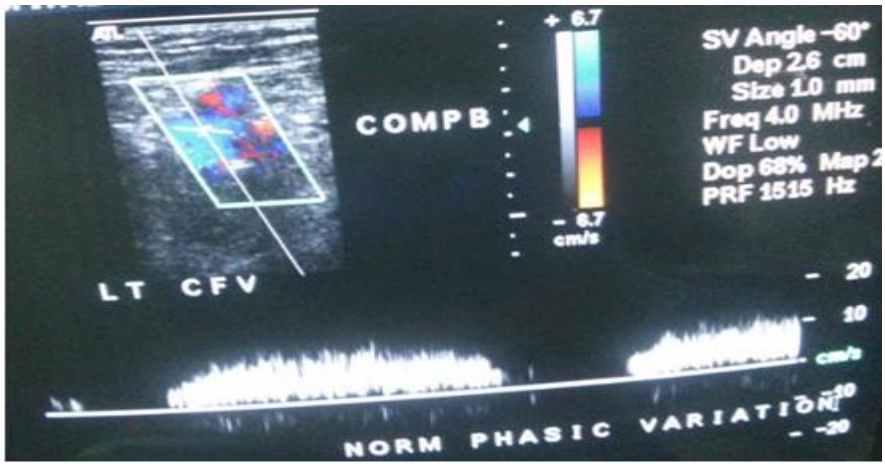


Figure 3: Spectral Doppler USS scan showing venous blood flow in the left common femoral vein, and normal respiratory phasic variation spectrum.

iii) Augmentation test

Assessment of the increase in peak systolic velocity on spectrum, when the vein distal to the Scanned one is pinched, Graded as positive, and non augmentation

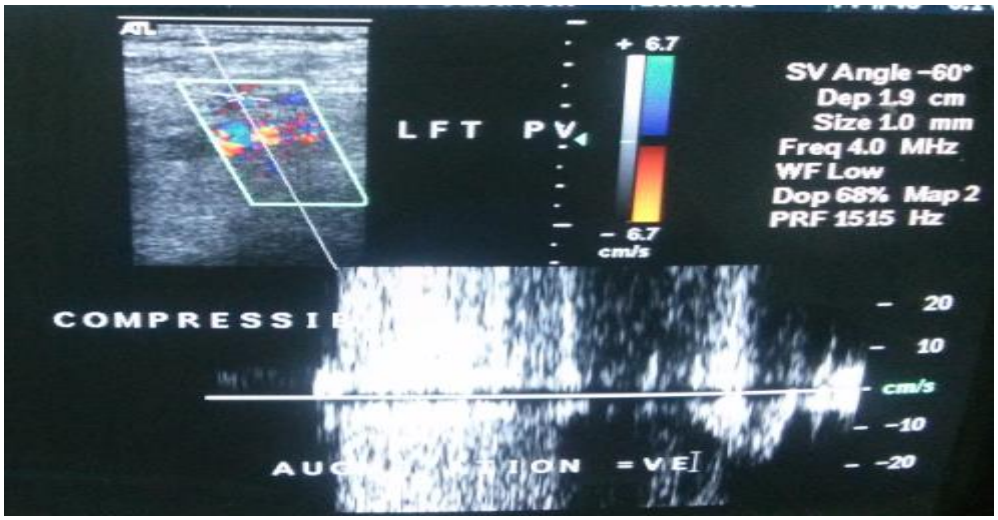


Figure 4: Spectral Doppler USS scan showing venous blood flow in the left popliteal vein and positive augmentation spectrum

iv) Valsava response

Assessment of the venous flow pattern proximal to scanned vein using peak systolic velocity Spectral waveform when intraabdominal pressure is raised Graded as reduced flow, and maintained flow.

v) Assessing presence or absence of thrombus within the vein, and type of thrombus

a) Acute thrombus- Dilated vein with no color on Doppler interrogation (anechoic)

b) Chronic- Echogenic foci within the lumen of the vein with either no flow or peripheral flow

On color Doppler interrogation.

A B

Figure 5: Gray scale USS scan (B) showing dilated right common femoral vein (note absence of echogenic foci within the lumen of the vein), Color Doppler USS scan (A) of the right common femoral vein showing absence of blood flow in the dilated vein (Acute thrombus)

Figure 6: Gray scale USS scans showing dilated left popliteal vein (note echogenic foci within the lumen of the vein) suggesting chronic thrombus

vi) Location of thrombus in the deep veins of the lower limbs

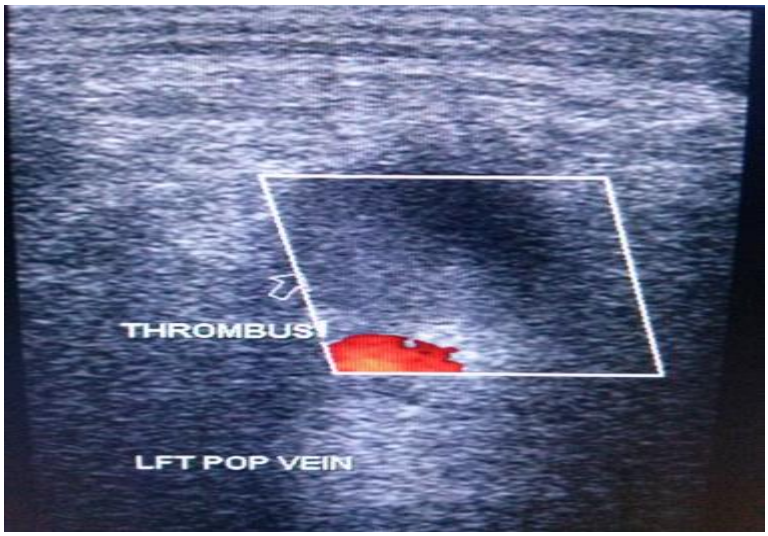
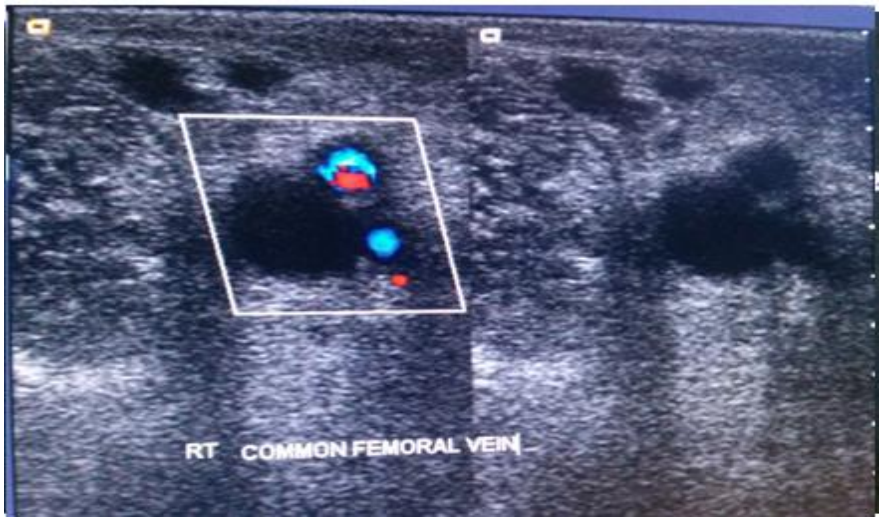


Figure 7: Color Doppler USS scan showing dilated, echogenic thrombus, with absence of blood flow in the left popliteal vein (chronic thrombus)



A B

Figure 8: Gray scale (B), and Color Doppler (A) USS scans, showing dilated, anechoic, with absent blood flow in the right common femoral vein

2.8.2 USS Image evaluation

Interpretation of the USS images was performed by two evaluators (principal investigator and one Radiologist). Images were interpreted for Sonographic features of DVT. Interpretations for the diagnosis of other diseases with similar symptoms as DVT were made, and these patients were not excluded from the study. In all cases of disagreement between the two observers, a third opinion was sought from another radiologist. The clinical conditions of the subjects were compared with the imaging findings. In order to avoid errors and bias, the final report was recorded after reaching consensus.

2.9 Data management and analysis

Data analysis was done using the statistical package for social sciences (SPSS) version 20. Data quality was checked by running frequencies daily. Data transformation by recording, counting, and cross tabulation was performed and obtained information was processed using Pearson chi-square and Fisher's exact tests to compare USS findings and patient demographic and associated factors. Fisher's exact test was used on cells with values less than 5. P value of 0.05 was considered to indicate statistically significant difference or relationship.

CHAPTER THREE

3.0 RESULTS

3.1 Socio-demographic

Table 1: Demographic distribution

AGE	**GENDER**		**TOTAL (%)**
	Females (%)	Males (%)	
18-30	7 (12.7)	2 (5.9)	9 (10.1)
31-40	8 (14.5)	4 (11.8)	12 (13.5)
41-50	14 (25.5)	6 (17.6)	20 (22.5)
51-60	13 (23.6)	7 (20.6)	20 (22.5)
Above 60	**13 (23.6)**	**15 (44.1)**	**28 (31.5)**
Total	**55 (61.8)**	**34 (38.2)**	89 (100)

Among 89 scanned patients, females were 55 (61.8%) and males 34 (38.2%). And the Age group of above 60 years was majority, of which females were 13 (23.6%) and males 15 (44.1%)

3.2 Prevalence of DVT

Table 2: proportion of patients with DVT

DVT	Present (%)	Absent (%)	Total (%)
	22	67	89
	(24.7)	(75.3)	(100)

Among 89 (100%) scanned patients with symptoms suggesting DVT, majority of patients had other diseases of the lower limbs 67 (75.3%) Patients with symptoms suggesting DVT and thrombus was found were 22 (24.7%)

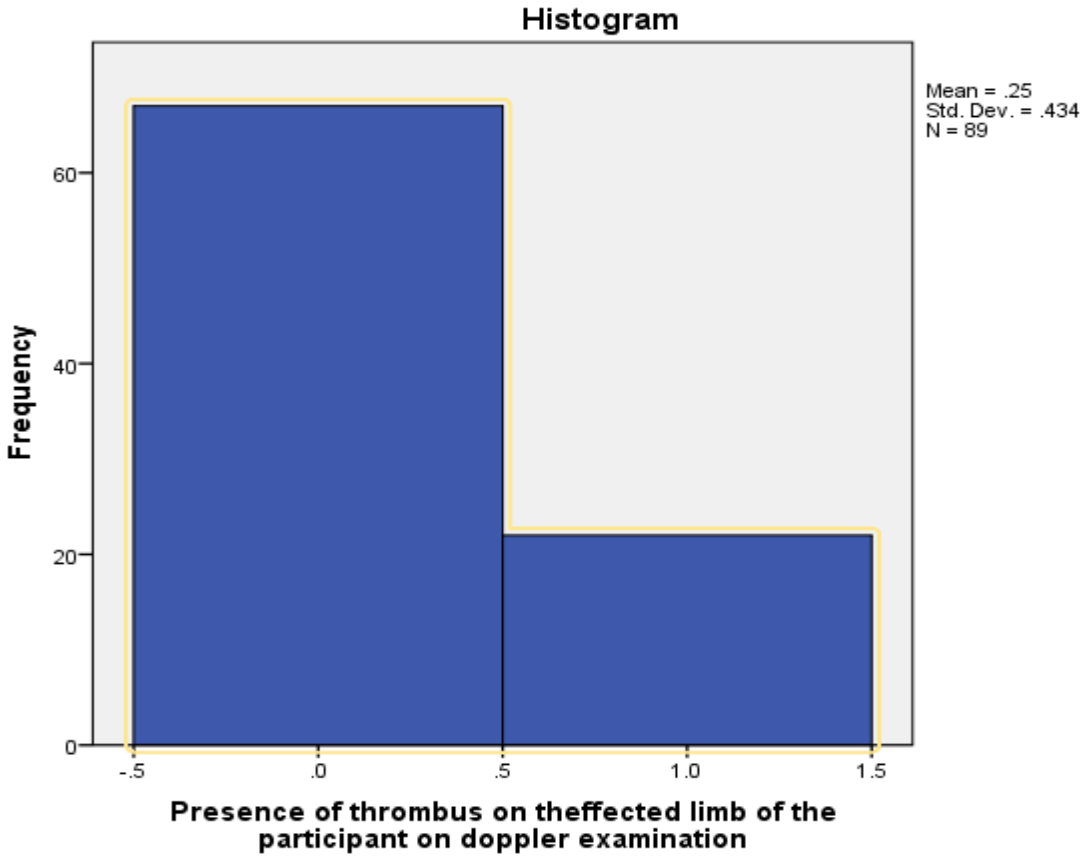


Figure 9: presence of thrombus on the affected limb of the participant on Doppler examination

3.3 Distribution of sonographic findings

Table 3: Proportion of sonographic findings

SONOGRAPHIC FINDING	%	Total
VEIN COMPRESSION		
Totally compressible	68 (76.4)	
Non compressible	**17 (19.1)**	
Intermittent compression	**4 (4.5)**	
TOTAL	89 (100)	89 (100)
BLOOD FLOW		
Spontaneous flow	67 (75.3)	
No flow	**17 (19.1)**	
Slow flow	3 (3.4)	
Peripheral flow	**2 (2.2)**	
TOTAL	89 (100)	89 (100)
RESPIRATORY PHASICITY		
Present	67 (75.3)	
Absent	**22 (24.7)**	
TOTAL	89 (100)	89 (100)
AUGMENTATION TEST		
Positive	68 (76.4)	
Negative	**21 (23.6)**	
TOTAL	89 (100)	89 (100)
VALSAVA MANEOUVER		
Reduced flow	67 (75.3)	
Maintained flow	**22 (24.7)**	
TOTAL	89 (100)	89 (100)

In majority of patients in which thrombus was found, Non compression of the vein 17 (19.1%), absence of blood flow 17(19.1%), absent respiratory phasic variations 22 (24.7%), non augmentation 22 (24.7%), and maintained flow on valsava maneuver 22 (24.7%) was the frequent finding. And the least common sonographic findings were intermittent compression of the vein 4 (4.5%) and peripheral blood flow 2 (2.2%).

3.4 Distribution of sonographic findings of DVT by gender

Table 4: proportion of patients with sonographic features of DVT by gender

GENDER	**PRESENCE OF THROMBUS**		**TOTAL %**	**P VALUE**
	YES %	**NO %**		
MALES	**11 (32.4)**	23 (25.6)	34 (38.2)	**0.18**
FEMALES	**11 (20.0)**	44 (80.0)	55(61.9)	
TOTAL	**22 (24.7)**	67 (75.3)	89 (100)	

In patients with sonogrophic features of DVT 24.7%, majority were male 32.4%, while females were 20%. Relationship between gender and sonographic findings of DVT was not statistically significant (p value 0.18).

3.5 Distribution of sonographic findings of DVT by age

Table 5: Proportion of patients with sonographic features of DVT by age

AGE	THROMBUS		TOTAL %	P VALUE
	YES %	NO %		
18-30	2 (22.2)	7 (77.8)	9 (10.1)	**0.25**
31-40	**6 (50.0)**	6 (50.0)	12 (12.4)	
41-50	**5 (25.0)**	15 (75.0)	20 (22.4)	
51-60	**3 (15.0)**	17 (85.0)	21 (23.6)	
>60	**6 (21.4)**	22 (78.6)	28 (31.5)	
TOTAL %	22 (24.7)	67 (75.3)	89 (100)	

Majority of patients with sonographic findings of DVT were in 31-40 age group 50%, followed by 41-50, 18-30, and above 60 age groups with proportions of 25%, 22.2%, and 21.4% respectively. Least number of patients with sonographic findings of DVT was in 51-60 age group 15%. There was no significant association between age and sonographic findings of DVT p value 0.25.

3.6 DVT by age groups

Table 6: Percentage distribution of DVT by age groups

DVT	**AGE GROUPS**		P VALUE
	Below 60	Above 60	
No (%)	45 (73.8)	22 (78.6)	**0.626**
Yes (%)	**16 (26.2)**	**6 (21.4)**	
TOTAL	61 (100.0)	28 (100.0)	
	18-40	Above 40 years	
No (%)	13 (61.9)	54 (79.4)	**0.10**
Yes (%)	**8 (38.1)**	**14 (20.6)**	
TOTAL	21 (100.0)	68 (100.0)	

DVT was nonsignificantly higher in patients aged less than 60 years (26.3% vs. 21.4%, p=0.626), and also nonsignificantly higher in patients aged between 18-40 years (38.1% vs. 20.6%, p=0.10)

3.7 Distribution of DVT by associated factors

Table 7: Percentage proportion DVT by associated factors

ASSOCIATED FACTORS	THROMBUS YES %	P VALUE	ODDS RATIO
Immobilization		**0.00**	**3.3**
Yes	**14 (53.8)**		
No	**8 (12.7)**		
Surgery			
Yes	4 (23.5)	0.89	0.1
No	18 (25.0)		
Oral contraceptives			
Yes	2 (18.2)	0.59	0.60
No	20 (25.6)		
Cardiac disease			
Yes	3 (14.3)	0.20	0.00
No	19 (27.9)		
Stroke			
Yes	1 (33.5)	0.72	1.2
No	21 (24.4)		
Pregnancy & Puperium			
Yes	**5 (55.6)**	**0.024**	**4.2**
No	**17 (21.2)**		
Others factors (malignancy, obesity, old age, cigarette)	4 (16.7)	0.36	0.3

Prevalence of DVT was significantly higher among patients who were pregnant or in puperium period (55.6% vs. 21.2%, p=0.024) and in immobilized patients (53.8% vs. 12.7%, p=0.000), Oral contraceptive use or its duration, previous surgery and stroke were not risk factors for DVT. Patients who were pregnant or in puperium were 4 times likely to have DVT (odds ratio=4.2), while those with history of immobilization were 3 times likely to have DVT (odds ratio=3.3).

3.8 Prevalence of DVT with history of pregnancy or puperium by gender

Table 8:Percentage distribution of DVT in patients with a history of pregnancy or in puperium by gender.

GENDER	HISTORY OF PREGNANCY AND PUPERIUM (%)		TOTAL	P VALUE
MALE	No	Yes		**0.04**
No	23 (67.6)		23 (67.6)	
Yes	11 (32.4)		11 (32.4)	
	34 (100)		34 (100)	
FEMALE				
No	40 (87.0)	4 (44.4)	44 (80)	
Yes	**6 (13.0)**	**5 (55.6)**	11 (20)	
	46 (100)	9 (100)	55 (100)	

Prevalence of DVT was significantly higher among women who were pregnant or in the puperium period 55.6% vs. 13.0%, p=0.004)

3.9 Location of DVT by associated factors

Table 9: Percentage distribution of thrombus location by associated factors

ASSOCIATED FACTORS	LOCATION OF THROMBUS %								
	CFV	SFV	DFV	PV	ATV	PTV	PRV	PCFV	TOTAL
Immobilization	**13 (28.3)**	7 (15.2)	**8 (17.4)**	**7 (15.2)**	3 (6.5)	3 (6.5)	3 (6.5)	**2 (4.3)**	46 (100)
Surgery	4 (57.1)	1 (14.3)	1 (14.3)	1 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7 (100)
Oral contraceptives	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	**1 (50.0)**	2 (100)
Cardiac disease	3 (20.0)	3 (20.0)	3 (20.0)	2 (13.3)	1 (6.7)	0 (0.0)	0 (0.0)	**1 (6.7)**	13 (100)
Stroke	1 (33.3)	1 (33.3)	1 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100)
Pregnancy & Puperium	**5 (45.5)**	2 (18.2)	**3 (27.3)**	**1 (9.1)**	0 (0.0)		0 (0.0)	**0 (0.0)**	11 (100)
Trauma	4 (57.1)	1 (14.3)	1 (14.3)	1 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7 (100)
Other factors	4 (40.0)	2 (20.0)	2 (20.0)	2 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	10 (100)

Key for abbreviations

CFV Common femoral vein
SFV Superficial femoral vein
DFV Deep femoral vein
PV Popliteal vein
ATV Anterior tibial vein
PRV Peroneal vein
PCFV Proximal to common femoral vein

Among patients with history of immobilization and DVT, the most common location of thrombus was CFV 28.3% (13) followed by deep femoral vein 17.4% (8) and popliteal vein 15.2% (7). 4.3% (2) showed sonographic findings suggesting thrombus location proximal CFV. Patients found to have DVT and either pregnant or in puperium also CFV was the most common location 45.5% (5) followed by deep femoral vein and popliteal vein locations with 17.4% (8) and 15.2% (7) percentage proportions respectively. Ultrasound features suggesting thrombus proximal CFV was found in 50% (1), 6.7 %(1), and 4-3% (2) patients with history of oral contraceptive use, cardiac diseases, and history of immobilization respectively.

3.10 Type of thrombus by Age and sex

Table 10: Percentage distribution of thrombus type by gender and age

GENDER	TYPE OF THROMBUS %			
	ACUTE	CHRONIC	BOTH	TOTAL
Male	**4 (36.4)**	6 (54.5)	**1 (9.1)**	11 (50.0)
Female	2 (18.2)	**9 (81.8)**	0 (0.0)	11 (50.0)
TOTAL	**6 (27.3)**	**15 (68.2)**	**1 (4.5)**	22 (100)
AGE				
18-30	0 (0.0)	2 (100)	0 (0.0)	2 (6.3)
31-40	1 (16.7)	4 (66.7)	**1 (16.7)**	6 (18.8)
41-50	**3 (60.0)**	2 (40.0)	0 (0.0)	5 (15.6)
51-60	1 (33.3)	12 (66.7)	0 (0.0)	13 (40.6)
>60	1 (16.7)	**5 (83.3)**	0 (0.0)	6 (18.8)
TOTAL	6 (18.8)	25 (78.1)	1(3.1)	32 (100)

In patients with DVT, chronic DVT was most frequent (68.2%) followed by acute DVT in 27.3% of patients, while 4.5% of patients had acute on chronic DVT. Among females and males found with DVT in this study, chronic thrombus was frequent in females (81.8%) while

acute thrombus was more frequent in males (36.4%). And 9.1% of males had acute on chronic DVT. Chronic DVT was also frequent in patients above 60 years of age; with acute thrombus most frequent in patients aged 41 to 50. Patients between 31 to 40 years 16.7% had acute on chronic DVT. Chronic DVT was also frequent 83.3% in patients above 60 years of age; with acute thrombus most frequent 60.0% in patients aged 41 to 50. Patients between 31 to 40 years 16.7% had both acute on chronic DVT.

3.11 Type of thrombus by location

Table 11: Percentage distribution of thrombus type by location

THROMBUS TYPE	THROMBUS LOCATION (%)							
	CFV	**SFV**	**DFV**	**PV**	**ATV**	**PTV**	**PV**	**P CFV**
ACT Yes	7 (36.8)	4 (40.0)	5 (41.7)	**6 (60.0)**	**3 (100)**	**3 (100)**	**3 (100)**	1 (33.3)
No	0 (0.0)	3 (27.3)	2 (22.2)	1 (9.1)	2 (22.2)	4 (22.2)	4 (22.2)	4 (36.4)
P VALUE	0.29	0.53	0.35	**0.01**	**0.00**	**0.00**	**0.00**	0.92
CHRNC Yes	14 (70)	8 (72.7)	9 (69.2)	5 (50.0)	**0 (0.0)**	**0 (0.0)**	**0 (0.0)**	2 (66.7)
No	2 (100)	8 (72.7)	7 (77.8)	11 (91.7)	16 (84.2)	16 (84.2)	16 (84.2)	16 (84.2)
P VALUE	0.36	1.00	0.65	0.029	**0.00**	**0.00**	**0.00**	0.9

Key for abbreviations

CFV Common femoral vein
SFV Superficial femoral vein
DFV Deep femoral vein
PV Popliteal vein
ATV Anterior tibial vein
PRV Peroneal vein
PCFV Proximal to common femoral vein
ACT Acute thrombus
CHRNC Chronic thrombus

Acute DVT was significantly found in popliteal vein (60.0% vs. 9.1%, p=0.024), anterior tibial veins (100.0% vs. 22.2%, p=0.026), posterior tibial vein (100.0% vs. 22.2%, p=0.026) and peroneal veins (100% vs. 22.2%, p=0.026). Chronic DVT was significantly not found in anterior tibial vein (100.0% vs. 15.8%, p=0.013), posterior tibial vein (100.0% vs. 15.8%,p=0.013) and peroneal veins (100.0% vs. 15.8%, p=0.013)

3.12 Type of thrombus by limb affected

Table 12: Percentage distribution of thrombus type by limb affected

THROMBUS TYPE	LIMB AFFECTED (%)				P VALUE
ACUTE Yes	Right lower limb	Left lower limb	Both limbs		**0.57**
No	**3 (37.5)**	4 (36.4)	0 (0.0)	7 (33.3)	
	5 (62.5)	7 (63.6)	2 (100.0)	14(66.7)	
TOTAL	8 (100.0)	11 (100.0)	2 (100.0)	21 (100.0)	
CHRONIC Yes	5 (62.5)	**9 (75.0)**	2 (100.0)	16 (72.7)	**0.55**
No	3 (37.5)	3 (25.0)	0 (0.0)	6 (27.3)	
TOTAL	8 (100.0)	12 (100.0)	2 (100.0)	22 (100.0)	

Acute thrombus was most frequent in the right lower limb 37.5 %, and in the left lower limb 36.4%, variation in frequency was not statistically significant (p=0.57). Chronic thrombus was frequent in the left lower limb 75.0% and 62.5% in the right lower limb, different in frequency was not significant statistically (p=0.55)

3.13 Distribution of DVT by Wells criteria

Table 13: Percentage distribution of patients with DVT by wells criteria

WELLS CRITERIA	THROMBUS Yes%	No%	TOTAL	P Value
DVT LIKELY	**19 (50.0)**	19 (50.0)	38 (42.7)	**0.00**
DVT UNLIKELY	**3 (5.9)**	48 (94.1)	51 (57.3)	
TOTAL	22 (24.7)	67 (75.3)	89 (100)	

Among patients with DVT, majority 50% (19) were patients in which DVT was likely, and only 5.9% (3) patients DVT was unlikely by Wells criteria. Relationship between patient's assessment by Wells criteria and diagnosis of DVT was statistically significant with P value of 0.000

CHAPTER FOUR

4.0 DISCUSSION

Lower limb swelling is a common symptom of DVT.[3] It has been shown that early diagnosis ensures early treatment with anticoagulants and reduces the chances of PE which is its fatal complication [30]. The role of imaging is to bring suggestive diagnosis and hence affect decision making concerning management. [1] This cross-sectional hospital based study used duplex ultrasound to evaluate features of thrombosis in the deep veins of the lower limbs in patients clinically suspected to have DVT. Wide availability, cost effectiveness, non invasive nature, absence of radiation and magnetic hazards are added advantages to the use of Duplex USS [26]. Despite its high sensitivity, sonographic features of deep vein thrombosis are observed in asymptomatic subjects, thus questioning its specificity, with thrombus found in the deep veins of lower limbs in patients with moderate to high likelihood of DVT by Wells criteria [1, 9]

All recruited patients underwent both gray scale ultrasound with color and spectral Doppler examinations of the lower limbs, and both longitudinal and transverse views of all images were interpreted to locate thrombus in the deep veins of the lower limbs.
Prevalence of DVT was high (49%) and (36.4%) in two different studies done in Brazil [3, 15], thrombosis of the deep veins was observed in minority (24.7%) of patients examined in this study. Difference in demographics, methodology, and complimentary tests (D-dimer) employed in some studies could explain the difference in prevalence.

Most of these thrombus findings were seen in the common femoral vein, deep common femoral vein, and popliteal vein and compares well to the findings of other previous studies [1,23] , but differs with the study done in Brazil which showed distal veins to be most frequent location (29.73%), followed by popliteal vein (23.4%) and least location in femoral vein

(20.83%) [15] This could be because of the different methodology used in which patients without symptoms suggestive of DVT were included in this study.

Changes within the deep veins of the lower limbs begin late in life due to increase in procoagulant factors in blood, stiffening of the vein walls and venous stasis as a consequence of aging [16]. In patients with younger age (below 30 years) occurrence of deep vein thrombosis is accelerated by genetic factors, of which thrombophilia, protein c deficiency, and non-O-blood type have been implicated [19]. In this study significant number of patients with DVT was in between 18 to 30 years of age. This finding is different when compared to the study done by Cushman M et al, mean age of this study group was 60 +/-3.52 years could be another explanation, as deep vein thrombosis is common in individuals above 40 years of age and its prevalence increases to over 1% by 70 to 80 years of age [16].

Studies done by Gade A et al and Vesa S.C et al showed that the left leg is commonly affected with DVT in some associated factors; this finding was also seen in this study, where high proportion of DVT was in the left leg than the right leg. [17, 23]

In this study, among the scanned patients who were clinically suspected of DVT, majority were females, DVT was slightly more frequent among males compared to females. These findings are consistent with the findings reported by Andreaou ER et al (2008) and colleagues in Canada and those they reported from China [6].

Adult patients from the age of 18 years were recruited in this study; however, most of the patients were of the age group of above 60 years. Deep vein thrombosis was observed in (24.7%) of patients in this study. The prevalence was observed to vary with age, whereby it was high in 31 to 40 years of age, followed by 41 to 50 years of age, and lower in patients above 60 years of age respectively, and this finding differs from other previous studies by Cushman M et al [16]. This could be explained by the fact that, most patients above 60 years of age with symptoms suggesting DVT were diagnosed of having other diseases of the lower limbs and not DVT.

Immobilization history was the most frequent associated factor among scanned patients, followed by other associated factors which included obesity, old age, malignancy, and history of cigarette smoking.

Prevalence of DVT was high in patients who were pregnant or in the puperium period, these patients were four times likely to have DVT, and compares well to the findings of other previous studies done in China and Sudan [8, 17].

Prevalence of DVT was also high in this study, immobilized patients were 3 times likely to have DVT, this is similar to the findings reported by Crooks J and Beveridge T el in 1978 [22]. Patients with a history of surgery showed 23.5% prevalence of DVT, with patients with a history of surgery being 2 times likely to have DVT; this is similar to the findings reported in previous studies by Cushman et al and Kingue et al [16, 18].

In this study, it was observed that, in patients with a history of immobilization, those pregnant or in puperium period , and patients with history of surgery, high proportion of thrombus was located at common femoral vein, followed by deep femoral vein and popliteal vein, least location of thrombus was in the calf veins (anterior tibial, posterior tibial, and peroneal), with no DVT located in the calf veins in pregnant patients or those in puperium period and in patients with history of surgery. These observations are consistent with those of previous studies by Binder B et al and colleagues (2009) and Adam et al (2009) [17, 21].

In this study it was also observed that there was no thrombus found in calf veins in patients younger than 30 years of age, and the percentage frequency of thrombus in the calf veins increased with age with the frequency of 6.7% and 7.1% in ages between 41 to 50 and 51 to 60 respectively and no calf DVT observed in those patients above 60 years, these findings differs from those reported by Vesa SC et al who found that patients above 60 years of age without symptoms for DVT had high prevalence of calf DVT [23], this can be explained by different in study methodology in which patients without symptoms were also included, and

can be due to the fact that most patients above 60 years involved in the study were having other diseases and not DVT.

The most common location of thrombus in both males and females was the common femoral vein, while the location of thrombus in calf veins was frequent in males than females. This observation is different from what was found by Binder B et al and colleagues (2009) [21]. This could be explained by the fact that majority of females involved in this study had risk factors much associated with proximal DVT.

Venous incompressibility, altered vascular blood flow, absent respiratory phasic variation, negative augmentation, and maintained flow with valsava maneuver were frequent sonographic findings observed in patients with DVT. These findings are consistent with the previous studies by De Oliveira A et al and colleagues (2008), Ahuja T.A et al and Gornik et al [11, 12].

Finally in this study, chronic DVT was most frequent than acute DVT, with a small number of patients who have acute on chronic DVT.

Among females and males found with DVT in this study, chronic thrombus was frequent in females, while acute thrombus was frequent in males. 9.1% of males had acute on chronic DVT. Chronic DVT was also frequent in patients above 60 years of age; with acute thrombus most frequent in patients aged 41 to 50. Acute on chronic DVT was frequent in patients between 31 to 40 years. These findings are different with previous study by Hudgens S.A et al and colleagues (2003) [14]; the difference in study methodology explains this variation.

In this study all patients were assessed and scored by Wells criteria. Among patients with DVT, majority were patients in which DVT was likely, DVT was unlikely in only 5.9% of patients by Wells criteria. This finding was consistent with the study done by Scarvelis D et al (2006) and Kesieme E et al and colleagues (2011) [1,7].

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Twenty five percent of studied patients had sonographic findings of DVT. Chronic DVT was the most frequent finding, followed by acute DVT. Common femoral vein was the most common location of DVT, followed by deep common femoral vein, and popliteal vein. The least common location of DVT was the calf veins (anterior tibial, posterior tibial and peroneal veins). Small proportion of patients showed sonographic features suggesting thrombus location distal to the common femoral vein.

Prevalence of DVT varied with age, being more common in males than females. Findings were more frequent in patients with a history of immobilization, and in patients who were pregnant or in puperium.

These sonographic findings should receive more emphasis during scanning and interpretation of sonographic images of patients who present with lower limb swelling and tenderness, especially when their symptoms have become chronic.

In this study Duplex ultrasound revealed a number of DVT sonographic findings in symptomatic individuals. Duplex ultrasound may also reveal high rates of DVT sonographic findings in asymptomatic individuals. Majority of asymptomatic individuals have sonographic findings of DVT (vein incompressibility, absent venous blood flow, absent phasic variation) compared to only 25% of patients with symptoms [9, 15].

Duplex ultrasound alone cannot be used to define the cause of symptoms among symptomatic patients. Duplex sonographic findings must be correlated with patients score by Wells criteria, clinical signs and symptoms following a careful assessment of associated factors for accurate diagnosis and management decisions.

5.2 Recommendations

1) Careful assessment of associated factors of DVT should be obtained in correlation with Likelihood of DVT score by Wells criteria in order not to miss sonographic findings of DVT in asymptomatic patients, which is also the commonest cause of PE as its fatal complication.

2) Careful examination and interpretation of sonographic findings in real time scanning is needed as some DVT which occurs proximal to common femoral vein can easily be missed, and needs to be coupled with and confirmed by venography, since they carry a high risk of PE. Timing in the use of ultrasound for diagnosis (examination and interpretation) of deep vein thrombosis should be enhanced for Radio Technologists and Radiologists.

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APPENDICES

Appendix I: Informed Consent Form (English Version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES,

DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS.

ID-NO……..

Consent to participate in a study

Dear Sir/ Madam

Hello! My name is Dr. Ugumba Mussa Kwikima; I'm conducting a study on ultrasonographic findings in patients with symptoms suggestive of DVT attending Muhimbili.

Study purpose

This study is conducted as partial fulfillment of the requirements of MMED Radiology at MUHAS. The study is also conducted to establish sonographic findings of DVT among patients with suggestive symptoms attending Muhimbili.

How to be involved

The patient agree to participate in this study will be required to sign the consent form, then interviewed after that will continue with screen as requested.

Confidentiality

The information obtained from you will be confidential. No name will appear on any document of this study instead identification number will be used.

Participation and right to withdraw

Involvement in this study is voluntary. You can participate or refuse to participate from this study. Refusal to participate from this study will not interfere with your management.

Benefits

The information that you provide will help us to correlate the ultrasonographic findings in patients with suspected DVT and associated factors. Thus the study outcomes will help to improve patient's management thus improve quality of life.

Contact Personally

If you ever have questions about this study, you should contact the principal investigator, Dr. Ugumba Mussa Kwikima, Muhimbili University of Health and Allied sciences, P.O.Box 65001, Dar es Salaam. Tel. 0712544405.

OR in case you have questions about your rights of participation in this study, you may contact Prof M. Moshi chairperson of senate of research and publication committee. P. O. BOX 65001 Dar es Salaam. Telephone: +255 0222152489.

Dr. Mussa Balowa who is the supervisor of this study,

Tel: +255788002506

Participant agrees……

I…….have read the contents in this form. My questions have been answered. I'm willing to participate in this study.

Signature of participant…….Date……

Signature of researcher…….Date……

Appendix II: Informed Consent form (Swahili version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI

KURUGENZI YA UTAFITI NA UCHAPISHAJI

FOMU YA RIDHAA

Namba ya utambulisho _____

Ridhaa ya kushiriki kwenye utafiti

Habari! Jina langu ni Dr. Ugumba Mussa Kwikima nafanya utafiti wenye lengo la kuangalia kuvimba kwa miguu kutokana na damu kuganda kwenye mishipa kati ya watu wazima wenye dalili za tatizo hilo wanaofanyiwa sonographia katika hospitali za Muhimbili.

Madhumuni ya utafiti huu

Ni pamoja na kutimiza sehemu ya matakwa ya shahada ya uzamili ya matibabu kitengo cha vipimo vya mionzi Chuo kikuu cha afya na sayansi za tiba Muhimbili.

Unaombwa Kushiriki katika utafiti huu, ili tuweze kupata matokeo ambayo yatatusaidia kujua ukubwa na vihatarishi vinavyoambatana na tatizo la kuvimba miguu kutokana na kuganda kwa damu kwenye mishipa, kwa watu wazima.

Jinsi ya kushiriki

Ukikubali kushiriki katika utafiti huu, utasailiwa halafu utatakiwa kujibu maswali kutoka kwenye dodoso lililoandaliwa halafu utaendelea na kipimo kama kawaida.

Usiri

Taarifa zote zitakazokusanywa kupitia dodoso hili zitakuwa ni siri. Jina lako halitatumika badala yake tutatumia namba ya utambulisho.

Uhuru wa kushiriki na haki ya kujitoa

Kushiriki kwenye utafiti huu ni hiyari. Unaweza kushiriki au ukakataa kushiriki na hii haitakuondolea haki ya kupata matibabu yako.

Nani wa kuwasiliana naye

Kama una maswali kuhusiana na utafiti huu, wasiliana na mtafiti imkuu, Dr. Ugumba Mussa Kwikima, chuo kikuu cha afya na sayansi za tiba Muhimbili, S.L.P 65001 Dar es salaam. Simu 0712544405. Prof M. Moshi, mwenyekiti kamati ya utafiti na uchapishaji, S.L.P 65001, Dar es salaam. Simu 0222152489. Dr Musa Balowa, msimamizi wa utafiti huu, Simu 0788002506.

Appendix III: Questionnaire (English Version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

SCHOOL OF MEDICINE-DEPARTMENT OF RADIOLOGY
P.O.BOX 65001 MUHIMBILIDAR ES SALAAM –TANZANIA

1. ID NO:_____

2. SEX: F/M

3. AGE_____Yrs

4. Date of interview:_____ dd/mm/yyyy

5. Date of birth: _____dd/mm/yyyy

6. District_____

7. Region_____

8. Religion_____

9. Marital status
    1-Single
    2-Cohabiting
    3-Married
    4-Divorced
    5-Widowed
10. Level of education attained
    1-None
    2-Primary school
    3-Secondary school
    4-Post secondary

11. What is your occupation?

    1-Informal employment

    2-Formal employment

    3-None

12. History of Immobilization YES NO

13. History of Surgery YES NO

14. History of Oral Contraception use YES NO Not applicable.

    If YES: Duration_____months/years

15. History of Hormone replacement therapy YES NO Not applicable

    If YES: Duration_____months/years

16. Cardiac disease YES NO

17. History of Stroke YES NO

18. Pregnant/pueperium YES NO

19. History of trauma YES NO

20. Others YES NO If YES specify

CLINICAL MODEL FOR PREDICTING PRETEST PROBABILITY OF DVT

CLINICAL FEATURE	SCORE
Active cancer (within last 6 months or on treatment)	1
Paralysis/Paresis or plaster cast immobilization of leg	1
Recently bedridden for more than 2 days or surgery with GA or regional anesthesia in last 3 months	1
Entire leg swollen	1
Calf swelling more than 3 cm than other side at a point 10 cm below tibial tuberosity	1
Unilateral pitting edema	1
Collateral superficial veins	1
Previous DVT	1
Alternative diagnosis is at least as likely as DVT	-2(minus 2)
Total score	
D-Dimer results	+ or -

Score of 2 or higher DVT is likely while is unlikely with a score less than 2.

Wells criteria DVT likely DVT unlikely

Physical

Examination_____

Appendix IV: Ultrasonography findings recording form

DEEP VEIN THROMBOSIS SONOGRAPHIC FINDINGS RECORDING FORM

Ultrasonography

Fill in immediately after each sonographic examination and attach images

Which lower limb affected

1. Right Lower limb 2. Left lower limb

Doppler flow pattern

3. Compression a. Totally compressed b. Intermittent compression c. Non compressible

4. Vascular blood flow a. Spontaneous b. No flow c. slow flow

1. Phasicity a. Present b. Absent

2. Augmentation a. Positive b. None augmentation

3. Valsava response a. Reduced flow b. Increased flow c. Maintained flow

4. Thrombus is found a. Yes (Continue question 5…) c. No (End of Questionnaire)

5. Type of thrombus a. Acute b. Chronic c. Both

6. Location of the thrombus.

a. Common Femoral Vein 1. Yes 2. No

b. Superficial femoral vein 1. Yes 2. No

c. Deep femoral vein 1. Yes 2. No

d. Popliteal vein 1. Yes 2. No

e.	Anterior tibia vein	1. Yes	2. No
f.	Posterior tibia vein	1. Yes	2. No
g.	Peroneal vein	1. Yes	2. No
h.	Distal common femoral vein	1. Yes	2. No