ONE YEAR CROSS SECTIONAL STUDY TO DETECT THE PREVALENCE OF HYPERHOMOCYSTEINEMIA IN CASES OF DEEP VEIN THROMBOSIS IN KLES DR. PRABHAKAR KORE HOSPITAL , BELGAUM

Submitted by:

DR. GAUTAM KAMAT

Dissertation

Submitted to the

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In partial fulfillment

of the requirements for the award of the degree of

M.S. IN GENERAL SURGERY

Under the Guidance of :
DR. SHRISHAIL C. METGUD M.S.

Professor of Surgery

DEPARTMENT OF GENERAL SURGERY
J. N. MEDICAL COLLEGE, BELGAUM-590010.
KARNATAKA.

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Date : **Dr. GAUTAM KAMAT.**

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Date:
Place:Belgaum

Guide :
DR.S.C.METGUD. M.S.
Professor of Surgery
Department of Surgery,
J. N. Medical College,
Belgaum – 590 010. Karnataka.

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ENDORSEMENT BY HEAD OF THE DEPARTMENT, PRINCIPAL/HEAD OF THE INSTITUTION

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DR. A. S. GODHI. **M.S.FICS**
Professor & Head,
Department of Surgery,
J N. Medical College,
Belgaum. Karnataka.

Date :

Place :Belgaum

DR. V. D. PATIL. **MD. (Paed)**
Principal,
J. N. Medical College,
Belgaum – 590 010.
Karnataka.

Date:

Place: Belgaum

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Dr. Gautam Kamat.

LIST OF ABBREVATIONS

Cm	-	Centimeter
CT	–	Computed Tomography
D	-	Day
DM	–	Diabetes Mellitus
DNA	–	Deoxy ribose Nucleic Acid
DVT	–	Deep Vein Thrombosis
ED	–	Emergency Department
ELISA	–	Enzyme Linked ImmunoSorbent Assay
Hcy	–	Homocysteine
HTN	-	Hypertension
ICU	–	Intensive Care Unit
IHD	–	Ischaemic Heart Disease
IPG	–	Impedance Plethysmography
IVC	–	Inferior Vena Cava
KLES	–	Karnataka Lingayat Education Society
LMWH	–	Low Molecular Weight Heparin
MRI	-	Magnetic Resonance Imaging
PE	–	Pulmonary Embolism
UFH	–	Un-Fractionated Heparin
VTE	–	Venous Thrombo-Embolism

ABSTRACT

Background : Hyperhomocysteinemia is a known risk factor for the development of deep vein thrombosis. Various studies have been conducted in the western countries to know the prevalence of hyperhomocysteinemia in patients with DVT and in general population. There is no documented literature of the prevalence of hyperhomocysteinemia in Indian population. Thus the aim of this study was to determine the prevalence of hyperhomocysteinemia in cases of DVT in our population.

Objective: To evaluate the prevalence of hyperhomocysteinemia in cases of deep vein thrombosis in KLES Prabhakar Kore hospital, Belgaum, India.

Design: Prospective cross sectional study

Materials and Methods: A total of 70 patients were included in the study.DVT was confirmed by Doppler examination. Serum homocysteine was measured and the data analysed. Statistical significance was calculated using chi square test.

Results: A total of 70 patients were studied of which 53 were males and 17 were females. The prevalence of hyperhomocysteinemia among the cases of DVT was 31.428 %.The prevalence among males was 35.85 % and among females was 17.64 %.There was statistically significant association between hyperhomocysteinemia and presence of ischaemic heart disease with a p value of 0.005 on chi square analysis..

Conclusion: The prevalence of hyperhomocysteinemia in cases of deep vein thrombosis in our population was 31.428 %. There was a statistically significant association between hyperhomocysteinemia and ischaemic heart disease.

KEY WORDS: Hyperhomocysteinemia, Deep vein thrombosis.

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INTRODUCTION

Deep vein thrombosis (DVT) is a common but elusive illness that can result in suffering and death if not recognized and treated effectively. Death can occur when the venous thrombi break off and form pulmonary emboli, which pass to and obstruct the arteries of the lung. DVT and pulmonary embolism (PE), most often complicate the course of sick, hospitalized patients but may also affect ambulatory and otherwise healthy persons.

Since venous thrombosis is difficult to recognize clinically, these hospitalized cases probably represent the tip of the iceberg. Unfortunately, the death rate from PE and DVT is substantial, and the probability of survival of affected individuals is decreased when compared with unaffected ones.

An association between the risk of venous thromboembolism and a hypercoagulable state has been recognized for some years. More recent advances in thrombosis research and laboratory medicine have provided an ever-expanding list of specific laboratory anomalies that may predispose people to venous thromboembolism.

Mild hyperhomocysteinemia is an established risk factor for atherosclerosis and vascular disease.[1,2] In classic homocystinuria, half the vascular complications are of venous origin,[3] but until recently it has been unclear whether mild hyperhomocysteinemia is also a risk factor for venous thrombosis.[2,4,5]

In a case–control study, Falcon et al. found that hyperhomocysteinemia was a risk factor for thrombosis in people younger than 40 years of age.[6] Recently, hyperhomocysteinemia was found to be a risk factor for recurrent venous thrombosis in patients between 20 and 70 years of age, as compared with controls from the

general population.[7] Although the results of these studies support the hypothesis that mild hyperhomocysteinemia is a risk factor for venous thrombosis, the studies were not designed to estimate the risk in the general population.

Although, studies are available which gives us the prevalence of hyperhomocysteinemia in patients with Deep Venous Thrombosis in the western population, no studies are mentioned in literature depicting the prevalence of hyperhomocysteinemia in patients with DVT in Indian population.

Thus, the present study was undertaken to detect the prevalence of hyperhomocysteinemia in patients with DVT coming to our hospital.

AIMS AND OBJECTIVES

1. To determine the prevalence of hyperhomocysteinemia in cases of Deep Vein Thrombosis in KLES Prabhakar Kore hospital, Belgaum.

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REVIEW OF LITERATURE

Deep venous thrombosis and its sequel, pulmonary embolism , are the leading causes of preventable in-hospital mortality in the world. The first reference to peripheral venous disease was recorded on the Ebers papyrus in 1550 BC and documented the potential fatal hemorrhage that may ensue from surgery on varicose veins. In 1644, Schenk first observed venous thrombosis when he described an occlusion in the inferior vena cava. In 1846, Virchow recognized the association between venous thrombosis in the legs and PE.[8] Heparin was only introduced to clinical practice in 1937. Over the last 25 years, considerable progress has been made in the pathophysiology, diagnosis, and treatment of DVT.

Frequency

The best epidemiological evidence comes from the 30-year prospective study of men born in 1913. For every 100,000 person-years, this study found an incidence of 387 cases of recognized venous thrombosis, of which 285 subjects had a diagnosis of PE and 107 had fatal PE. This corresponds to an average of 39 cases and 11 deaths per year in a practice of 10,000 patients. One of every 9 persons develops recognized DVT when younger than 80 years, and clinically recognized VTE (Venous thromboembolism) accounts for 1 of every 20 deaths in those older than 50 years.[9] Autopsy studies demonstrate that approximately 80% of all cases of DVT and PE remain undiagnosed, even when they are the immediate cause of death.[10] Therefore, the true prevalence in the population at large is probably much higher.

The exact incidence of DVT is unknown because most studies are limited by the inherent inaccuracy of clinical diagnosis. More importantly, most DVT is occult and usually resolves spontaneously without complication..

Etiology

A clinical suspicion of DVT or PE often stimulates efforts to identify known risk factors for venous thrombosis. All recognized risk factors for DVT arise from the 3 underlying components of the Virchow triad: [8]

1. Venous stasis
2. Hypercoagulability
3. Vessel intimal injury.

The single most powerful risk marker for DVT is a prior history of VTE. In the absence of prophylaxis, patients who have had prior recognized PE or extensive DVT are virtually certain to develop recurrent VTE with surgery.

RISK FACTORS FOR DVT [9,11]

1. Anesthesia

Patients receiving general anesthesia have a 500% increased risk of DVT compared with patients receiving epidural anesthesia for the same surgical procedure.

2. Autoimmune disease and immune deficiency

Of patients with systemic lupus erythematosus, 9% develop spontaneous DVT.

3. Blood surface antigens

Type A blood is associated with lower levels of Antithrombin III and higher levels of Factor VIII than type O blood. Women of reproductive age with type A blood are 4 times as likely to develop DVT compared with women with type O blood.

4. Cancer

Malignancy is an important risk factor for DVT, and spontaneous DVT without an obvious cause is an important marker for possible occult malignancy.

5. Strokes and neurotrauma

DVT is common after stroke or neurological trauma. Without prophylaxis, half the patients develop acute DVT within 5 days following a stroke. Forty percent of postoperative neurosurgical patients develop DVT.

6. Chemotherapy

Many types of chemotherapy increase the risk of DVT and PE.

7. Coagulopathy

Deficiencies of protein C, protein S, or antithrombin III are well-recognized coagulopathies that together account for approximately 15% of the cases of DVT. Resistance to activated Protein C, accounts for many more. The Lupus anticoagulant is another common coagulopathy that can be inherited or acquired.

8. Fibrinolysis

Impaired fibrinolysis occurs in several inherited syndromes but is most common in postoperative patients, those taking synthetic estrogens of any type, and women who are pregnant or status postpartum.

9. Heart disease

Acute myocardial infarction and congestive heart failure increase the likelihood of DVT and PE, independent of bed rest or immobilization. Patients with acute myocardial infarction who are not receiving anticoagulation have a 26-38% rate of DVT

10. Hyperlipidemia

The presence of lipemic serum greatly increases the rapidity and extent of thrombus formation in response to vascular injury.

11. Immobility

Immobilization that produces stasis is the most important risk factor for DVT and PE. DVT occurs in 10% of all patients placed at bed rest in a general medical ward and in 29% of those placed at bed rest in an intensive care unit

12. Increasing age

Increasing age leads to an increased risk of DVT and PE.

13. Inflammatory bowel disease

Patients with ulcerative colitis or Crohn's disease are at increased risk for DVT and PE because of increased fibrinogen, factor VIII, and platelet activity and depressed levels of antithrombin III and alpha2-macroglobulin.

14. Hyperhomocystinemia

The role of mild to moderate hyperhomocysteinemia in the development of vascular disease has been documented and reviewed extensively.[12,13,14,15,16] Unlike some thrombophilia defects, hyper-Hcy is associated with both venous[17] and arterial[18] thrombosis. In a recent meta-analysis, including 9 published studies, Ray found that hyper-Hcy was a significant risk factor for venous thromboembolism (VTE).[17]

15. Obesity

Obesity has long been accepted as a risk factor for DVT and PE, but the evidence supporting this association is not convincing.

16. Oral estrogens

Case-control and cohort studies based on clinical signs and symptoms of thrombosis suggest a relative risk of approximately 3-12 times higher for patients taking oral contraceptives compared with those not taking them.

17. Polycythemia and thrombocytosis

The risk of venous and arterial thrombosis increases linearly with an increasing hematocrit value. Forty percent of deaths in patients with polycythemia vera are related to thrombosis, but only a third of these are due to venous thrombosis.

18. Pregnancy and puerperium

PE is the most common nontraumatic cause of maternal death in pregnancy, and the prevalence is even higher in the postpartum period.

19. Prior DVT

Patients with a prior episode of DVT are 5 times more likely to develop new DVT compared with patients with no prior episodes of DVT. Prior DVT increases the risk of new postoperative DVT from 26% to 68%. A history of prior clinically apparent PE increases the risk of new postoperative DVT to nearly 100%.

20. Surgery

Perioperative DVT can result from minimal venous endothelial injury. The rate of postoperative DVT in patients who do not receive effective prophylaxis is 70% after nonelective hip surgery, 48% percent after elective orthopedic surgery, and 12% after elective general surgery.

21. Tissue antigens

HLA antigens Cw4, Cw5, and Cw6 are associated with an increased frequency of DVT and PE.

Pathophysiology

Millions of tiny injuries occur within normal blood vessels each day, and millions of tiny microthrombi are formed and lysed in a dynamic balance of functional hemostasis without clinically apparent venous or arterial thrombosis. The German pathologist Virchow demonstrated in 1846 that flow stasis, altered

coagulability, or extensive vessel wall injury may cause microthrombi to propagate, resulting in macroscopic thrombi.[8] Vessel wall endothelial damage is the most important of these 3 factors because even minor endothelial injury often results in an accumulation of macroscopic thrombi in the veins.

Disorders of hemostasis, coagulation, anticoagulation, or fibrinolysis occur in a variety of clinical settings that can cause recurrent DVT or PE and premature arteriosclerotic syndromes or myocardial infarction at an early age.

Hemostasis

The initiating event in venous thrombosis is platelet adhesion. Initial platelet adhesion and aggregation are stimulated by a component of endothelial cells, most likely a substance known as amorphous electron-dense substance, which is exposed by endothelial cell injury. The release of this substance is enhanced by activity of the intrinsic coagulation cascade and is inhibited by platelet anti-aggregating agents, thrombolytics, and anticoagulants.

Platelet activation causes the release of platelet proaggregants thromboxane A2 and serotonin, resulting in the aggressive recruitment of more circulating platelets to form a hemostatic plug. Thromboxane A2 and serotonin also act to bring about local vasoconstriction. Exposed platelet membrane phospholipids catalyze the activation of factor X and the local formation of thrombin, itself a powerful proaggregant.

Coagulation

After a hemostatic plug is well established, coagulation pathways are activated and thrombin is generated. Fibrin cross-linking builds a true thrombus out of what

was initially a loose aggregation of blood elements. Three factors serve to retard and prevent uncontrolled propagation: flow dilution, natural anticoagulants, and natural thrombolytics

Anticoagulation

Protein C, protein S, and antithrombin III are the best understood of the natural circulating anticoagulants. Antithrombin III is a general inhibitor of the intrinsic pathway. Protein C inhibits factor V and factor VIII, principal components of the common coagulation pathway.

Many other plasma proteins serve as activators, inhibitors, or cofactors in the coagulation cascade, including such known proteases as heparin cofactor II, alpha2-macroglobulin, alpha1-antitrypsin, and C1 inhibitor. Isolated deficiency of heparin cofactor II can cause recurrent venous thrombosis, and other cofactors can increase the likelihood of thrombosis in response to vascular injury or venous stasis. Together, these plasma proteins prevent minor endothelial injury from initiating uncontrolled intravascular coagulation.

Fibrinolysis

Fibrinolysis is the body's defense against the formation of a thrombus. Fibrinolysis is initiated by tissue activators and by circulating activators that transform the inactive precursor plasminogen into the active fibrinolytic agent plasmin. Plasmin attacks and degrades fibrin, and when excess plasmin is present, it also attacks and degrades fibrinogen. Damaged endothelial cells release tissue-type plasminogen activator at the same time they bind platelets and initiate the clotting

process. This balancing process ensures that under normal conditions, the formation of a thrombus remains localized to an injured area where it is needed. Any disturbance of the delicate balance leads either to increased bleeding or to increased propagation of thrombi.

Impaired fibrinolytic activity permits thrombus propagation and leads to an increased likelihood of clinically apparent venous thrombosis.

Relevant Anatomy:

Peripheral venous system

The peripheral venous system functions both as a reservoir to hold extra blood and as a conduit to return blood from the periphery to the heart and lungs. The correct functioning of the venous system depends on a complex series of valves and pumps that are individually frail and prone to malfunction, yet the system as a whole performs remarkably well under extremely adverse conditions.

Primary collecting veins of the lower extremity are passive thin-walled reservoirs that are tremendously distensible. Outflow from collecting veins is via secondary conduit veins that have thicker walls and are less distensible. Most of these veins are subfascial and are surrounded by tissues that are dense and tightly bound. These subfascial veins belong to the deep venous system. The greater saphenous vein is a superficial vessel that nonetheless lies within a fascial sheath through most of its course from the groin to the ankle.

Deep venous system

No matter what pathway is taken, all venous blood is eventually received by the deep venous system on its way back to the right atrium of the heart. Five major named branches to the deep venous system are found in most patients, 3 below the knee and 2 above the knee. To confuse the issue, the principal deep venous trunk of the leg is called the popliteal vein from below the knee until it passes upward and anteriorly through the adductor canal in the distal thigh, then its name changes to the femoral vein for the remainder of its course in the thigh.

Deep veins of the calf

The lower leg has 3 groups of deep veins: the anterior tibial vein, draining the dorsum of the foot; the posterior tibial vein, draining the sole of the foot; and the peroneal vein, draining the lateral aspect of the foot. From the ankle, the anterior tibial vein passes upward anterolateral to the interosseous membrane, the posterior tibial vein passes upward posteromedially beneath the medial edge of the tibia, and the peroneal vein passes upward posteriorly through the calf. In most patients, each one of these is actually a pair of veins flanking an artery of the same name. Just below the knee, the 4 anterior and posterior tibial veins join with the 2 peroneal veins to become the single, large popliteal vein.

Deep veins of the thigh

The popliteal vein courses proximally behind the knee and then passes anteromedially in the distal thigh through the adductor canal, at which point its name changes to the femoral vein.. In the proximal thigh, the femoral vein and the deep

femoral vein unite to form the common femoral vein, which passes upwards above the groin crease to become the iliac vein .

Above the thigh

The external iliac vein is the continuation of the femoral vein as it passes upward behind the inguinal ligament. At the level of the sacroiliac joint, it unites with the hypogastric vein to form the common iliac vein. The left common iliac is longer than the right and more oblique in its course, passing behind the right common iliac artery. At the level of the fifth lumbar vertebra, the 2 common iliac veins come together at an acute angle to form the inferior vena cava.

The calf-muscle pump

The passage of blood upward from the feet against gravity depends on a complex array of valves and pumps. Muscle pumps of the calf and thigh provide the motive force for venous return. The most important of these is called the calf-muscle pump, often referred to as the "peripheral heart.". Inflow to a segment of deep vein is through intake valves from perforating veins and from the deep vein segment below. Outflow is through an outflow valve to the deep vein segment above. Squeezing of the vein segment occurs when muscle contraction increases the pressure within a fascial muscle compartment..

Clinical Features

Sex

The male-to-female ratio is 1.2:1.

Age

DVT usually affects individuals older than 40 years

History

The signs and symptoms of DVT are related to the degree of obstruction to venous outflow and inflammation of the vessel wall. The bedside diagnosis of venous thrombosis is insensitive and inaccurate.

Many patients are asymptomatic, however, the history may include the following:

- Edema : principally unilateral, is the most specific symptom. Massive edema with cyanosis and ischemia (phlegmasia cerulea dolens) is rare.
- Leg pain : occurs in 50% of patients, but this is entirely nonspecific. Pain can occur on dorsiflexion of the foot (Homans sign).
- Tenderness : occurs in 75% of patients but is also found in 50% of patients without objectively confirmed DVT.
- Clinical signs and symptoms of PE as the primary manifestation occur in 10% of patients with confirmed DVT.
- Warmth or erythema of skin can be present over the area of thrombosis.

Physical

No single physical finding or combination of symptoms and signs is sufficiently accurate to establish the diagnosis of DVT. The following is a list outlining the most sensitive and specific physical findings in DVT:

- Edema, principally unilateral

- Tenderness is usually confined to the calf muscles or along the course of the deep veins in the medial thigh. Pain and/or tenderness away from these areas is not consistent with venous thrombosis and usually indicates another diagnosis.

Homans sign :

Discomfort in the calf muscles on forced dorsiflexion of the foot with the knee straight has been a time-honored sign of DVT. However, this sign is present in less than one third of patients with confirmed DVT.

The Homans sign is found in more than 50% of patients without DVT and, therefore, is nonspecific.

Venous distension and prominence of the subcutaneous veins

Superficial thrombophlebitis is characterized by the finding of a palpable, indurated, cordlike, tender, subcutaneous venous segment. Forty percent of patients with superficial thrombophlebitis without coexisting varicose veins and with no other obvious have an associated DVT.

Patients with superficial thrombophlebitis extending to the saphenofemoral junction are also at higher risk for associated DVT.

Fever: Patients may have a fever, usually low grade

Phlegmasia cerulea dolens

Patients with venous thrombosis may have variable discoloration of the lower extremity. The most common abnormal hue is reddish purple from venous engorgement and obstruction.

In rare cases, the leg is cyanotic from massive ileofemoral venous obstruction. This ischemic form of venous occlusion was originally described as phlegmasia cerulea dolens or painful blue inflammation. The leg is usually markedly edematous, painful, and cyanotic. Petechiae are often present.

Phlegmasia alba dolens

Painful white inflammation was originally used to describe massive ileofemoral venous thrombosis and associated arterial spasm. The affected extremity is often pale with poor or even absent distal pulses.

The physical findings may suggest acute arterial occlusion, but the presence of swelling, petechiae, and distended superficial veins point to this condition.

Clinical findings of PE

These findings are the primary manifestation in about 10% of patients with DVT.

Wells Clinical Score for DVT [19] :

Clinical Parameter Score	**Score**
Active cancer (treatment ongoing, or within 6 mo or palliative)	+1
Paralysis or recent plaster immobilization of the lower extremities	+1
Recently bedridden for >3 d or major surgery <4 wk	+1
Localized tenderness along the distribution of the deep venous system	+1
Entire leg swelling	+1
Calf swelling >3 cm compared with the asymptomatic leg	+1
Pitting edema (greater in the symptomatic leg)	+1
Previous DVT documented	+1
Collateral superficial veins (nonvaricose)	+1
Alternative diagnosis (as likely or greater than that of DVT)	-2

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Total of above score

High probability	>3
Moderate probability	1 or 2
Low probability	<0

Lab Studies

Recent interest has focused on the use of D-dimer in the diagnostic approach to DVT. D-dimer fibrin fragments are present in fresh fibrin clot and in fibrin degradation products of cross-linked fibrin. Monoclonal antibodies specific for the D-dimer fragment are used to differentiate fibrin-specific clot from non–cross-linked fibrin and from fibrinogen. These specific attributes of the D-dimer antibodies account for their high sensitivity for venous thromboembolism.

D-dimer levels remain elevated in DVT for about 7 days. Patients presenting late in the course, after clot organization and adherence have occurred, may have low levels of D-dimer. Similarly, patients with isolated calf vein DVT may have a small clot burden and low levels of D-dimer that are below the analytic cut-off value of the assay. This accounts for the reduced sensitivity of the D-dimer assay in the setting of confirmed DVT.

D-dimer results should be used as follows:

A negative D-dimer assay result rules out DVT in patients with low-to-moderate risk and a Wells DVT score less than 2.

All patients with a positive D-dimer assay result and all patients with a moderate-to-high risk of DVT require a diagnostic study .

Protein S, protein C, antithrombin III, factor V Leyden, prothrombin 20210A mutation, antiphospholipid antibodies, and homocysteine levels can be measured.

Deficiencies of these factors or the presence of these abnormalities all produce a hypercoagulable state. These are rare causes of DVT.

Imaging Studies

Because of the inherent inaccuracy of clinical diagnosis that is based on the history, the physical examination, and the assessment of risk factors, D-dimer testing and a determination of pretest probability should be used to identify those patients who require further objective diagnostic testing.

Diagnosing DVT and committing patients to the risks of anticoagulation therapy without confirmatory objective testing is unacceptable.

Duplex ultrasonography

Technological advances in ultrasonography have permitted the combination of real-time ultrasonographic imaging with Doppler flow studies (duplex ultrasonography). The major ultrasonographic criterion for detecting venous thrombosis is failure to compress the vascular lumen, presumably because of the presence of occluding thrombus. The absence of the normal phasic Doppler signals arising from the changes to venous flow provides indirect evidence of venous occlusion.

Duplex ultrasonography is also helpful to differentiate venous thrombosis from hematoma, Baker cyst, abscess, and other causes of leg pain and edema.

The primary disadvantage of duplex ultrasonography is its inherent inaccuracy in the diagnosis of calf vein thrombosis.

Impedance plethysmography

In some countries, impedance plethysmography (IPG) has been the initial noninvasive diagnostic test of choice. This procedure is based on recording changes in blood volume of an extremity, which are directly related to venous outflow. In the setting of proximal vein thrombosis, venous outflow from the lower extremity is slowed and the blood volume or venous capacitance is increased. Standardized graphs are used to discriminate normal IPG study results from abnormal results.

MRI

MRI has increasingly been investigated for evaluation of suspected DVT. In limited studies, the accuracy approaches that of the criterion standard, contrast venography.

MRI is the diagnostic test of choice for suspected iliac vein or inferior vena caval thrombosis when CT venography is contraindicated or technically inadequate. In suspected calf vein thrombosis, MRI is more sensitive than any other noninvasive study. Expense, lack of general availability, and technical issues limit its use. Although MRI is highly sensitive and relatively specific, the cost of the examination, the technical complexity, and the lack of general availability limit the use of MRV as a screening tool [20,21].

CT venography

With the introduction of multidetector CT technology, CT venography has been incorporated into CT angiographic studies of the chest as part of the diagnostic evaluation for suspected PE. CT venography of the lower extremities is performed after scanning of the chest has been completed. Studies in which indirect CTV was compared with venography showed 100% sensitivity and 96-97% specificity [22].

In the Prospective Investigation of Pulmonary Embolism Diagnosis II (PIOPED II) study reported by Stein et al, the addition of CT venography to CT angiography of the chest increased the diagnostic sensitivity for venous thromboembolic disease than CT angiography alone [23].

The primary utility of CT venography is for the diagnosis of ileofemoral DVT. The iliac veins cannot usually be visualized by ultrasonography, and a different diagnostic modality must be used. Herein lies the value of CT venography where venous occlusion proximal to the inguinal ligament may be detected.

Medical therapy:

Treatment of DVT by anticoagulation

Anticoagulation has been the mainstay of therapy for DVT and PE since the initial introduction of heparin into clinical use in the 1930s. Rapid anticoagulation is essential because thrombus progression and recurrent embolization are 15 times higher in patients who do not receive adequate anticoagulation within the first 48 hours.

After initial anticoagulation with heparin, long-term anticoagulation is usually maintained with warfarin. Warfarin should never be started without prior heparinization because warfarin reduces the levels of anticoagulants before it reduces the levels of procoagulant proteins. This produces a hypercoagulable state during the first 5-7 days. If heparin is not given during this period of warfarin induction, many patients have worsening thrombosis.

Intravenous unfractionated heparin is gradually being replaced in modern practice by subcutaneous fractionated low molecular weight heparins. These newer agents offer much easier dosing, a wider therapeutic window, fewer bleeding complications, and faster and more reliable results. Several different preparations are

available, but the various heparins are not equivalent and each requires a different dosing regimen.

Treatment of DVT by fibrinolysis

Fibrinolytic therapy has intrinsic appeal because it is intuitively obvious that it is preferable to remove an abnormal clot rather than to allow it to remain in place. Besides the obvious advantage of restoring a widely patent outflow channel, lysis of a thrombus has been demonstrated to preserve and restore normal venous valve structure and function if performed early enough in the course of the disease process.

The cumulative evidence suggests that compared with anticoagulation alone, lytic therapy for DVT produces more rapid clot resolution, more complete clot resolution, a marked reduction in late symptoms, and a reduced likelihood of recurrent DVT. By removing the clot before venous valve injury occurs, fibrinolysis can maintain and restore normal physiologic function of the venous system of the leg, when anticoagulation alone fails to do so in the vast majority of cases.

In 1997 a study by Konstantinides et al, which was a 719-patient multicenter registry study of patients with PE, showed a mortality rate of 11.1% for patients initially treated with heparin, compared with 4.7% for patients initially treated with fibrinolytic agents [24].

Surgery for DVT

Surgical therapy for DVT may be indicated when anticoagulant therapy is ineffective, unsafe, or contraindicated. The major surgical procedures for DVT are clot removal and partial interruption of the inferior vena cava to prevent PE.

The rationale for thrombectomy is to restore venous patency and valvular function. Thrombectomy alone is not indicated because rethrombosis is frequent. Heparin therapy is a necessary adjunct. Thrombectomy is reserved for patients with massive ileofemoral vein thrombosis (phlegmasia cerulea dolens) with vascular compromise when thrombolysis is absolutely contraindicated.

Compression stockings

The post thrombotic syndrome affects approximately 50% of patients with DVT after 2 years. Elderly patients and patients with recurrent ipsilateral DVT have the highest risk. Below-the-knee elastic stockings assist the calf muscle pump and reduce venous hypertension and venous valvular reflux. This reduces leg edema, aids the microcirculation, and prevents venous ischemia.

The regular use of graduated elastic compression stockings reduces the incidence of the postphlebitic syndrome by 50%.

Ambulation

Controversy exists regarding the role of ambulation in the therapy of DVT. The study by Partsch cited 2 small previous studies that demonstrated that the incidence of a new PE after initiation of anticoagulant therapy with a LMWH did not

increase significantly in patients treated with early ambulation and compression. The authors concluded that early ambulation and compression is not associated with any significant risk of PE [25].

Surgical therapy:

Long-term results after DVT are better whenever venous patency and valve function can be established early and maintained. No matter what treatment modality is chosen, preservation of patency and of venous valve function are the strongest predictors of a good long-term outcome.

In many patients, fibrinolysis alone is highly effective, and it has become the primary treatment of choice for many forms of venous and arterial thrombosis. Unfortunately, when thrombosis is extensive, fibrinolysis alone may be inadequate to dissolve the volume of thrombus present.

Venous thrombectomy is a rarely used method of clot extraction that may improve the long-term outcome if it is successful in establishing and maintaining patency

Filters for DVT

The idea of placing a barrier in the inferior vena cava to prevent PE from DVT was first suggested by Trousseau in 1868. In the mid 1900s before the adoption of anticoagulant therapy, DVT and PE were generally managed by laparotomy and vena caval ligation. The IVC filters are inserted transvenously under simple local anesthesia. The current benchmark standard is the Greenfield filter. Its design

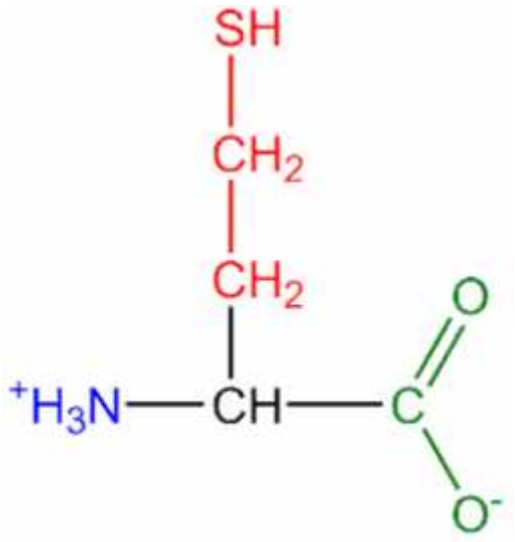
incorporates all the features of an ideal filter — maintain caval patency, trap emboli, preserve prograde caval blood flow, avoid stasis, and enhance thrombolysis of trapped emboli. The Greenfield filter achieves a long-term patency rate of 98% with only a 4% incidence of recurrent PE.

Generally accepted indications for filter placement are (1) severe hemorrhagic complications on anticoagulant therapy or other absolute contraindications to anticoagulation and (2) failure of anticoagulant therapy, such as new or recurrent venous thrombosis or PE, despite adequate anticoagulation. The use of vena caval filters has expanded to include primary venous thromboembolism prophylaxis in special patient populations at increased risk of VTE.

The study by Decousus et al randomized 400 patients with proximal DVT to filter or no filter groups. Both groups were anticoagulated with UFH. After 12 days, a statistically significant reduction occurred in PE in the filter group [26].

Currently, the newer filters are placed under ultrasonographic guidance either by transabdominal or by intravascular ultrasonography. The advantage of ultrasonography is that the filters may be placed at the bedside in the ICU or the ED, thereby avoiding the pitfalls and difficulties of transporting the patient to the angiography suite.

HYPERHOMOCYSTEINEMIA



Homocysteine is a sulfhydryl containing amino acid derived from the essential amino acid, methionine, which is abundant in animal sources of protein [27]. The metabolic pathway that converts methionine to homocysteine is essential for the proper functioning of many biomolecules, including DNA, proteins, phospholipids and neurotransmitters [27,28,29].

In the methylation pathway, homocysteine acquires a methyl group either from betaine (a reaction that occurs mainly in the liver) or from 5-methyltetrahydrofolate (a reaction that occurs in all tissues and is vitamin B12-dependent). In the transsulfuration pathway, homocysteine is metabolised to cystathionine in a reaction catalysed by cystathionine-β- synthase and requiring vitamin B6.

Plasma concentrations of homocysteine vary widely, but intracellular concentrations of homocysteine are normally maintained within a relatively narrow

range [29]. Total plasma (or total serum) homocysteine refers to the combined pool of free, bound, reduced and oxidised forms of homocysteine in the blood.

The following factors influence homocysteine metabolism and cause hyperhomocysteinaemia

Genetic factors

1. 5, 10-Methylenetetrahydrofolate reductase C677T homozygosity (common)
2. Heterozygosity for cystathionine beta synthase defects (uncommon)
3. Homocystinuria (very rare)

Physiological factors

1. Increasing age
2. Male gender
3. Menopause
4. Reduced glomerular filtration rate
5. Increased muscle mass

Lifestyle factors

1. Reduced vitamin intake (folate, vitamin B12, vitamin B6)
2. Smoking
3. Caffeine consumption
4. Alcohol consumption
5. Physical inactivity

Disease states

1. Vitamin deficiency (folate, vitamin B12, vitamin B6)
2. Renal failure
3. Hypothyroidism
4. Diabetes mellitus
5. Psoriasis
6. Malignancies

Drugs

1. Lipid lowering — cholestyramine, nicotinic acid, fibric acid derivatives (eg, fenofibrate)
2. Anticonvulsants — phenytoin, carbamazepine
3. Sex hormones — androgens
4. Anti-rheumatic drugs — methotrexate
5. Other — cyclosporin, diuretics, levodopa, methionine loading (oral, intravenous, peritoneal), theophylline, trimethoprim

Many hypotheses have been proposed to explain how hyperhomocysteinemia may lead to venous thrombosis and atherosclerosis. One hypothesis is that homocysteine has a toxic effect on the vascular endothelium and on the clotting cascade [1,2]. However, virtually all these studies used amounts of homocysteine that produced higher-than-physiologic concentrations. Alternatively, hyperhomocysteinemia may reflect abnormal methionine metabolism that affects the methylation of DNA and cell membranes [30].

Causes of hyperhomocysteinemia are multifactorial [31,32]. Most operate by altering the function or blood concentrations of B vitamins (folic acid, vitamin B12, vitamin B6) involved as cofactors in the homocysteine metabolic pathway, interfering with renal function, or influencing enzyme activities. The single most important determinant of tHcy in the general population is folate status [29].

Lowering plasma homocysteine concentrations by folic-acid-based vitamin supplementation is recommended in the treatment of hyperhomocysteinemia.

Definition of hyperhomocysteinemia

An elevated plasma tHcy level (hyperhomocysteinemia) is most commonly defined according to arbitrary cut-off points (e.g. 95th percentile) in the distribution of values obtained from the so-called normal population. Each laboratory should establish reference limits for its own region, with separate reference limits for children, adults, the elderly and pregnant women.

Laboratory studies suggest that an elevated tHcy level is both atherogenic and thrombogenic [27,33,34,35]. Given below are the proposed mechanisms by which hyperhomocysteinemia produces these complex changes in the structure and function of cerebral, coronary and peripheral vessels.

Atherogenesis

- Induces DNA hypomethylation and expression of genes known to mediate cell growth and differentiation.
- Induces oxidative stress.

- Induces vascular inflammation by altering expression of tumour necrosis factor-α and inducible Nitric Oxide synthase.
- Induces endothelial dysfunction as a result of increased oxidative stress, decreased bioavailability of nitric oxide (due to increased oxidative stress), and increased inflammation.
- Alters hepatic and macrophage lipoprotein metabolism, in part by enhancing uptake of modified low density lipoprotein.
- Induces hypertrophy and altered mechanics in the microcirculation, and increases intima media thickness.

Thrombogenesis

- Induces tissue factor expression in monocytes.
- Modulates leukocyte–endothelium interactions.
- Increases platelet aggregation.
- Enhances binding of lipoprotein-A to fibrin.
- Interferes with several clotting factors.

Folic acid has been shown to prevent postprandial endothelial dysfunction in normohomocysteinaemic subjects, and to improve endothelial function in patients with hyperhomocysteinemia, hypercholesterolemia, diabetes and coronary artery disease [29]. The exact mechanisms underlying the ameliorative effects of folate on the endothelium are uncertain, but may include homocysteine-lowering, antioxidant actions, effects on cofactor availability, or direct interactions with the enzyme endothelial nitric oxide synthase [33,34,35]

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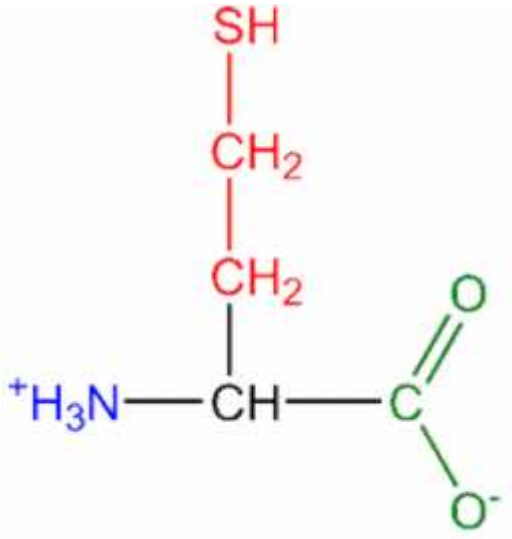

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MATERIALS AND METHODS

This study was conducted in KLE'S hospital and medical research centre, Belgaum from December 2006 to December 2007. After obtaining approval from the institutional ethics committee, written informed consent was taken from all the patients who were included in the study.

Inclusion criteria:

All patients with deep vein thrombosis confirmed by Doppler ultrasound were included in the study.

Exclusion criteria:

There was no exclusion criteria.

METHODOLOGY

During the course of the study, all patients with Doppler ultrasound proven deep vein thrombosis were included in the study.Written informed consent was taken from the patients for participation in the study. Details of the patient like name, age, sex, inpatient number, history of smoking, DM, HTN, IHD were recorded on the proforma.

METHOD OF HOMOCYSTEINE ESTIMATION

2cc of over night Fasting venous blood sample was collected in EDTA bulb from the cubital vein and sent for serum homocysteine estimation to the biochemistry laboratory.

The ELISA method was used for the estimation of serum homocysteine levels. *Hyperhomocysteinemia* was defined as a serum homocysteine level of more than 16.0 in male patients and a serum homocysteine level of more than 20.4 in female patients.

STATISTICAL ANALYSIS

The prevalence was calculated using the following formula :

$$\text{Prevalence} = \frac{\text{Number of patients with DVT with hyperhomocysteinemia}}{\text{Total number of patients with DVT}} \times 100$$

Statistical analysis for significance of difference between age, sex, and presence or absence of the risk factors such as DM, HTN, smoking, IHD, immobilasation and trauma and surgery, between the two groups was done using Chi-Square test with Yate's correction.

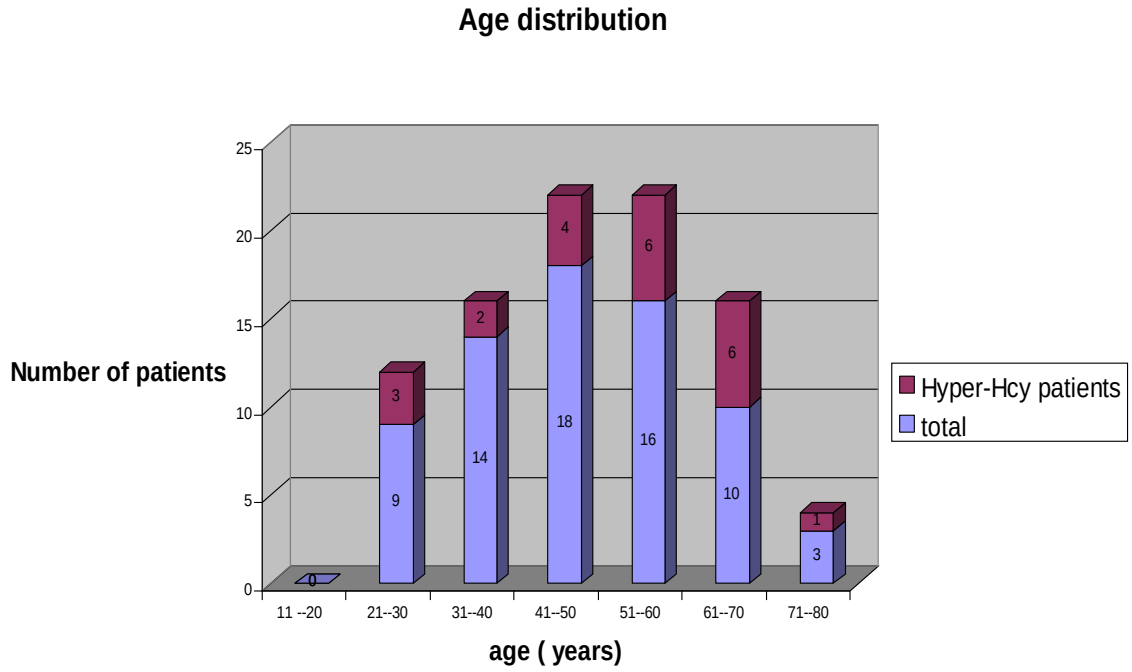
OBSERVATIONS AND RESULTS

A total of 70 patients satisfied the selection criteria.Out of these 70 patients 22 patients were found to have raised serum homocysteine levels.The prevalence of hyperhomocysteinemia in this study was calculated as 31.428 %.

The observations are represented in tabular form:

TABLE NO.1: AGE DISTRIBUTION

Age	Total	Hyper-Hcy patients
11 --20	0	0
21--30	9	3
31--40	14	2
41--50	18	4
51--60	16	6
61--70	10	6
71--80	3	1



On analysis with Chi-square test the P value for the difference in age distribution in the two groups was 0.6519 showing the insignificance of the same

TABLE NO.2: SEX DISTRIBUTION

Age	Males	Females
11--20	0	0
21--30	3	0
31--40	1	1
41--50	3	1
51--60	6	0
61--70	6	0
71--80	0	1

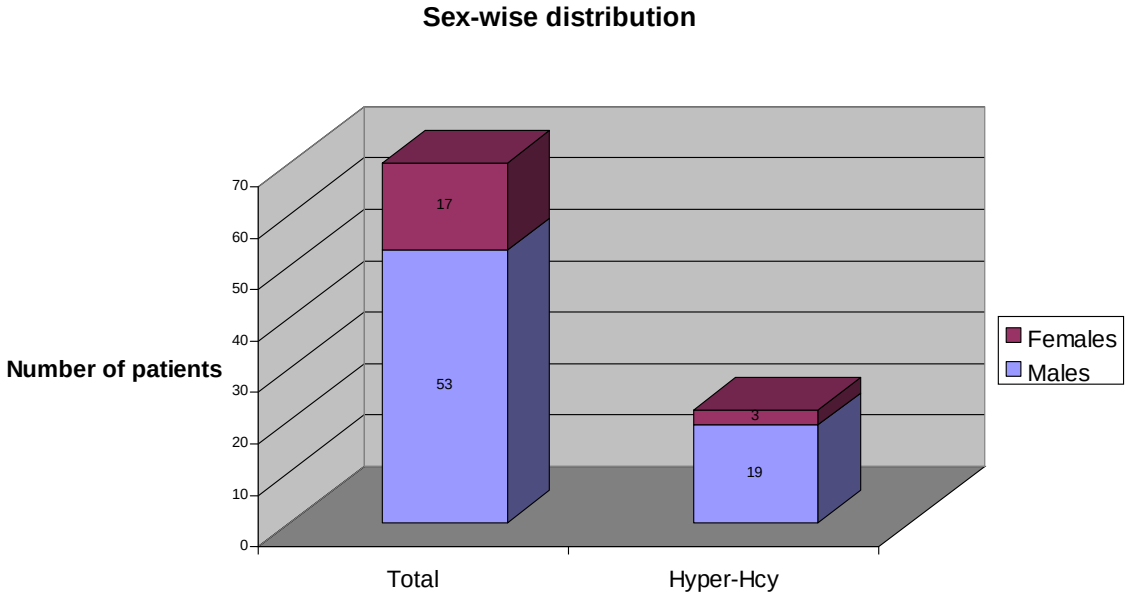


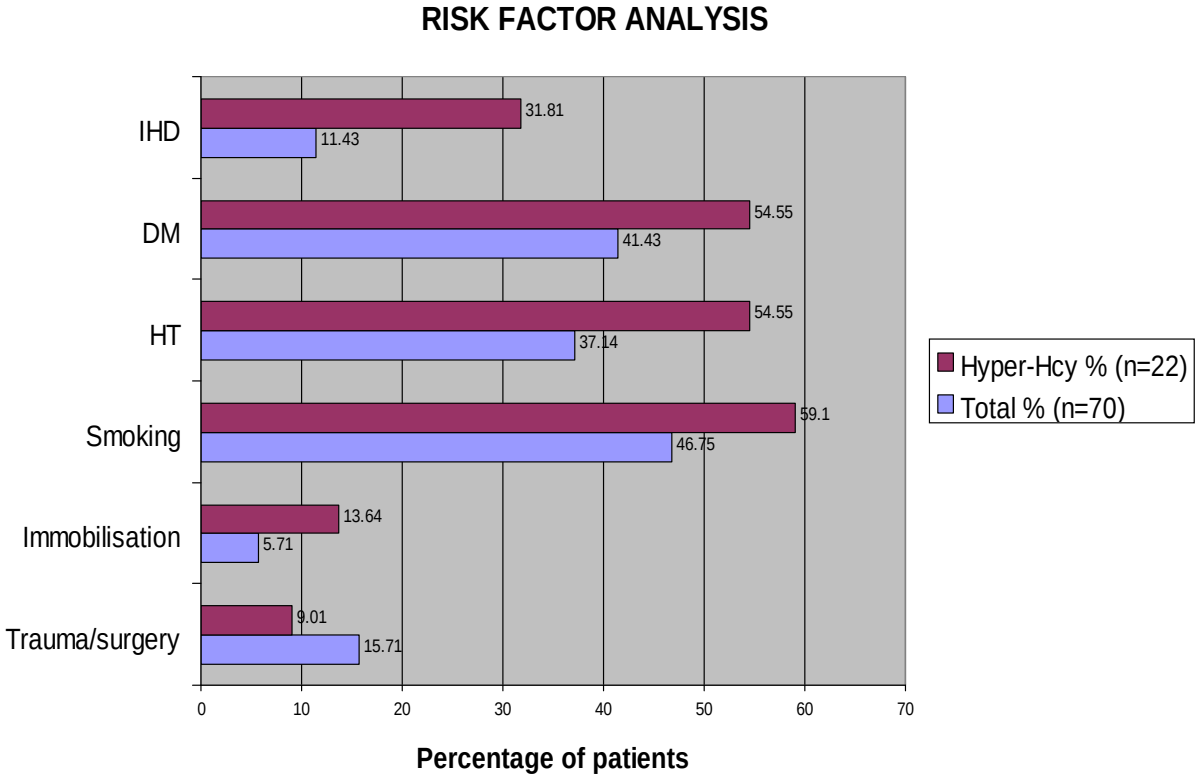
TABLE 3: SEX DISTRIBUTION 2

Gender	Total	HyperHcy
Males	53	19
Females	17	3

The prevalence of hyper homocysteinemia among males was 35.85 % and that among females was 17.64 %.The P value for the sex distribution difference in the two groups was 0.268 showing that the difference was insignificant

TABLE 4. RISK FACTOR ANALYSIS

RISK FACTORS	Total % (n=70)	Hyper-Hcy % (n=22)	p VALUE
Trauma/surgery	15.71	9.01	p = 0.498
Immobilisation	5.71	13.64	p = 0.168
Smoking	46.75	59.1	p = 0.385
HT	37.14	54.55	p = 0.061
DM	41.43	54.55	p = 0.131
IHD	11.43	31.81	p = 0.005



The P value for the distribution of risk factors in the two groups was significant only in case of presence of IHD wherein the P value was 0.005.In case of all the other risk factors the P value was > 0.05 showing that the difference was insignificant

DISCUSSION

Hyperhomocysteinemia is a proven risk factor for deep vein thrombosis. The prevalence of hyperhomocysteinemia in cases of DVT is mentioned in literature. Elevated homocysteine concentrations have been found in 40% of patients with vascular disease and 35% of patients with venous thromboembolism [18]. A case control study conducted by Simioni et al. showed that the prevalence of hyperhomocysteinemia in their study was 25 % [36].Another study by Den Heijer M showed a prevalence of hyperhomocysteinemia as 10 % [18]. In our study the prevalence of hyperhomocysteinemia in patients with DVT was found to be 31.428 %.Thus our study shows that the prevalence of hyperhomocysteinemia in patients with DVT is higher in our Indian population as compared to western population.

Falcon et al. found that hyperhomocysteinemia was a risk factor for thrombosis in people younger than 40 years of age[6]. Hyperhomocysteinemia is a risk factor for recurrent venous thrombosis in patients between 20 and 70 years of age, as compared with controls from the general population[7].In our study there was no statistical significance in the prevalence of hyperhomocysyeinemia among the different age groups.

In our study the sex wise prevalence of hyperhomocysteinemia was 35.85 % in males as compared to 17.64 % in females.Thus the prevalence was higher in males as compared to females.This is consistent with finding in other studies [7,9,18].

In the distribution of risk factors in the two groups IHD was significant with a P value was 0.005. Hyperhomocysteinemia is also associated with arterial thrombosis [12,13,14,15,18]. It is an established risk factor for atherosclerosis and vascular disease [1,2,,13,14,16]. The association between mild hyperhomocysteinemia and venous thrombosis is similar in degree to that reported for hyperhomocysteinemia and arterial vascular disease [37,38]. Thus in our study, there is a statistically significant association between hyperhomocysteinemia and IHD.

Although smoking is a known risk factor for hyperhomocysteinemia, this study did not show any statistically significant association between them.

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CONCLUSION

- The prevalence of hyperhomocysteinemia in cases of deep vein thrombosis in our population was 31.428 %.
- There was a statistically significant association between hyperhomocysteinemia and ischaemic heart disease.
- Smoking was not a statistically significant risk factor for hyperhomocysteinemia.

SUMMARY

Hyperhomocysteinemia is a known risk factor for the development of deep vein thrombosis. Various studies have been conducted in the western countries to know the prevalence of hyperhomocysteinemia in patients with DVT and in general population. There is no documented literature of the prevalence of hyperhomocysteinemia in Indian population. Thus this study was conductd to determine the prevalence of hyperhomocysteinemia in cases of DVT in our population.

This was a Prospective cross sectional study with a total of 70 patients included in the study. DVT was confirmed by Doppler examination. Serum homocysteine was measured and the data analysed. Prevalence was calculated. Statistical significance was calculated using chi square test.

Of the 70 patients studied 53 were males and 17 were females. The prevalence of hyperhomocysteinemia among the cases of DVT was 31.428 %.The prevalence among males was 35.85 % and among females was 17.64 %.There was statistically significant association between hyperhomocysteinemia and presence of ischaemic heart disease with a p value of 0.005 on chi square analysis..

BIBLIOGRAPHY

1. Undas A, Brozek J, Szczeklik A. Homocysteine and thrombosis: from basic science to clinical evidence. Thromb Haemost 2005;94:907-15.

2. Rees MM, Rodgers GM. Homocysteinemia: association of a metabolic disorder with vascular disease and thrombosis. Thromb Res 1993; 71:337-359.

3. Mudd SH, Skovby F, Levy HL. The natural history of homocystinuria due to cystathionine beta-synthase deficiency. Am J Hum Genet 1985; 37:1-31.

4. Ageno W, Prandoni P, Romualdi E, Ghirarduzzi A. The metabolic syndrome and the risk of venous thrombosis: a case-control study. J Thromb Haemost 2006;4:1914-8.

5. Brattström L, Tengborn L, Lagerstedt C, Israelsson B, Hultberg B. Plasma homocysteine in venous thromboembolism. Haemostasis 1991; 21:51-57.

6. Falcon CR, Cattaneo M, Panzeri D, Martinelli I, Mannucci PM. High prevalence of hyperhomocysteinemia in patients with juvenile venous thrombosis. Arterioscler Thromb 1994; 14:1080-1083.

7. Den Heijer M, Blom HJ, Gerrits WBJ. Is hyperhomocysteinaemia a risk factor for recurrent venous thrombosis? Lancet 1995;345:882-885

8. Kumar V, Abbas AK, Fausto N. Robbin and Cotran Pathologic Basis of Disease. 7th ed. Philadelphia, Saunders; 2004: 130-133

9. Rosen P, Barkin RM. Emergency Medicine: Principles and Practice. Vol 3. 4th ed. St. Louis, Mosby; 1998: Chapter 107;1123-1154

10. Havig O. Deep vein thrombosis and pulmonary embolism. An autopsy study with multiple regression analysis of possible risk factors. Acta Chir Scand Suppl 1977; 478: 1-120

11. Rosen P, Barkin RM, Feied CF. Emergency Medicine: Concepts and clinical practice . 5th ed. St. Louis, Mosby; 2001: Chapter 83; 786-794.

12. Malinow MR. Plasma homocyst(e)ine and arterial occlusive diseases: a mini-review. Clin Chem. 1995;41:173-176.

13. Malinow MR. Hyperhomocyst(e)inemia: a common and easily reversible risk factor for occlusive atherosclerosis. Circulation. 1990;81:2004-2006.

14. Frohlich JJ. Lipoproteins and homocyst(e)ine as risk factors for atherosclerosis: assessment and treatment. Can J Cardiol. 1995;11:18C-23C

15. Malinow MR. Homocyst(e)ine and arterial occlusive diseases. J Intern Med. 1994;236:603-617.

16. Fortin LJ, Genest J Jr. Measurement of homocyst(e)ine in the prediction of arteriosclerosis. Clin Biochem. 1995; 28:155-162.

17. Ray JG. Meta-analysis of hyperhomocysteinemia as a risk factor for venous thromboembolic disease. Arch Intern Med. 1998;158:2101-2106

18. Den Heijer M, Koster T, Blom HJ. Hyperhomocysteinemia as a risk factor for deep-vein thrombosis. N Engl J Med. 1996; 334:759-762.

19. Anand SS, Wells PS, Hunt D, Brill-Edwards P, Cook D, Ginsberg JS. Does this patient have deep vein thrombosis? JAMA. Apr 8 1998; 279(14):1094-9.

20. Michiels JJ, Oortwijn WJ, Naaborg R. Exclusion and diagnosis of deep vein thrombosis by a rapid ELISA D- dimer test, compression ultrasonography, and a simple clinical model. Clin Appl Thromb Hemost. Jul 1999; 5(3):171-80.

21. Nawaz S, Chan P, Ireland S. Suspected deep vein thrombosis: a management algorithm for the accident and emergency department. J Accid Emerg Med. Nov 1999;16(6):440-2

22. Garg K, Kemp JL, Wojcik D, et al. Thromboembolic disease: comparison of combined CT pulmonary angiography and venography with bilateral leg sonography in 70 patients. AJR Am J Roentgenol. Oct 2000;175(4):997-1001.

23. Stein PD, Fowler SE, Goodman LR, Gottschalk A, Hales CA, Hull RD, et al. Multidetector computed tomography for acute pulmonary embolism. N Engl J Med. Jun 1 2006;354(22):2317-27.

24. Konstantinides S, Geibel A, Olschewski M. Association between thrombolytic treatment and the prognosis of hemodynamically stable patients with major pulmonary embolism: results of a multicenter registry. Circulation 1997 Aug 5; 96(3): 882-8

25. Partsch H. Ambulation and compression after deep vein thrombosis: dispelling myths. Semin Vasc Surg. Sep 2005; 18(3):148-52.

26. Decousus H, Leizorovicz A, Parent F, Page Y, Tardy B, Girard P. A clinical trial of vena caval filters in the prevention of pulmonary embolism in patients with proximal deep-vein thrombosis. N Engl J Med. Feb 12 1998; 338(7):409-15.

27. Hankey GJ, Eikelboom JW. Homocysteine and vascular disease. Lancet 1999; 354: 407-413 N Engl J Med. 1996; 334:759-762.

28. D'Angelo A, Selhub J. Homocysteine and thrombotic disease. Blood 1997; 90: 1-11

29. Moat SJ, Lang D, McDowell IFW. Folate, homocysteine, endothelial function and cardiovascular disease. J Nutr Biochem 2004; 15: 64-79.

30. Blom HJ, van der Molen EF. Pathobiochemical implications of hyperhomocysteinemia. Fibrinolysis 1994; 8:86-7.

31. Refsum H, Smith AD, Ueland PM, et al. Facts and recommendations about total homocysteine determinations: an expert opinion. Clin Chem 2004; 50: 3-32.

32. Desouza C, Keebler M, McNamara DB, Fonseca V. Drugs affecting homocysteine metabolism. Impact on cardiovascular risk. Drugs 2002; 62: 605-616

33. Symons JD, Mullick AE, Ensunsa JL. Hyperhomocysteinaemia evoked by folate depletion: effects on coronary and carotid arterial function. Arterioscler Thromb Vasc Biol 2002; 22: 772-780.

34. Faraci FM. Hyperhomocysteinaemia: a million ways to lose control. Arterioscler Thromb Vasc Biol 2003; 23: 371-373.

35. Faraci FM, Lentz SR. Hyperhomocysteinemia, oxidative stress, and cerebral vascular dysfunction. Stroke 2004; 35: 345-347

36. Simioni P, Pradoni P, Burlina A, Tormene D, Sardella C, Ferrari V et al. Hyperhomocysteinemia and deep-vein thrombosis. A case-control study**.** Thromb Haemost. 1996 Dec; 76(6): 883-6

37. Selhub J, Jacques PF, Bostom AG. Association between plasma homocysteine concentrations and extracranial carotid-artery stenosis. N Engl J Med 1995;332:286-291

38. Stampfer MJ, Malinow MR, Willett WC. A prospective study of plasma homocysteine and risk of myocardial infarction in US physicians. JAMA 1992; 268:877-881.

ANNEXURE-II

PARTICIPANT INFORMED CONSENT FORM

We hereby request you to participate in our study – "**ONE YEAR CROSS SECTIONAL STUDY TO DETECT THE PREVALENCE OF HYPERHOMOCYSTEINEMIA IN CASES OF DEEP VEIN THROMBOSIS IN KLES HOSPITAL, BELGAUM**."

PRINCIPAL INVESTIGATORS:

Name : Dr. Gautam V. Kamat

Guide : Dr. Shrishail C. Metgud

PURPOSE OF THE STUDY

The purpose of the study is to evaluate the level of homocysteine in blood in patients with deep vein thrombosis. There will be approximately 70 participants in the study . This study will be under the supervision of Dr. Shrishail C. Metgud, Professor in General Surgery, Department of General Surgery, KLES hospital, Belgaum.

PROCEDURE

This is an observational study and you will be included in the study only if you wish to give consent for the study and agree to provide additional background and medical information required. You will be asked about the details of present and other relevant history. Clinical examination and Doppler study of the lower limbs will be required to

be performed. After the required clinical examination and investigations, the levels of homocysteine in your blood will be measured.

The health care that is provided to you by the doctors and staff in the hospital will remain the same regardless of your choice and whether you are in the study group or not.

FINANCIAL INCENTIVE FOR PARTICIPATION.

You will not receive any payment for the participation in this study.

ALTERNATIVES

If you decide not to participate in the study, the doctor and the staff will provide the usual standard care throughout your hospital stay.

AUTHORISATION TO PUBLISH RESULTS

Results of this study maybe published for scientific purposes or presented to scientific groups; however, you will not be identified.

INSTITUTIONAL POLICY

The doctors and the staff of KLES Hospital, Belgaum, will provide facilities and medical attention to you within the limitations of the laws of the state of Karnataka.

VOLUNTARY PARTICIPATION

Your participation in this study is voluntary and your decision whether or not participate , will not affect the care during current or future relations with the doctors and hospital.

In case you need any further information regarding your rights as a study participant, you may contact:

The Investigator

Dr. Gautam V. Kamat

PG student, Dept of General Surgery,

JNMC Belgaum.

09986415390

Guide

Dr. Shrishail C. Metgud

Associate Professor

Dept. of General Surgery

JNMC Belgaum.

ANNEXURE-III: MASTER CHART

Sr. No.	Name	Age	Gender	Trauma/ surgery	Immobili ation	Smoking	HT	DM	IHD	Doppler study	Se. Hcy level
1	SK	42	M	Nil	Nil	+	+	+	Nil	DVT Rt DFV	12.2
2	RP	46	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	30.6
3	SM	38	M	+	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	10.6
4	KS	40	M	Nil	Nil	+	+	Nil	Nil	DVT Lt DFV	11.4
5	AD	34	M	Nil	Nil	+	Nil	+	Nil	DVT Rt DFV	10.7
6	IS	58	M	Nil	Nil	+	+	Nil	+	DVT Rt DFV	21.67
7	AD	30	M	Nil	Nil	+	Nil	Nil	Nil	DVT Lt DFV	22.3
8	DK	43	M	Nil	Nil	+	Nil	Nil	Nil	DVT Rt DFV	6.4
9	KP	46	F	Nil	Nil	Nil	+	+	Nil	DVT Rt DFV	26.4
10	SW	26	M	+	Nil	Nil	Nil	Nil	Nil	DVT Rt CFV	13.1
11	RN	58	M	Nil	Nil	+	Nil	+	Nil	DVT Lt CFV	18.8
12	RH	46	M	Nil	Nil	+	Nil	+	Nil	DVT Rt DFV	12.6
13	HS	72	M	Nil	Nil	Nil	Nil	+	Nil	DVT Lt DFV	14.6
14	VJ	30	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	36.9
15	SK	64	M	Nil	+	Nil	+	+	Nil	DVT Lt CFV	29.2

Sr. No.	Name	Age	Gender	Trauma/ surgery	Immobili ation	Smoking	HT	DM	IHD	Doppler study	Se. Hcy level
16	SC	40	F	Nil	Nil	Nil	Nil	Nil	Nil	DVT Rt DFV	11
17	GM	42	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	29.2
18	RP	44	F	+	Nil	Nil	Nil	Nil	Nil	DVT Rt CFV	9.6
19	BG	34	M	Nil	Nil	+	Nil	Nil	Nil	DVT Lt DFV	17.7
20	MC	48	F	+	Nil	Nil	Nil	Nil	Nil	DVT Rt DFV	7.2
21	BP	66	M	Nil	Nil	+	Nil	Nil	Nil	DVT Lt DFV	19.1
22	SK	68	M	Nil	Nil	+	Nil	+	Nil	DVT Rt DFV	8.6
23	SM	46	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	24.9
24	AW	74	M	+	+	+	+	Nil	+	DVT Lt CFV	8.7
25	NM	48	M	Nil	Nil	+	Nil	Nil	Nil	DVT Rt DFV	5.2
26	NM	68	M	Nil	+	Nil	+	+	+	DVT Rt CFV	26.9
27	MG	34	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	11.1
28	BM	52	M	Nil	Nil	+	Nil	Nil	Nil	DVT Rt DFV	8.3
29	RP	64	M	+	Nil	+	+	+	+	DVT Lt CFV & IV	47.6
30	PA	39	M	Nil	Nil	+	Nil	Nil	Nil	DVT Lt DFV	6.9
31	BM	53	M	Nil	Nil	+	+	Nil	Nil	DVT Rt DFV	10.3
32	GM	49	F	+	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	6.2

Sr. No.	Name	Age	Gender	Trauma/ surgery	Immobili ation	Smoking	HT	DM	IHD	Doppler study	Se. Hcy level
33	RL	55	M	Nil	Nil	+	+	+	Nil	DVT Rt CFV	24.7
34	SP	57	M	Nil	Nil	+	Nil	+	Nil	DVT Rt DFV	4.5
35	SS	67	F	Nil	Nil	Nil	+	Nil	Nil	DVT Lt DFV	8.9
36	YP	51	M	Nil	Nil	+	Nil	Nil	Nil	DVT Rt DFV	26.5
37	KJ	28	F	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	8.2
38	CH	29	M	+	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	4.8
39	BJ	70	M	Nil	Nil	Nil	+	+	+	DVT Rt CFV	17.2
40	MS	47	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	13.9
41	RP	31	F	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	11.5
42	MN	53	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	8.9
43	AD	27	M	+	Nil	Nil	Nil	Nil	Nil	DVT Rt DFV	7.2
44	HH	69	M	Nil	Nil	+	+	+	+	DVT Rt DFV	36.1
45	KA	71	F	Nil	Nil	Nil	+	+	Nil	DVT Lt DFV	21.6
46	IS	22	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Lt DFV	5.2
47	SKG	35	F	Nil	Nil	+	+	+	+	DVT Lt CFV	52.7
48	KG	53	M	Nil	Nil	+	+	+	Nil	DVT Rt DFV	7.6

Sr. No.	Name	Age	Gender	Trauma/ surgery	Immobili ation	Smoking	HT	DM	IHD	Doppler study	Se. Hcy level
49	MH	56	M	Nil	Nil	+	+	Nil	Nil	DVT Rt DFV	20.1
50	RF	55	M	+	+	+	+	+	+	DVT Rt CFV & IV	42.6
51	LP	46	F	Nil	Nil	Nil	+	+	Nil	DVT Rt DFV	8.2
52	RT	38	M	Nil	Nil	+	Nil	+	Nil	DVT Lt DFV	6.9
53	YK	60	M	Nil	Nil	+	+	+	Nil	DVT Rt DFV	12.8
54	HL	49	M	Nil	Nil	+	Nil	Nil	Nil	DVT Lt DFV	13.1
55	TK	43	F	Nil	Nil	Nil	+	+	Nil	DVT Rt DFV	7.9
56	GS	64	M	Nil	Nil	+	Nil	Nil	Nil	DVT Lt DFV	14.9
57	HK	30	M	Nil	Nil	+	Nil	Nil	Nil	DVT L CFV	34.9
58	WR	45	F	Nil	Nil	Nil	+	+	Nil	DVT Rt DFV	12.7
59	NM	56	M	Nil	Nil	+	Nil	+	Nil	DVT Lt DFV	5.5
60	RP	35	M	Nil	Nil	Nil	Nil	Nil	Nil	DVT Rt DFV	6.1
61	PN	57	M	Nil	Nil	+	Nil	+	Nil	DVT Lt DFV	11.6
62	VN	28	M	+	Nil	Nil	Nil	Nil	Nil	DVT L CFV	13.7
63	LP	39	F	Nil	Nil	Nil	Nil	Nil	Nil	DVT Rt DFV	7.7
64	JA	52	M	Nil	Nil	+	+	+	Nil	DVT Lt DFV	8.3
65	CN	47	F	Nil	Nil	Nil	+	Nil	Nil	DVT Rt DFV	7.4

Sr. No.	Name	Age	Gender	Trauma/ surgery	Immobili ation	Smoking	HT	DM	IHD	Doppler study	Se. Hcy level
66	GH	39	M	Nil	Nil	+	Nil	Nil	Nil	DVT Rt DFV	8.5
67	PP	67	M	Nil	Nil	+	Nil	+	Nil	DVT L CFV	14.8
68	FN	49	F	Nil	Nil	Nil	+	Nil	Nil	DVT Rt DFV	4.8
69	UA	37	F	Nil	Nil	Nil	+	+	Nil	DVT Rt DFV	9.9
70	SH	51	M	Nil	Nil	+	Nil	+	Nil	DVT Lt DFV	8.1

KEY TO MASTER-CHART

M	-	Male
F	-	Female
+	-	Present
NIL	-	Absent
DVT	-	Deep vein thrombosis
Rt	-	Right
Lt	-	Left
DFV	-	Deep femoral vein
CFV	-	Common femoral vein
IV	-	Iliac vein
HT	-	Hypertension
DM	-	Diabetes mellitus
IHD	-	Ischaemic heart disease
Se Hcy	-	Serum homocysteine

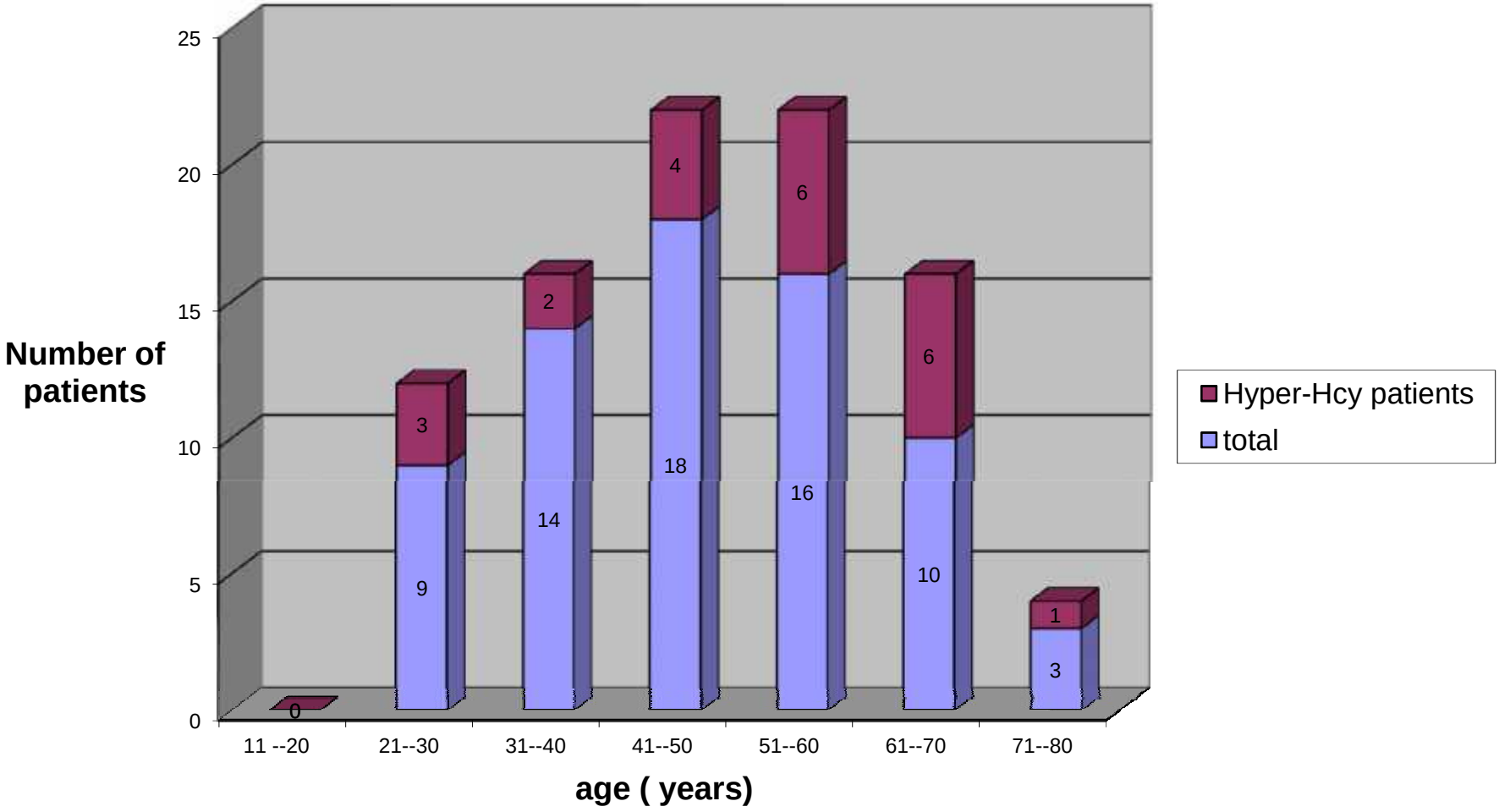
Sr. No.	Name	Age	Gender	Trauma / surgery	Immobilization	Smoking	HT	DM	IHD
1	SK	42	M	Nil	Nil	+	+	+	Nil
2	RP	46	M	Nil	Nil	Nil	Nil	Nil	Nil
3	SM	38	M	+	Nil	Nil	Nil	Nil	Nil
4	KS	40	M	Nil	Nil	+	+	Nil	Nil
5	AD	34	M	Nil	Nil	+	Nil	+	Nil
6	IS	58	M	Nil	Nil	+	+	Nil	+
7	AD	30	M	Nil	Nil	+	Nil	Nil	Nil
8	DK	43	M	Nil	Nil	+	Nil	Nil	Nil
9	KP	46	F	Nil	Nil	Nil	+	+	Nil
10	SW	26	M	+	Nil	Nil	Nil	Nil	Nil
11	RN	58	M	Nil	Nil	+	Nil	+	Nil
12	RH	46	M	Nil	Nil	+	Nil	+	Nil
13	HS	72	M	Nil	Nil	Nil	Nil	+	Nil
14	VJ	30	M	Nil	Nil	Nil	Nil	Nil	Nil
15	SK	64	M	Nil	+	Nil	+	+	Nil
16	SC	40	F	Nil	Nil	Nil	Nil	Nil	Nil
17	GM	42	M	Nil	Nil	Nil	Nil	Nil	Nil
18	RP	44	F	+	Nil	Nil	Nil	Nil	Nil
19	BG	34	M	Nil	Nil	+	Nil	Nil	Nil
20	MC	48	F	+	Nil	Nil	Nil	Nil	Nil
21	BP	66	M	Nil	Nil	+	Nil	Nil	Nil
22	SK	68	M	Nil	Nil	+	Nil	+	Nil
23	SM	46	M	Nil	Nil	Nil	Nil	Nil	Nil
24	AW	74	M	+	+	+	+	Nil	+
25	NM	48	M	Nil	Nil	+	Nil	Nil	Nil
26	NM	68	M	Nil	+	Nil	+	+	+
27	MG	34	M	Nil	Nil	Nil	Nil	Nil	Nil
28	BM	52	M	Nil	Nil	+	Nil	Nil	Nil
29	RP	64	M	+	Nil	+	+	+	+
30	PA	39	M	Nil	Nil	+	Nil	Nil	Nil
31	BM	53	M	Nil	Nil	+	+	Nil	Nil
32	GM	49	F	+	Nil	Nil	Nil	Nil	Nil
33	RL	55	M	Nil	Nil	+	+	+	Nil
34	SP	57	M	Nil	Nil	+	Nil	+	Nil
35	SS	67	F	Nil	Nil	Nil	+	Nil	Nil
36	YP	51	M	Nil	Nil	+	Nil	Nil	Nil
37	KJ	28	F	Nil	Nil	Nil	Nil	Nil	Nil
38	CH	29	M	+	Nil	Nil	Nil	Nil	Nil
39	BJ	70	M	Nil	Nil	Nil	+	+	+
40	MS	47	M	Nil	Nil	Nil	Nil	Nil	Nil
41	RP	31	F	Nil	Nil	Nil	Nil	Nil	Nil
42	MN	53	M	Nil	Nil	Nil	Nil	Nil	Nil
43	AD	27	M	+	Nil	Nil	Nil	Nil	Nil

44	HH	69	M	Nil	Nil	+	+	+	+
45	KA	71	F	Nil	Nil	Nil	+	+	Nil
46	IS	22	M	Nil	Nil	Nil	Nil	Nil	Nil
47	SKG	35	F	Nil	Nil	+	+	+	+
48	KG	53	M	Nil	Nil	+	+	+	Nil
49	MH	56	M	Nil	Nil	+	+	Nil	Nil
50	RF	55	M	+	+	+	+	+	+
51	LP	46	F	Nil	Nil	Nil	+	+	Nil
52	RT	38	M	Nil	Nil	+	Nil	+	Nil
53	YK	60	M	Nil	Nil	+	+	+	Nil
54	HL	49	M	Nil	Nil	+	Nil	Nil	Nil
55	TK	43	F	Nil	Nil	Nil	+	+	Nil
56	GS	64	M	Nil	Nil	+	Nil	Nil	Nil
57	HK	30	M	Nil	Nil	+	Nil	Nil	Nil
58	WR	45	F	Nil	Nil	Nil	+	+	Nil
59	NM	56	M	Nil	Nil	+	Nil	+	Nil
60	RP	35	M	Nil	Nil	Nil	Nil	Nil	Nil
61	PN	57	M	Nil	Nil	+	Nil	+	Nil
62	VN	28	M	+	Nil	Nil	Nil	Nil	Nil
63	LP	39	F	Nil	Nil	Nil	Nil	Nil	Nil
64	JA	52	M	Nil	Nil	+	+	+	Nil
65	CN	47	F	Nil	Nil	Nil	+	Nil	Nil
66	GH	39	M	Nil	Nil	+	Nil	Nil	Nil
67	PP	67	M	Nil	Nil	+	Nil	+	Nil
68	FN	49	F	Nil	Nil	Nil	+	Nil	Nil
69	UA	37	F	Nil	Nil	Nil	+	+	Nil
70	SH	51	M	Nil	Nil	+	Nil	+	Nil

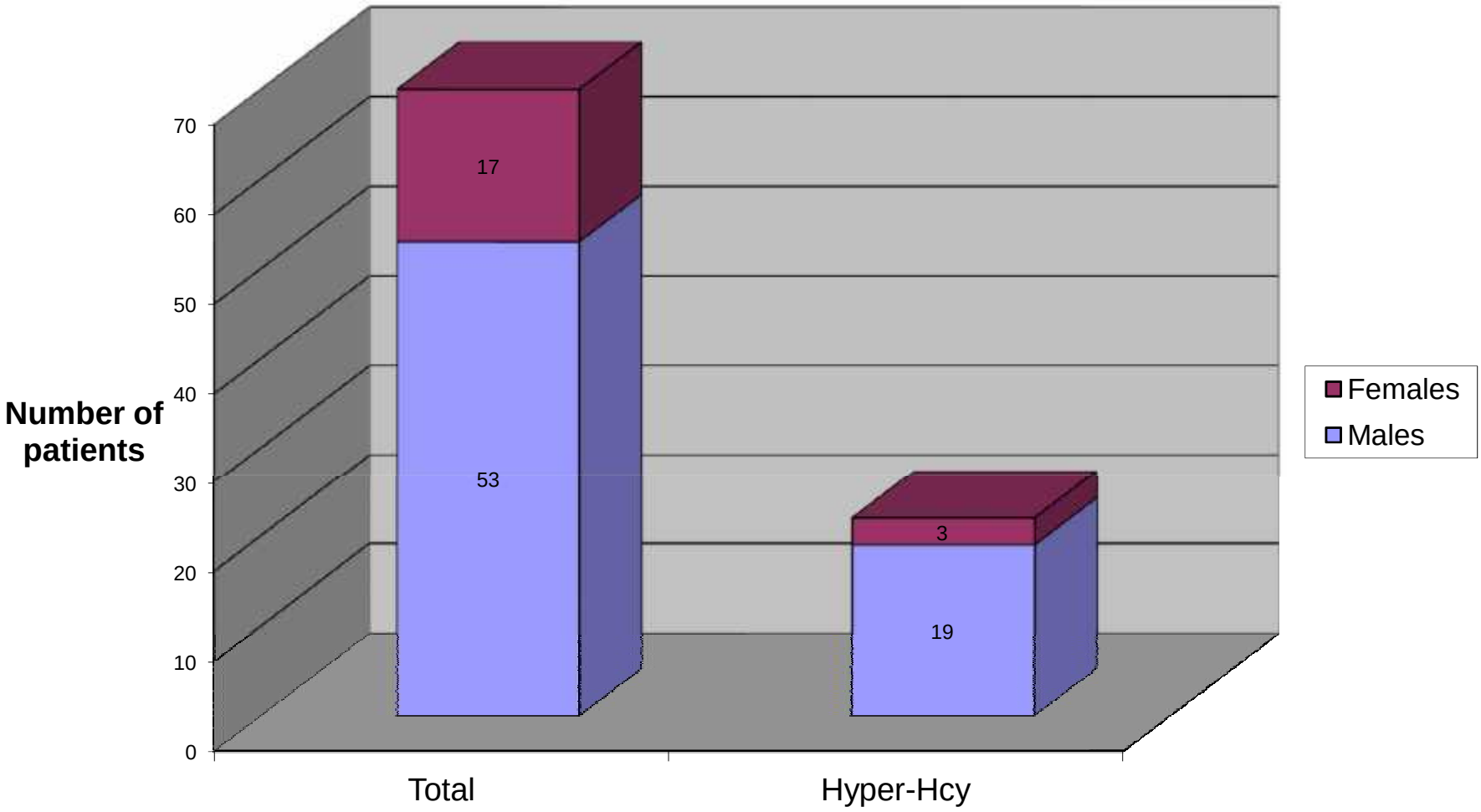
Doppler study	Se. Hcy level
DVT Rt DFV	12.2
DVT Lt DFV	30.6
DVT Lt DFV	10.6
DVT Lt DFV	11.4
DVT Rt DFV	10.7
DVT Rt DFV	21.67
DVT Lt DFV	22.3
DVT Rt DFV	6.4
DVT Rt DFV	26.4
DVT Rt CFV	13.1
DVT Lt CFV	18.8
DVT Rt DFV	12.6
DVT Lt DFV	14.6
DVT Lt DFV	36.9
DVT Lt CFV	29.2
DVT Rt DFV	11
DVT Lt DFV	29.2
DVT Rt CFV	9.6
DVT Lt DFV	17.7
DVT Rt DFV	7.2
DVT Lt DFV	19.1
DVT Rt DFV	8.6
DVT Lt DFV	24.9
DVT Lt CFV	8.7
DVT Rt DFV	5.2
DVT Rt CFV	26.9
DVT Lt DFV	11.1
DVT Rt DFV	8.3
DVT Lt CFV & IV	47.6
DVT Lt DFV	6.9
DVT Rt DFV	10.3
DVT Lt DFV	6.2
DVT Rt CFV	24.7
DVT Rt DFV	4.5
DVT Lt DFV	8.9
DVT Rt DFV	26.5
DVT Lt DFV	8.2
DVT Lt DFV	4.8
DVT Rt CFV	17.2
DVT Lt DFV	13.9
DVT Lt DFV	11.5
DVT Lt DFV	8.9
DVT Rt DFV	7.2

DVT Rt DFV	36.1
DVT Lt DFV	21.6
DVT Lt DFV	5.2
DVT Lt CFV	52.7
DVT Rt DFV	7.6
DVT Rt DFV	20.1
DVT Rt CFV & IV	42.6
DVT Rt DFV	8.2
DVT Lt DFV	6.9
DVT Rt DFV	12.8
DVT Lt DFV	13.1
DVT Rt DFV	7.9
DVT Lt DFV	14.9
DVT L CFV	34.9
DVT Rt DFV	12.7
DVT Lt DFV	5.5
DVT Rt DFV	6.1
DVT Lt DFV	11.6
DVT L CFV	13.7
DVT Rt DFV	7.7
DVT Lt DFV	8.3
DVT Rt DFV	7.4
DVT Rt DFV	8.5
DVT L CFV	14.8
DVT Rt DFV	4.8
DVT Rt DFV	9.9
DVT Lt DFV	8.1

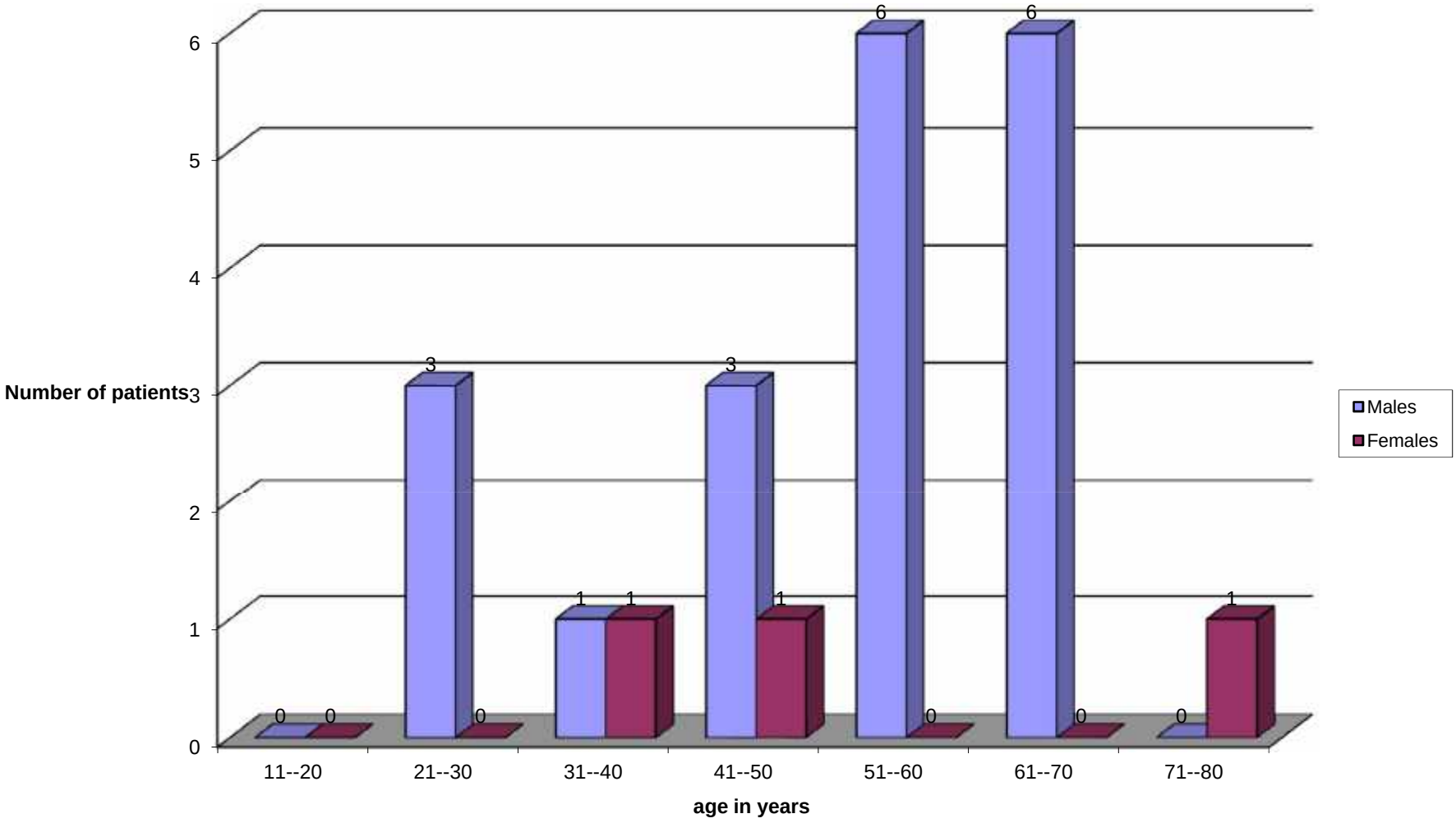
Age distribution



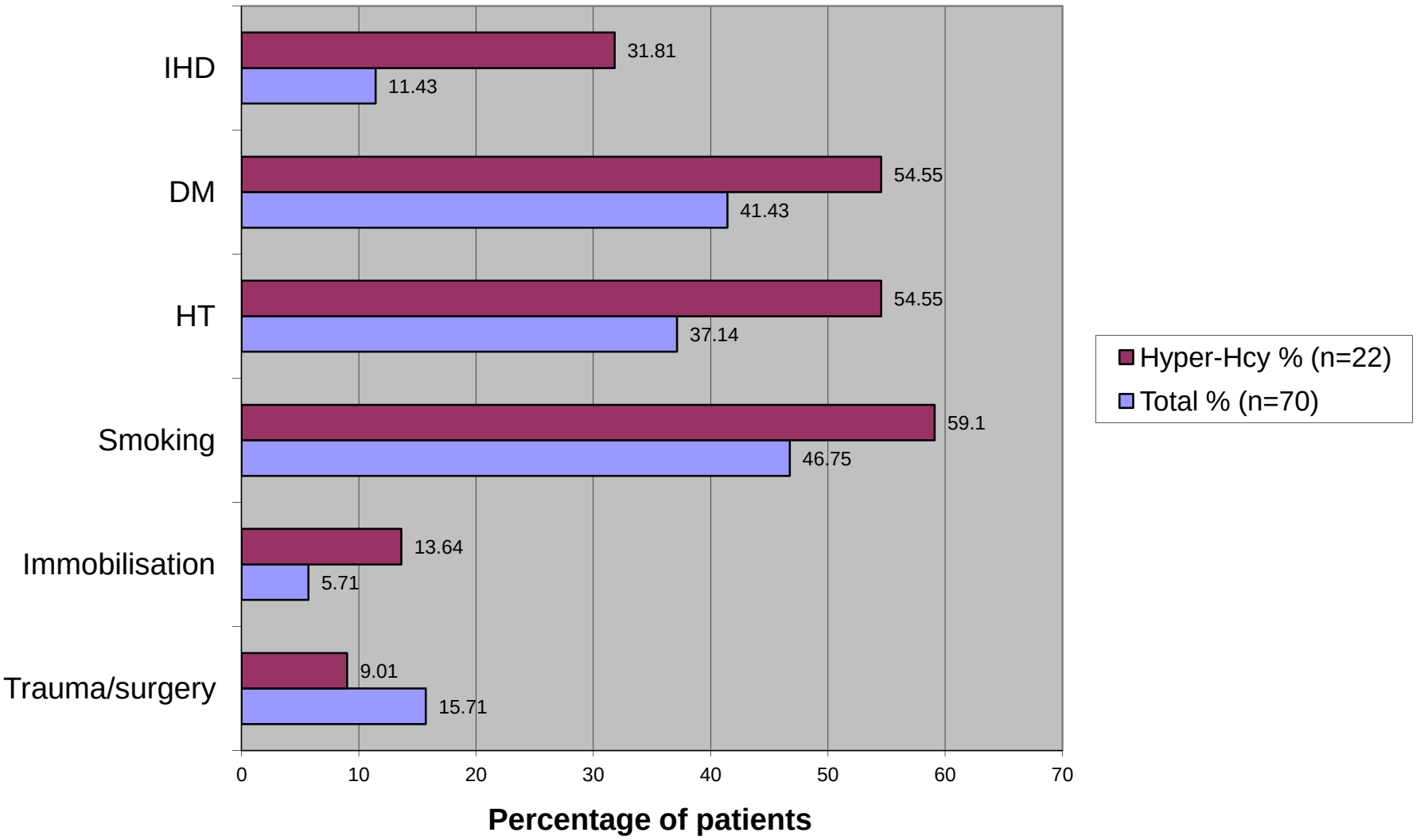
Sex-wise distribution



Age-sex distribution of Hyperhomocysteinemia patients.



RISK FACTOR ANALYSIS



age	total	Hyper-Hcy patients
11 --20	0	0
21--30	9	3
31--40	14	2
41--50	18	4
51--60	16	6
61--70	10	6
71--80	3	1

Age	Males	Females
11--20	0	0
21--30	3	0
31--40	1	1
41--50	3	1
51--60	6	0
61--70	6	0
71--80	0	1

Gender	Total
Males	53
Females	17

	Total % (n=
Trauma/su	15.71
Immobilisa	5.71
Smoking	46.75
HT	37.14
DM	41.43
IHD	11.43

Hyper-Hcy
19
3

Hyper-Hcy % (n=22)
9.01
13.64
59.1
54.55
54.55
31.81

ANNEXURE-I

PROFORMA

NAME: S.I. NUM:

AGE: SEX:

I.P. NUM:

ADDRESS:

OCCUPATION:

H/O TRAUMA/ SURGERY:

H/O PROLONGED IMMOBILISATION:

H/O SMOKING:

ASSOCIATED ILLNESS: HYPERTENSION:

DIABETES MELLITUS:

ISCHAEMIC HEART DISEASE:

INVESTIGATIONS

DOPPLER STUDY:

SE. HOMOCYSTEINE LEVEL:

SUMMARY:

STATEMENT OF CONSENT