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PREVALENCE OF MUSCULOSKELETAL COMPLICATIONS AMONG HEMOPHELIA INTIKUR ANBESSA SPECIALIZED HOSPITAL.

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Prevalence of musculoskeletal complications among hemophilia patients as seen inTikur Anbessa specialized hospital.

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LIST OF ABBREVIATION

AAU – Addis Ababa University

ADL – Activities OfDaily Living

ESH – Ethiopian Hemophilia society

FVIII – Factor VIII

FIX – Factor IX

ROM – Range of Motion

SPSS –StatisticalPackage for social sciences

TASH –Tikur Anbessa Specialized Hospital

WFH – World Federation of Hemophilia

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Abstract

Background: Hemophilia is an X-linked bleeding disorder caused by deficiency of factor VIII (Hemophilia A) or factor IX (Hemophilia B). Repeated bleeding into joints and muscles leads to musculoskeletal complications, accounting for 70–80% of hemorrhagic episodes. There is no local data showing musculoskeletal complications in Ethiopia.

Methods: A descriptive cross-sectional study was conducted among 149 male hemophilia patients attending Tikur Anbessa Specialized Hospital. Data were collected through structured interviews, physical examination, and review of hematology clinic records and recorded using Cobo toolbox. Statistical analysis was performed using Statisty application, with $p < 0.05$ considered significant.

Results: Musculoskeletal complications were identified in 83.9% of patients, including hematomas (91.3%), pseudotumor (9.4%), muscle atrophy (36.2%), joint swelling (65.1%), loss of range of motion (57.0%) and joint instability (16.8%). Pain was reported by 79.9%, most commonly in the knees (80.7%), followed by elbows (34.5%) and ankles (22.7%). Statistical analysis revealed significant associations between factor level ($p< 0 .01$) and treatment modality ($p<0.001$) with musculoskeletal complications, while age of the patient, age at diagnosis of hemophilia, and hemophilia type were not statisticallysignificant.

Conclusion: Most of patients (83.9%) have musculoskeletal complications among hemophilia patients in Tikur Anbessa Specialized Hospital, with knees disproportionately affected. The treatment modality ($p < 0.001$) and factor level($p < 0.01$) are significantly associated with musculoskeletal complications among hemophilia patients.

Key words: Arthropathy, hemophilia A, hemophilia B, musculoskeletal complications.

1 INTRODUCTION

1.1 Back ground

Hemophilia is X-linked coagulopathy caused by either a quantitative or qualitative deficiency of clotting factors VIII or IX, resulting in Hemophilia A and Hemophilia B respectively. This deficiency affects normal hemostasis and predisposes patients to spontaneous or trauma-related bleeding episodes, which may involve soft tissues, joints and intracranial bleeding(1).

Hemophilia predominantly affects males, while females typically are asymptomatic carrier. It is predominantly inherited but about 30% of cases occur as spontaneous mutations. In severe Hemophilia A, a characteristic genetic abnormality involves a large inversion and translocation within the F8 gene but, hemophilia B is associated with remarkable genetic heterogeneity, with more than 2,100 distinct point mutations identified in the F9 gene(2).

Globally, the prevalence of hemophilia at birth is about 24.6 in every 100,000 live births for hemophilia A and 5.0 in every 100,000 live births for hemophilia B. Hemophilia A accounts for 80–85% and Hemophilia B (15-20%). According to the World Federation of Hemophilia (WFH) annual global survey, there are currently 233,577 individuals living with hemophilia worldwide. In Ethiopia, the 2021 WFH global survey reported a total of 367 registered patients, of whom 172 were diagnosed with Hemophilia A, 32 with Hemophilia B, while 163 cases remained unclassified by type(2)(3).

The severity of hemophilia is determined by the serum concentration of clotting factors. In severe disease, factor activity is less than 1% of normal levels; in the moderate form, factor level activity ranges between 1–5%; and in the mild form, factor levels are 5–25% of normal. These factor levels directly correlate with the frequency and intensity of bleeding episodes, meaning that lower concentrations are associated with frequent and severe hemorrhagic events(2).

Musculoskeletal complications are the most common manifestations in patients with hemophilia, occurring in 70–80% of cases. The most common presentation is hemarthrosis, which accounts for 45–70% of bleeding episodes. When recurrent, hemarthrosis predisposes to chronic synovitis, joint contractures, and progressive hemophilic arthropathy (2) . Bleeding in to the muscles, representing 10–20% of hemorrhages, can lead to hematoma formation; if inadequately treated, these hematomas may exert pressure on adjacent neurovascular structures and form pseudotumor.

Pseudotumor that form within bone are particularly concerning, as they increase the risk of pathological fractures(4,5).

The management of hemophilia includes reducing the frequency of joint bleeding through replacement therapy with recombinant clotting factors or blood products. Preventive strategies include prophylaxis with intravenous recombinant factor concentratesto minimize bleeding episodes. Additional prevention of bleeding episodesincludes avoiding contact sports, maintaining a healthy lifestyle, and engaging in muscle-strengthening exercises. Despite these interventions, musculoskeletal disability from recurrent bleeds continues to be one of the most common complications, significantly affectingactivities of daily living. This demand the need for ongoing orthopedic evaluation and management as a multidisciplinary part of comprehensive hemophilia care.(5,6)

1.2 STATEMENT OF THE PROBLEM

Hemophilia is associated with recurrent bleeding into joints and muscles, which in long term leads to chronic arthropathy, pseudotumor formation, and progressive disability that compromises activities of daily living. This requires timely identification, treatment, and structured follow-up of musculoskeletal complications of hemophilia patients. A multidisciplinary approach, involving hematologists, physiotherapists and orthopedic surgeons is important for effective management(7). However, in our local context, there are no epidemiological studies that define the prevalence and pattern of musculoskeletal complications in hemophilia. As a result, patients have no regular follow-up and orthopedic surgeons were not involved into the multidisciplinary team, limiting opportunities for early evaluation and management.

1.3 SIGNIFICANCE OF THE STUDY

Early detection and intervention for musculoskeletal disability remain central priorities in the care of patients with hemophilia. To improve existing treatment guidelines, integrated management strategies and resource allocation must be needed in a clear understanding of local disease epidemiology. However, in our setting, there are no epidemiological studies that define the exact burden of musculoskeletal complications among hemophilia patients. As a result, orthopedic specialists are often engaged late in the disease course, when joint damage has already advanced, limiting opportunities for early intervention(2,8).

This study aims to address the prevalence and patterns of musculoskeletal complications among hemophilia patients attending Tikur Anbesa Specialized Hospital. The findings will provide critical evidence to establish the role of orthopedic care in hemophilia management, serve as a baseline for longitudinal follow- up, and guide the design of targeted orthopedic interventions for affected patients. Beyond direct clinical application, the results are expected to raise awareness among healthcare providers and inform policy development, particularly in shaping strategies that strengthen orthopedic involvement in the multidisciplinary care of hemophilia patients.

2 LITRATURE REVIEW

The history of hemophilia starts from second century AD, when Jewish rabbinical writings documented abnormal bleeding patternsfrom circumcision of boys whose brothers had died from excessive bleeding. By the 10th century AD, the Arabian physician Abu Khasim described families in which male relatives prone to severe hemorrhage after traumatic events. In 1803, John Conrad Otto published one of the earliest medical literature of a hereditary bleeding disorder that commonly affected men and could be traced in the family lineage. The term hemophilia introduced by Johann Schönlein and Friedrich Hopff at the University of Zurich. In 1947 Doctor Alfredo Pavlovsky distinguished between Hemophilia A and Hemophilia B, marking an important step in understanding the disease. Between 1920 and 1960 scientists identified and classified multiple coagulation factors, assigning them Roman numbers that remain in use today. Hemophilia also earned the name royal diseaseafter Queen Victoria of England (1837–1901) who believed to have carried Hemophilia B, transmitting it to several European royal families, including those of Russia, Spain, and Germany(9).

The Ethiopian Hemophilia Society (EHS) was established in the 1990s in response to the growing burden of bleeding disorders and the challenges surrounding their management. Today, EHS functions as the official national patient organization and is formally recognized by the World Federation of Hemophilia. Its mandate includes collecting country- level epidemiologic data, maintaining a national registry, and coordinating comprehensive care for individuals with hemophilia across multiple treatment sites nationwide.

Theprevalence of hemophilia is estimated at approximately 1 in 5,000 live male births, with no clear racial or geographic predilection worldwide. Hemophilia A occurs in roughly 1 in 35,000 males. Prevalence varies across countries, with lower rates typically reported in low-income settings compared to high-income countries. This difference is attributed to differences in healthcare funding, which affect access to diagnosis and management for individuals with hemophilia. Low-income countries often prioritize public health interventions targeting larger populations, while household socioeconomic status further influences health-seeking behavior as families with limited resources prioritize basic needs such as food over medical care (10). Data from World Federation of Hemophilia (WFH) global surveys indicate an increase in reported

hemophilia prevalence over time. In Ethiopia, there are over 650 males identified and registered as living with hemophilia(3).

The clinical presentation of hemophilia mainly differ by both the severity and chronicity of the disease pattern, with disease severity linked to the frequency and severity of bleeding episodes. In patients with severe hemophilia, the first episode of hemarthrosis typically manifests early in childhood.In 2024 an institutional based study done at Tikur Anbessa specialized hospital, Ethiopia by Lyar et al among 105 hemophilic patients with mean age of 21 years shows, the majority (72.4%) have hemophilia A and the most affected joint is knee (70.4%) followed by the elbow (24.7%), hip (15.2%) and smaller joints such as the ankle (9.5%) and wrist (7.6%)(11).In 2019 study conducted in Kenyatta national hospital, Kenya by Edward Nguyo Maina in 37 hemophilic patients of which hemophilia A, accounts 91.9% and hemophilia B represents 8.1%. 70.3% have severe hemophilia and remaining 29.7% have moderate hemophilia. Musculoskeletal involvement was almost universal (97%) of patients had at least one orthopedic complication. Recurrent hemarthrosis was the most common (86.5%) manifestation followed by decreased joint range of motion (75.7%) and fixed flexion deformities (70.3%) of hemophilia patients. A history of muscle hematoma was present in 67.3% of the hemophilic individuals whereas, fractures were not common and no cases of pseudotumor or peripheral nerve palsy were identified. Disease severity and bleeding frequency demonstrated a statistically significant correlation with the Global Joint score(12).

In a study conducted in 2002 in the Western Cape region of South Africa, 49 patients with hemophilia were studied.The majority (76%) had hemophilia A, while 24% had hemophilia B. Severe hemophilia was identified in 43% of patients, with moderate and mild disease present in 29 % and 22 % of hemophilia patients respectively. Earlier diagnosis was observed in patients with more severe disease, with mean ages at diagnosis of 9 months in severe cases, 11 months in moderate cases, and 21 months in mild cases of hemophilia. Most patients (73%) were managed with on demand factor replacement therapy and within this grouphalf of patients had evidence of functional joint limitation. In contrast, patients receiving periodic prophylactic therapy, representing 20% demonstrated lower rate of decreased range of motion of joints at 20%. Only 7% had continuous prophylaxis. Joint function decrement was identified in 43% of the hemophilia patients(13).

In 2014, Diop et al conducted a study in 140 patients with hemophilia, summarizing an 18-year national experience from Senegal and reporting a prevalence of 2.3 per 10,000 male live births. Hemophilia A was the common(90.7%) subtype while hemophilia B accounted for only 9.3% of the patients. 52.1% of patients had severe hemophilia and moderate to mild disease observed in 24.2% and 23.5% respectively. The timing at diagnosis was related to disease severity with mean ages at diagnosis of 4.9 years in severe cases, 5.3 years in moderate disease, and 8 years in mild cases of hemophilia. These indicates a significant delay when compared with high income settings, where age at diagnosis occurs at a mean age of about 1.6 years. Evaluation of the musculoskeletal complications showed that 36.5% of patients had established joint disability, with a greater degree of joint impairment noted in patients older than 20 years(14).

In 2015, Hayam et al conducted a single- center study on 30 Egyptian boys aged 6–16 years with hemophilic arthropathy. The majority of participants had hemophilia A (86.7%)while 13.3% were diagnosed with hemophilia B. Among hemophilia patients with severe disease, the mean age at first bleeding was 2.2 ± 1 years, ranging from 0.5 to 4 years. In terms of severity distribution50% of patients had severe hemophilia, 23.3% moderate, and 26.7% mild cases. Knee was most commonly (73.3%) affected, followed by the ankle (16.7%), elbow (6.7%), and shoulder (3.3%). Clinical assessment using the Gilbert scoring system revealed a statistically significant inverse correlation between global joint scores and serum factor levels(15).

In 2019 study conducted in central India evaluated 101 hemophilic patients presenting with musculoskeletal complications. The majority (90.1%) had hemophilia A while 9.9% had hemophilia B. The mean age of patients was 20.9 years with most (32.7%)patients inrange of 11–20 years of age group, followed by children aged 0–10 years (25.7%). Severe disease was identified in 59.3% of hemophilia A and 60% of hemophilia B patients. 59.4% experienced their first bleed before the age of twooften presenting as gum, nose or joint hemorrhage. Hemarthrosis was the most common (90.1%) complication with more than three bleeds per year. 63.4% of patients developed hemophilic arthropathy, 32.7% had synovitis and 17.8% presented with muscle hematomas. Less common complications included fractures (6.9%), neuropathy (4%), pseudotumor (3%)and contractures (2%). 184 joints were identified as target jointswith the knee most commonly (51.1%) affected, followed by the elbow (25.5%) and ankle (15.8%). The left

knee was more affected (27.4%) of joints with >3 bleeds per yearfollowed by the right knee (25.8%). Muscle hematomas were most (31.6%) seen in the psoas and calf (21.1%). Deformities such as hip and knee flexion contractures, genu varum, equines and claw hand were seen in 15.8% of patients(16).

In 2023 single centered study from Southern Iran, Bordbar et al evaluated musculoskeletal complications among 100 hemophilic patients aged 2-76 years. Hemophilia A, accounts 90 % of cases but only 10 % have hemophilia B. All patients showed hemophilic arthropathyand majority (93%) had involvement of multiple jointsmost commonly affected joints being knee and ankle.15% of hemophilia A patients and 40% of hemophilia B patients received prophylactic recombinant factor treatment. Skeletal complications common and severe in severe hemophilia, with higher rates of synovitis, target joints, osteoporosis and bone disease compared with those with non-severe disease. Increased annual bleeding rates were associated with the development of bone disease and target joints. Delayeddiagnosis was also associated with higher risk of osteoporosis(17).

Hemarthrosis accounts 70–80% of all bleeding episodes in patients with hemophilia with distribution varying across joints. By the third decade of life, about 85–90% of individuals will face chronic degenerative changes in at least one major joint(18,19). The knee is most frequently affectedfollowed by elbow, ankle, shoulder, wrist, and hip (45%, 30%, 15%, 3%, 2% and 2%respectively)(2). Hayam et al., in a study of 30 boys with hemophilic arthropathy, reported a similar pattern: 73.3% of cases involved the knee, 16.7% the ankle, 6.7% the elbow and 3.3% the shoulder (15) . A multicenter UK study by Stephenson et al. highlighted a shift in bleeding patterns among adolescents and young adults, with ankle most commonly affected. In this study of 100 patients 42.7% of bleeds occurred in the ankle, 20.7% in the elbow, 19.6% in the knee, 3.9% in the shoulder, 3.7% in the hipand 2.4% in the wrist(20). Similarly, Aznar JA et al., in a 2009 Spanish study, found the ankle to be the most affected joint (20%), followed by the knee (19%), elbow (17%)and hip (1.7%)(21).

In severe hemophilia, about 10–25% of bleeding episodes occur within muscles, most often in the iliopsoas, quadriceps, and calf. These bleeds usually follow trauma, though they can also arise spontaneously. How they present depends not only on disease severity but also on which muscle is involved and the constraints of its fascial compartment (22) . A 2010 cross- sectional

survey by Beyer et al across five European countries found about 75% of muscle hematomas were trauma- related. The iliopsoas was the most frequently affected site (55%) followed by the calf (18%) and thigh (18%)(23). In contrast, hemophilic pseudotumor remains a rare occurring in 1–2% of patients with severe hemophilia(24).

The risk of osteoporosis and fractures is higher in individuals with hemophilia compared to the general population. In a 2007 case-control study of 50 patients, Nair AP e al. reported an increased incidence of osteoporosis and fractures among adults with hemophilia (12% versus 0% in controls). Osteoporosis was most common in the lumbar spine (50%), followed by the intertrochanteric region (38%) and the hip (32%) (25) . Similarly, Lee et al. in a cohort of 11 patients with femoral neck fractures showed that fractures in hemophilia typically occur nearly two decades earlier than in the non-hemophilic population(26).

Peripheral nerve palsies in hemophilia are uncommon, but when they occur, they are the result of compressive effects from hematomas or pseudotumor. The femoral nerve is most frequently affected, followed by the median, ulnar, sciatic and radial nerves.The involvement of the cervical roots, lumbar and sacral plexus has also reported (27) . In a study from India, Saraf et al. examined 134 patients and found that 15% developed nerve palsy. Of these, the most involved the femoral nerve (75%), with about 20% affecting the sciatic nerve and 5% the peroneal nerve. Due to anatomical location femoral nerve palsy was associated with iliac and inguinal hematomas, sciatic nerve palsy to gluteal hematomas and peroneal nerve palsy to calf hematomas(28).

In 2007, Kar et al. conducted a multicenter study in India that observed the high prevalence of physical disability among individuals with hemophilia. The study found that 93.3% (139 out of 148) of patients with severe Hemophilia A experienced some complications. Disability was assessed using three parameters; general mobility status, functional ability, and joint range of motion. This study also demonstrated a significant correlation between disability severity and family income. The greater prevalence and severity observed among patients from low-income family(29).

Generalized musculoskeletal assessment is essential in the evaluation of patients with hemophilia. This should include both detailed history taking and physical examination. It is important for detecting acute and chronic complications timely. The assessment must include pain characteristics, frequency and severity of bleeding episodes, specific joint involvement, muscle tone, gait abnormalities, range of motion and the overall functional level of disability. Such a holistic approach ensures that both immediate management needs and long-term rehabilitation strategies are appropriately addressed, thereby optimizing patient outcomes(30).

Many standardized scoring systems have been developed to aid in the musculoskeletal evaluation of patients with hemophilia.Most widely used are the World Federation of Hemophilia (WFH) physical examination score, commonly referred to as the Gilbert score, and the Hemophilia Joint Health Score (HJHS). Both tools provide structured, reproducible assessments of joint status.

The WFH physical examination score (Gilbert score) was developed by Gilbert MS together with the orthopedic advisory committee of the WFH to standardize joint evaluation in hemophilia(2). It focuses on six index joints; the ankles, knees, and elbowsand assesses them across four domains: pain, bleeding history, physical examination findingsand radiological changes. The physical examination component includes structural and functional features. This includes joint swelling, muscle atrophy, axial deformity, crepitus, range of motion, flexion contractures and instability. Scoring ranges from 0–3 for pain, 0–3 for bleeding, 0–12 for physical examination and 0–13 for radiological assessment(31). The Gilbert score is particularly useful in patients with advanced arthropathy. Its main limitation is reduced sensitivity in detecting early mild changes in joint disease which makes it less reliable for evaluating early hemophilic arthropathy(32).

Table 1 WFH/gilbert physical examination score(33)

Physical finding	Score	Score key
Swelling	0 or 2+ (S)	0= none 2= present (S) if chronic synovitis
Muscle atrophy	0-1	0= <1cm 1=present
Knee deformity	0-2	0= 0–7-degrees valgus 1= 8-15 valgus or 0–5-degrees varus

		2= >15-degree valgus or > 5-degree varus
Ankle deformity	0-2	0= no deformity 1= < 10 valgus and < 10 degrees varus 2=.>10 valgus and > 10-degree varus
Crepitus on motion	0-1	0= absent 1= present
Range of motion	0-2	0= < 10% loss from full range of motion 1=10- 33 % loss from full range of motion 2= > 33 % loss from full range of motion
Flexion contracture	0 or 2	0= < 15 % fixed flexion contracture 1= ≥ 15 % fixed flexion contracture
Instability	0-2	0= none 1= present but not interfere with function 2= present and interferes with function
Total	0-12 0-10	Ankle or knee = deformity is score for ankle and knee only Elbow

The Hemophilia Joint Health Score (HJHS)is better in addressing the limitations of the WFH physical examination score. It provides a structured way to measure joint impairment, follow changes over time and evaluate the effectiveness of treatment. Although initially developed for patients aged 4–18 years, the HJHS can be used in assessing joint health in adults as well(34).

In the evaluation of musculoskeletal complications in hemophilia, several imaging modalities are routinely employed, including radiography, ultrasonography, computed tomography and magnetic resonance imaging (MRI). Radiography remains the standard tool for diagnosing moderate to severe hemophilic arthropathy, guiding therapeutic planning, and following progression(35). In contrast, MRI offers the highest accuracy as it is used in detection of a wide spectrum of musculoskeletal soft tissue lesions. It is used in identifying early joint changes, enabling timely interventions to prevent long- term disability. Ultrasonography is radiation- free

which assesses soft tissue swellings and serves an important role in minimally invasive procedures such as joint aspiration or intra- articular injections(36).

The important part of hemophilia management is the prevention and reduction of bleeding episodes to reduce long- term complications. This is achieved by replacement therapy using either recombinant clotting factors or blood products (6) . In the acute setting, management of bleeding requires factor replacement combined with supportive measures such as the RICE protocol (Rest, Ice, Compression, Elevation). For on- demand intravenous factor VIII therapythe recommended dose is 25–40 IU/kg with escalation up to 50 IU/kg in severe bleeds. Optimal outcomes depend on early administration; ideally within 2 hours of bleeding onsetwith repeat dosing every 12 hours. Treatment should be continued until FVIII plasma levels reach 80–100% for major bleeds and 40–60% for minor bleeds or until clinical improvement. In resource- limited settings where factor concentrates are unavailable, cryoprecipitate or fresh frozen plasma can be used as alternatives(37).

Primary and secondary prophylaxis with clotting factor concentrate is effective in reducing bleeding episodes and preventing musculoskeletal complications. It is considered as a standard care and recommended to be initiated as early in order to protectjoint damage and chronic disability(38).

Physiotherapy is central to hemophilia care aimed to preserve joint mobility and overall function. It is used in patient rehabilitation, helping restore and maintain muscle strength and joint range of motion (ROM) resulted from bleeding episodes or chronic arthropathy. Strengthening programs are individualized and initiated with isometric contractions followed by concentric exercises as the patient tolerates.(39).

Synovectomy is indicated in hemophilia patients when recurrent joint bleeding and chronic synovitis not responding to initial treatment. It helps to prevent progression from chronic synovitis to advanced arthropathy. There are 3 types of synovectomies; Chemical synovectomy, using agents such as rifampicin or oxytetracycline. Radio synovectomy, which involves intra- articular injection of radioisotopes such as yttrium, dysprosium, rhenium, or phosphorus and surgical synovectomy which is performed either by an open or arthroscopic technique. All the methods are aimed to reduce bleeding frequency, alleviate pain and preserve joint function(40)(41).

In hemophilia care, a range of surgical orthopedic procedures may be required to address musculoskeletal complications. These include synovectomy (performed either open or arthroscopically) for uncontrolled synovitis, arthrocentesis for joint decompression and nerve release procedures to relieve entrapment. Additional procedures include arthroscopic joint debridement, arthrodesis or joint arthroplasty can be used in cases of severe arthropathy(42). For hemophilic pseudotumor, management involves resection or percutaneous techniques while osteosynthesis can be considered in the treatment of pathologicalfractures. Curettage and filling with cancellous bone and radiotherapy can be used in advance. Preoperative arterial embolization helps to control intraoperative bleeding during surgery for giant pelvic pseudotumor. All these procedures aim to reduce pain, restore function and prevent progression(24).

A multidisciplinary approach of hematologists, orthopedic surgeons and physiotherapists is important to optimally manage bleeding disorder and musculoskeletal complications. It requires settings where there is reliable access to clotting factor replacement therapy the presence of experienced surgical teams in established hemophilia treatment center (HTC). This model of care minimizes risk, enhances recovery and ensures long- term function(43).

3 Study objectives

3.1 General objectives

- To assess prevalence and pattern of musculoskeletal complications among hemophilia patients visiting TikurAnbessa specialized hospital

3.2 Specific objectives

- To determine the prevalence of musculoskeletal complications in hemophilia patients
- To describe patterns of musculoskeletal involvement in hemophilia patients

4 Methodology

4.1 Study design

Cross sectional descriptive study

4.2 Study area

The study is conducted in TikurAnbessa specialized hospital. It is found in Addis Ababa, capital city of Ethiopia. It is tertiary, pioneer teaching hospital with accepting referrals from all over the country. Data is collected from adult and pediatric outpatient clinics, Ethiopian hemophilia society and hematology clinic.

4.3 Study population

All hemophilia patients visiting TikurAnbessa specialized hospital.

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

All patients with determined hemophilia disease

4.4.2 Exclusion criteria

Arthritis

Congenital musculoskeletal deformity.

Previous history or current history of high energy trauma.

4.5 Sample size and Sampling technique /Sampling procedures

4.5.1 Sample size

The sample size was determined using the single population proportion formula is used to estimate the required sample size when studying a proportion in a population. It is expressed as:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

where n is the sample size, Z is the Z-score corresponding to the desired confidence level, p is the estimated population proportion, and d is the margin of error.For 95% confidence, $Z = 1.96$.

Using the above formula sample size is calculated using Single population proportion formula with precision level of 5% and confidence interval of 95%. From target population of 238 hemophilia patients using finite population correction formula and 10% non-response rate, final sample size= 147

4.5.2 Sampling procedure

All hemophilia patients who visited TikurAnbessa specialized hospital are included in the study until desired sample size is obtained.

4.6 Data collection procedures (Instrument, personnel, data collection technique)

Data collection was carried out by the principal investigator, who identified and approached patients with known hemophilia in the study area. Each patient, together with a parent or guardian when appropriate, was informed about the study objectives and consent process. Recruitment was finalized only after written consent was obtained. All information was securely stored using Kobo Toolbox, and each participant was assigned a unique serial number before undergoing detailed history taking and physical examination. Privacy was maintained throughout the evaluation.

Clinical data included demographics (age, sex, age at diagnosis, site of first bleed, hemophilia type, treatment modality), as well as history of pain, swelling, muscle weakness, or sensory loss. Motor and sensory examinations were performed to exclude nerve palsy. Use of ambulation aids was documented, coded as B (brace/orthosis), C (cane), CR (crutches), or WC (wheelchair).

Joint pain was graded on a 0–3 scale:

- 0: no pain
- 1: mild pain, not interfering with daily activities, occasional non-narcotic analgesics
- 2: moderate pain, partial interference with occupation/ADL, requiring non-narcotics and occasional narcotics
- 3: severe pain, significant interference with occupation/ADL, frequent use of both non-narcotic and narcotic medications

Joint bleeding was also scored 0–3 based on the number of hemarthrosis episodes in the preceding year:

- 0: none
- 1: no major bleeds, 1–3 minor bleeds
- 2: 1–2 major and 4–6 minor bleeds
- 3: ≥3 major or ≥7 minor bleeds

Minor bleeds were defined as mild pain, minimal swelling, and limited restriction of motion resolving within 24 hours of treatment. Major bleeds involved pain, effusion, restricted motion, and failure to resolve within 24 hours.

Physical examination was scored 0–12 per joint, with 0 representing a normal joint and 12 the most severely affected. Bilateral knees, ankles, and elbows were assessed for swelling, muscle atrophy, axial deformity, crepitus, range of motion, flexion contracture, and instability. Swelling was evaluated for effusion, synovial thickening, periarticular mass, bony enlargement, or deformity. Muscle atrophy was measured by limb circumference 15 cm above or below the joint line and compared with the contralateral side.

Alignment was assessed using non-radiographic goniometry. For knee alignment, patients were asked to adduct their legs until contact, and varus/valgus was recorded to the nearest degree using reference points (ASIS–pubic tubercle midpoint, knee joint center, and mid-ankle). Ankle deformity was measured as deviation from a line drawn between the popliteal fossa and the midpoint of the malleoli. Normal ranges of motion were defined as: knee flexion 0–135°, ankle

dorsiflexion 0–20° from plantigrade, ankle plantarflexion 0–40°, and elbow flexion 0–140°. Crepitus was assessed by palpation during passive and active movements. Stability was tested using valgus/varus stress, anterior/posterior drawer tests for the knee, anterior drawer for the ankle, and varus/valgus stress for the elbow.

Finally, global pain, bleeding, and joint scores, along with the total number of affected joints, were computed and recorded. Results were explained to patients or guardians, and management options for identified complications were discussed.

4.7 Study variables

4.7.1 Dependent variables

Musculoskeletal complications

4.7.2 Independent variables

Age

Hemophilia type

Factor level

Factor or fresh frozen plasma transfusion requirement

4.8 Operational definitions

Hemophilia – a hereditary coagulopathy characterized by qualitative or quantitative deficiency of clotting factors VIII and IX

Aid to ambulation – any device utilized in assisting a patient to move about as they carry out activities of daily living

Musculoskeletal complications- morbidities that develop in the muscles, bones, and joints as a result off repeated bleeding episodes within these structures. They include hemarthrosis, muscle hematoma, pseudotumor, pathological fractures and peripheral nerve palsy.

Hemophilic Arthropathy: Chronic joint disease resulting from recurrent hemarthrosis, characterized by synovial hypertrophy, cartilage destruction, and reduced range of motion.

Muscle Hematoma: Bleeding into muscle tissue, with or without neurovascular compression, potentially evolving into pseudotumor if untreated.

Pseudotumor: A chronic, encapsulated hematoma within soft tissue or bone, which may cause pressure effects or predispose to pathological fractures.

Peripheral Nerve Palsy: Neurological deficit resulting from compressive hematomas or pseudotumor affecting peripheral nerves

Physical Disability: Limitation in mobility, functional ability, or joint range of motion.

4.9 Data analysis procedures

Data stored at Kobo Toolbox server would be extracted to excel and exported to statistyapplication for analysis. Descriptive statistics will be used for frequencies, means and proportions. Logistic regression will be used to assess correlation between dependent and independent variables. P-value < 0.05 is considered to be statistically significant.

4.10 Data quality management

Data collection will be conducted by the principal investigator together with trained orthopedic residents, using structured self- administered questionnaires and standardized physical examinations. The questionnaire is organized into three sections:

- Part I: sociodemographic information of the patient.
- Part II: historical background and current status of bleeding episodes affecting joints and muscles.
- Part III: physical examination findings of the joints.

Eligible participants will be enrolled, and all data will be captured and securely stored using the Kobo Toolbox platform and its server. Prior to data collection, the principal investigator provided training to the orthopedic residents on the relevance of the study and closely supervised the process to ensure adherence to protocol and consistency in data quality.

4.11 Ethical consideration

Ethical clearance would be obtained from Institutional Review Board (IRB) of Addis Ababa university, college of health science and permission for chart review and access to patient medical electronic recordings will be obtained from department of Orthopedics and trauma surgery, hemophilia treatment center and hematology unit. Patient confidentiality is maintained using unique study codes and no personal identifiers will be used.

4.12 Limitation of the study

The limitation of this study is:

Recall bias for past bleeding episodes

Language barrier

Cross-sectional design.

Single centered study

Factor level determination is carried out at only once at our setup and this may have poor correlation with current status of joint

Muscle hematoma, and pseudotumor responses mainly depend individuals recalling capacity of previous radiographic evaluations.

4.13 Dissemination plan

The findings of this study will be formally presented to the Department of Orthopedics and Trauma Surgery and archived within the Addis Ababa University College of Health Sciences library. Broader dissemination will include sharing results with the Ethiopian Society of Hemophilia and the Ethiopian Society of Orthopedics and Traumatology, as well as submission for publication in peer- reviewed journals. In addition, the study outcomes will be prepared for

presentation at national and international scientific conferences, ensuring that the knowledge generated contributes to both local practice and the global body of evidence in hemophilia care.

5 Results and discussion

5.1 Results

A total of 149 male patients with hemophilia were enrolled in the study. The age distribution ranged from 2 to 58 years, with a mean age of 15.7 years, reflecting a predominantly young population**.**

Table 2 age of the hemophilia patients in Tikur Anbessa specialized Hospital distribution

	Age
Mean	15.71
Std. Deviation	11.37
Minimum	2
Maximum	58
Quartile 1	6
Quartile 3	23
Interquartile Range	17

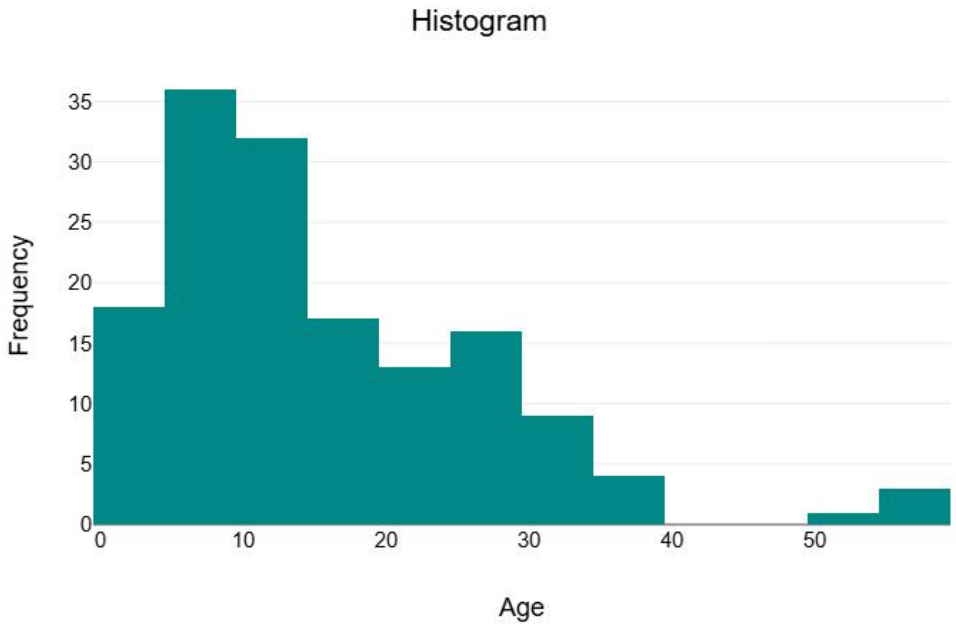

Figure 1Age of Hemophilia patients' distribution in years

The mean age at diagnosis was 41.7 months, while the median was 24 months, suggesting that many patients were identified relatively early in life, though delays in diagnosis were evident in some cases.

Table 3Age at diagnosis of hemophilia patients in months distribution

	Age at diagnosis in months
Mean	41.72
Std. Deviation	41.32
Minimum	4
Maximum	180
Quartile 1	6
Quartile 3	60
Interquartile Range	54

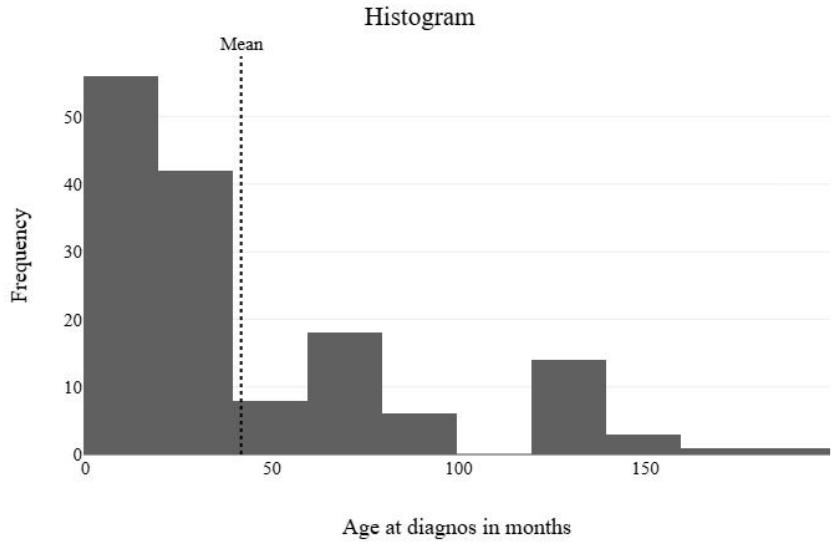

Figure 2Age at diagnosis of hemophilia patients in months distribution

At initial presentation, the most common bleeding manifestation was excessive circumcision bleeding (54.4%), followed by gum bleeding (26.2%), nasal bleeding (11.4%), recurrent joint swelling (4.7%), uvula bleeding post-uvulectomy (2.0%), and intracranial hemorrhage (1.3%).

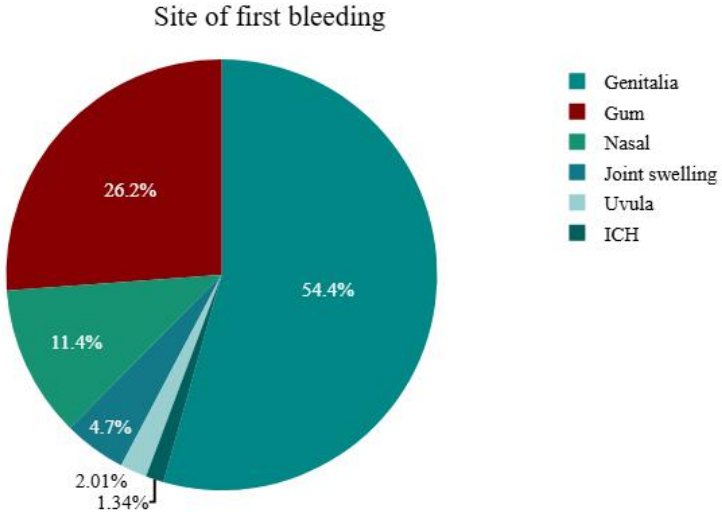

Figure 3Site of first bleeding of hemophilia patients

Of the study, 74.5% had hemophilia A and 25.5% hemophilia B. In terms of severity, 44.9% were severe, 32.2% moderate, and 22.8% mild. Most patients (80.5%) received episodic transfusion

therapy, while 19.4% had minimal or no transfusion; none were on prophylaxis or home-based therapy.

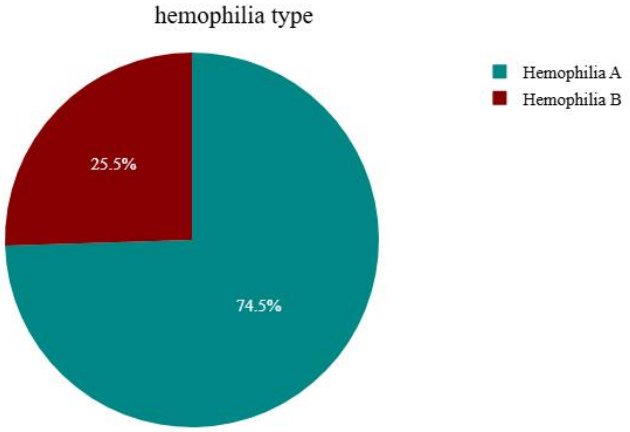

Figure 4 Type of hemophilia among hemophilia patients distribution

Table 4Severity of hemophilia distribution depending on factor level

Category	N	Frequency
Severe	67	44.97%
Moderate	48	32.21%
mild	34	22.82%
Total	149	100%

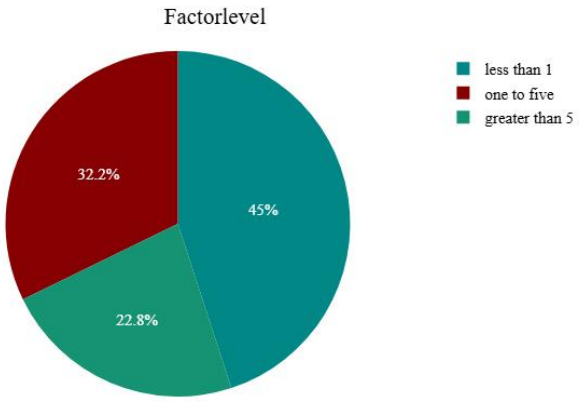

Figure 5Factor level distribution of hemophilia patients

Table 5 Type of treatmentmodality distribution among hemophilia patients

Category		N	frequency
treatment	episodic transfusion	120	80.54%
	no or minimal transfusion	29	19.46%
Total		149	100%

Musculoskeletal complications were highly prevalent. 91.3% had a history or presence of hematoma, with 100% involving joints, 83.3% muscles and 14% other sites. Pseudotumor were identified in 9.4%, most commonly in the calf (57.1%), followed by the thigh (14.3%), pelvis (14.3%), flank (7.1%) and forearm (7.1%). Only one patient (0.7%) had a pathological fracture of the distal femur. Peripheral nerve palsy symptoms were rare, with paresthesia or numbness reported in three patients (ulnar, obturator and lateral femoral cutaneous nerves).

Table 6History or presence of hematoma frequency among hemophilia patients

	Category	N	Frequency
History or presence of	No	13	8.72%

	Category	N	Frequency
hematoma			
	Yes	136	91.28%
Total		149	100%

*Table 7*Hematoma distribution in different tissues among hemophilia patients

History or presence of hematoma out of 149 patients			
Yes = 136 (91.28%)			No = 13 (8.72%)
joint	Muscle	Others	
136 (100%)	35 (25.73%)	19 (14%)	

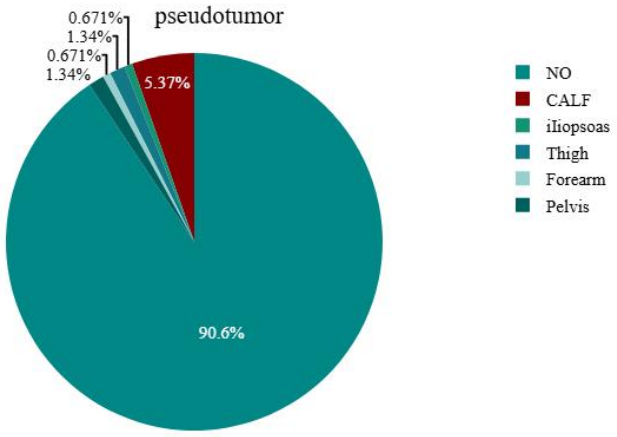

Figure 6History or presence of pseudotumor distribution among hemophilia pateients

Mobility aids were required by 18.1% of patients, most commonly canes (59.3%), followed by crutches (29.6%), wheelchairs (7.4%) and braces (3.7%). Pain was reported by 79.9%, with 34.5% experiencing mild pain, 62.2% moderate pain and 3.4% severe pain. Pain was most frequently localized to the knees (80.7%), followed by elbows (34.5%), ankles (22.7%), wrists (12.6%), hips (5.0%) and shoulders (5.0%).

Joint bleeding was common, with 81.9% experiencing at least one episode per year. Of these, 21.5% had 1–3 minor bleeds, 46.3% had 1–2 major or 4–6 minor bleeds, and 14.1% had ≥3 major or ≥7 minor bleeds. The most frequent sites were the knees (41.0%), elbows (32.8%), hips (20.5%), ankles (15.6%), wrists (9.8%) and shoulders (3.3%). On examination, 65.1% had joint swelling, predominantly in the knees (81.4%), followed by elbows (23.7%), ankles (19.6%)and wrists (6.2%).

*Table 8*Type of aid for mobility distribution in hemophilia patients

	Category	N	Frequency
Type of aid	no aid	122	81.88%
	cane	16	10.74%
	Brace	1	0.67%
	Crunches	8	5.37%
	wheelchair	2	1.34%
Total		149	100%

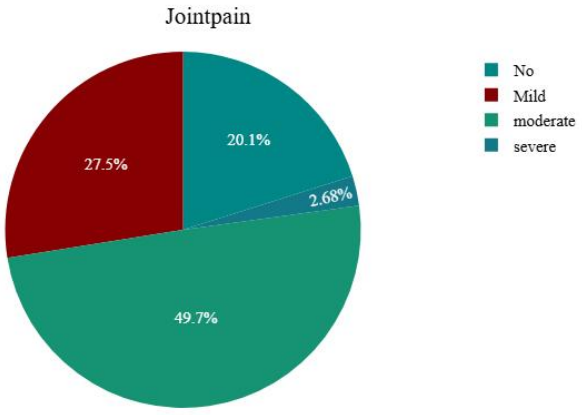

Figure 7Joint pain severity distribution among hemophilia patients

Table 9Joint bleeding distribution among hemophilia patients

Category		N	Frequency
Joint bleeding	no	27	18.12%
	1-3 minor bleeding	32	21.48%
	1-2 major or 4-6 minor	69	46.31%
	3 or more major or 7minor	21	14.09%
Total		149	100%

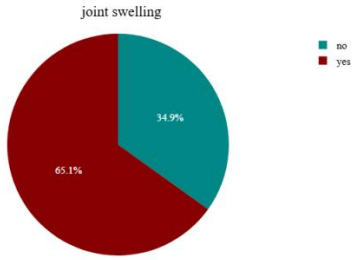

Figure 8Presence or absence of joint swelling among hemophilia patients

Table 10 Distribution of joint pain, swelling and hemarthrosis among hemophilia patients

Parameter	Joints						Total from 149 patients
	Knee	Elbow	Ankle	Wrist	Hip	Shoulder	
Pain	96	41	27	15	6	6	119
Hemarthrosis (bleeding)	50	40	19	12	25	4	122
Swelling	79	23	19	6	0	0	97

Other musculoskeletal findings included muscle atrophy in 36.2% (mostly quadriceps, 81.5%), axial deformity or contracture in 20.8%, joint crepitus in 39.6%, loss of range of motion in

57.0%, and joint instability in 16.8%. Overall, 83.9% of patients had at least one musculoskeletal complication, with the majority involving multiple joints.

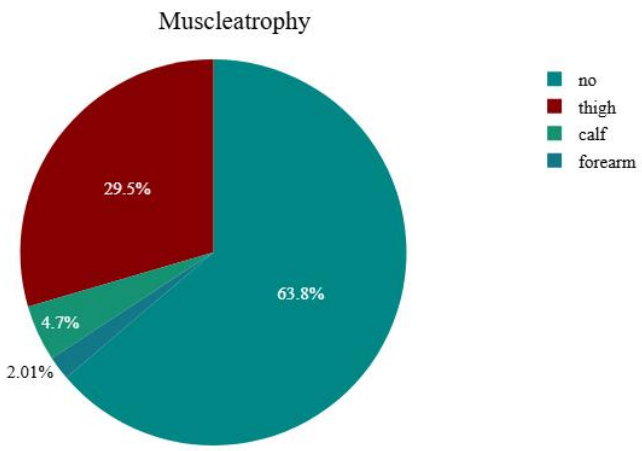

Figure 9Muscle atrophy distribution among hemophilia patients

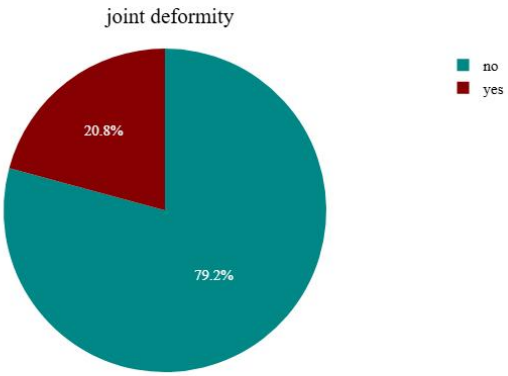

Figure 10Joint deformity distribution among hemophilia patients

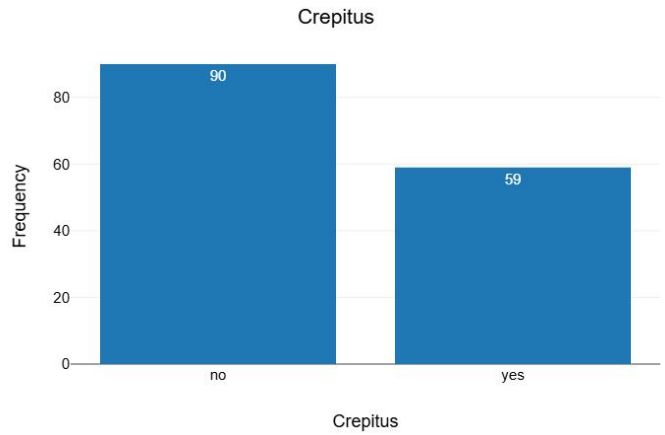

Figure 11Crepitus on motion frequency among hemophilia patients

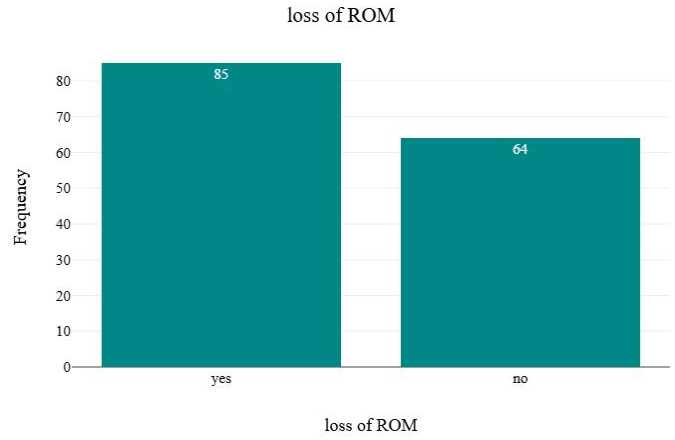

Figure 12Loss of range of motion frequency among hemophilia patients

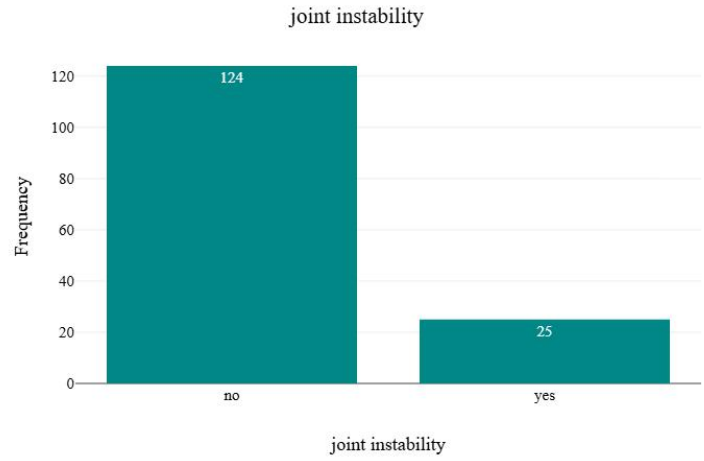

Figure 13Joint instability frequency among hemophilia patients

Musculoskeletal complications (one or combination of hematoma, recurrent joint swelling and pain, muscle atrophy, joint instability, decreased range of motion, crepitus on motion, deformity and pseudotumor) was found in 125 (83.9%) of the patients.

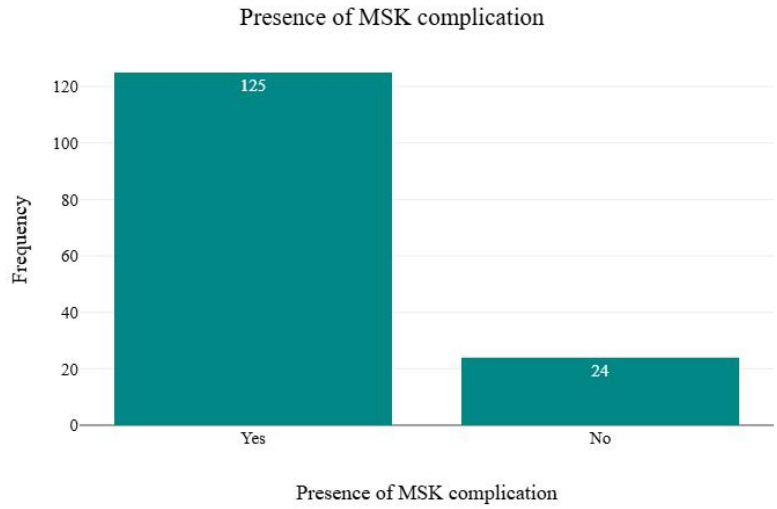

Figure 14Presence or absence of musculoskeletal complications frequency among hemophilia patients

The highest number of joints affected in one individual were 8 out of 10 joints (0.67%), 7 joints in 0.67%, 6 joints in 0.67 %, 5 joints in 1.34%, 4 joints in 4.03, 3 joints in 5.37%, 2 joints in 29.53% and a single joint in 41.61%.

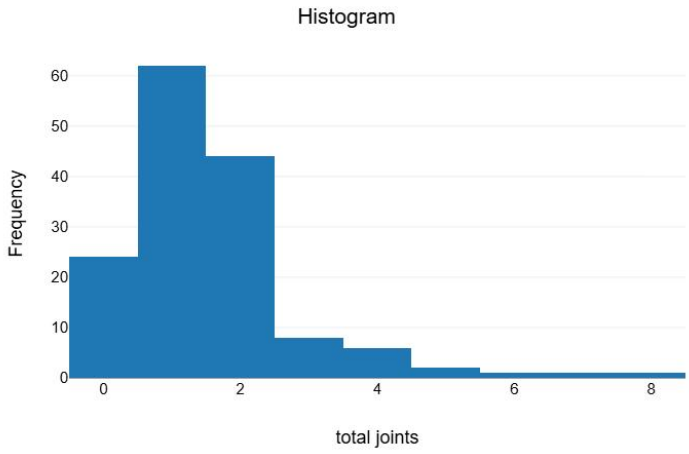

Figure 15Total joints involved frequency distribution among hemophilia patients

Gilbert scores confirmed that the knees were the most affected joints (mean 1.7 right, 1.6 left; maximum 10), followed by the elbows (mean 0.38 right, 0.5 left; maximum 6), while the ankles were least affected (mean <0.5; maximum 4–5).

Table 11Gilbert score of joints of hemophilia patients

	gilbert right knee	gilbert left knee	gilbert right elbow	gilbert left elbow	gilbert right ankle	gilbert left ankle
Mean	1.7	1.6	0.38	0.5	0.19	0.32
Std. Deviation	2.57	2.79	1.18	1.42	0.75	0.97
Minimum	0	0	0	0	0	0
Maximum	10	10	6	6	4	5

Gilbert scores confirmed that the knees were the most affected joints (mean 1.7 right, 1.6 left; maximum 10), followed by the elbows (mean 0.38 right, 0.5 left; maximum 6) while the ankles were least affected (mean <0.5; maximum 4–5).

Table 12Correlation of age and age at diagnosis with musculoskeletal complications of hemophilia patients

			asymptotic		
	U	z	p	exact p	r
Age	1346	-0.8	.426	.429	0.07
Age at diagnosis	1397.5	-0.53	.593	.599	0.04

Statistical analysis showed no significant association between age or age at diagnosis and musculoskeletal complications ($p < 0.429$ and $p < 0.599$ respectively). Similarly, hemophilia type was not associated with complications ($p = 0.653$). However, factor level ($p<0.01$) and

treatment modality (p <0.001) were significantly associated with the presence of musculoskeletal complications.

Table 13Correlation of hemophilia type, factor level and mode of treatment with musculoskeletal complications of hemophilia patients

	Chi^2	Df	p
hemophilia type - Presence of MSK complication	0.2	1	.653
Factor level - Presence of MSK complication	9.25	2	.01
treatment - Presence of MSK complication	17.02	1	<.001

5.2 Discussion

Out of 149 patients with hemophilia, the majority 111 (74.5%), were diagnosed with Hemophilia A while Hemophilia B accounted for 25.5% of cases. This is consistent with Lyar et al. reported 72.4% Hemophilia A and Hazewinkel et al. observed 76% Hemophilia A with 24% Hemophilia B. However, other studies showed even higher proportions of Hemophilia A: Mishra et al. (90.1%), Diop et al. (90.7%), Nguyo Maina (91.9%)and Bordbar et al. (90%)(11–14,16,17)

Mean age at diagnosis of our study is 41.7 months, with a median of 24 months. This is prolonged when compared to reports in South Africa, where the mean age at diagnosis was 9 months in severe cases, 11 months in moderate cases, and 21 months in mild hemophilia. Similarly, Diop et al. in Senegal found mean ages at diagnosis of 4.9 years in severe cases, 5.3 years in moderate, and 8 years in mild hemophilia(12,13).

In thisstudy 44.9% of patients had severe hemophilia, 32.2% moderate, and 22.8% mild. This is comparable to South African data, where 43% had severe disease, 29% moderate, and 22% mild. Diop et al. in Senegal reported a slightly higher proportion of severe cases (52.1%), while Nguyo Maina in Kenya found 70.3% severe hemophilia. In India, Mishra et al. documented 59.3% severe hemophilia A and 60% severe hemophilia B(11–13,15).

Musculoskeletal complications were present in 83.9% of our patients, with 91.3% reporting hematomas and 9.4% pseudotumor. In Kenya, Nguyo Maina reported musculoskeletal involvement in 97% of patients, with 86.5% recurrent hemarthrosis, 75.7% reduced range of motion and 70.3% fixed flexion deformities. In India, Mishra et al. found 90.1% hemarthrosis, 63.4% arthropathy, 32.7% synovitis, and 17.8% muscle hematomas, while pseudotumor were

less frequent (3%). Bordbar et al. in Iran reported 93% multiple joint involvementwith skeletal complications more common in severe hemophilia. Compared to these studies,our studyshows a similarly high burden, with pseudotumor appearing more commonly(11,15,16).

The knees were the most affected joints (80.7%), followed by elbows (34.5%) and ankles (22.7%) in this study. Lyar et al. in Ethiopia reported a similar involvement of joints with 70.4% knee involvement, 24.7% elbow, 15.2% hipand 9.5% ankle. Hayam et al. in Egypt found 73.3% knee involvement, 16.7% ankle, 6.7% elbow and 3.3% shoulder. In India, Mishra et al. showed the knee as the most common target joint (51.1%) followed by the elbow (25.5%) and ankle (15.8%). Bordbar et al. in Iran also found predominant knee and ankle involvement.But in United Kingdom Stephenson et al.and Spain Aznar et al. the most common joint involved was ankle(10,14–16,19,20).

In thisstudy, 80.5% were managed with episodic transfusion, 19.4% received minimal or no transfusion and none were on prophylaxis. In South Africa, 73% were managed with on-demand therapy, while 20% received periodic prophylaxis and 7% continuous prophylaxis, with prophylaxis associated with substantially lower rates of joint impairment. Bordbar et al. in Iran reported 15% of Hemophilia A patients and 40% of Hemophilia B patients on prophylaxis, with skeletal complications significantly reduced among those receiving preventive therapy(12,16).

In this study, statistical analysis demonstrated that factor level ($p< 0.01$) and treatment modality ($p<0.001$) were significantly associated with the presence of musculoskeletal complications. By contrast, age, age at diagnosis, and hemophilia type showed no significant associations.Comparable results have been reported in Hayam et al. in Egypt demonstrated a significant inverse correlation between serum factor levels and Gilbert joint scores, confirming that lower factor activity is strongly linked to worse joint health. Similarly, Mishra et al. in India found that patients with severe hemophilia, defined by factor activity <1%, had markedly higher rates of recurrent hemarthrosis (90.1%) and hemophilic arthropathy (63.4%) compared to those with moderate or mild disease. Bordbar et al. in Iran also documented that skeletal complications were significantly more frequent and severe among patients with severe hemophilia, with higher rates of synovitis, osteoporosis and multi-joint involvement.In South Africa, Hazewinkel et alpatients managed with on-demand therapy (73%) had substantially higher rates of functional joint limitation compared to those receiving periodic prophylaxis (20%). Manco-Johnson et al. in the United States confirmed this in a landmark trial, showing that prophylaxis prevented joint disease in boys with severe hemophilia compared to episodic treatment(43)(12,14–16).

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7 WORK PLAN AND BUDGET

7.1 Work plan

Task	June 2025	July 2025	aug 2025	Sep to nov	Dec 2025

				2025	
Proposal development					
Proposal presentation					
Submission for ethical approval					
Data collection and analysis					
Result writing and presentation					

7.2 Work budget

Title	Qualification	Numbers	Cost per case (ETB)	Cost (50 cases each data collector)	Tota in birr (ETB)
Data Collector	Orthopedics resident	1	300	1*300*50	15,000
Data collector	Orthopedics resident	1	300	1*300*59	17,700
Taking out card from store			20	109*30	3,270
Subtotal					35,970ETB

Materials and Equipments					
Type	Quality	Quantity	Unit Cost (ETB)	Total	
Pen	Lexi	4	25	100	
Pencil	Dot Pencil	2	10	20	
Notepad	Sinarline	2	50	100	
Printing proposal and binding		3*200	3	1800	
Printing Final thesis		3*200	3	1800	
Subtotal				3820	
Communication					
	Unit Cost (ETB)	Quantity	Total (ETB)		
Mobile Card	100	4	400		
Monthly Internet	979	6	5874		
Contingency					3000ETB
Grand Total= 35,970+ 3,820 + 400 + 5,874 + 3,000					49,064ETB

8 ANNEXES

8.1 CONSENT FORMS

Title – prevalence of musculoskeletal complications among hemophilia patients as seen in TASH

INVESTIGATOR

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Introduction; I would like you to know I am conducting a study on bone, joint and muscle complications on peoples living with hemophilia under the supervision of my advisors and coadvisors. This form lets you know about study that you can decide to participate or not. Your participation is on voluntary basis and you may withdraw without providing any reasons. If there is any question regarding the study you can ask me, my advisors and IRB by the contact provided above. Once you are volunteer to participate in the study, I would request you to sign at the end of this form.

Purpose – this study is aimed to evaluate the most common complication of hemophilia which results from bleeding to joint and muscle. The information after the study is useful to plan treatment for you and other hemophilia patients, and formulating policies that will help to improve quality of life for people living with hemophilia. This study involves all hemophilia patients visiting Tikur Anbessa specialized hospital.

Expectations of the participant; after you agree on study participation, the principal investigator will ask and examine your muscles and joints to evaluate if continued bleeding had resulted in structural changes in muscles and joints. All the findings will be recorded on data collection tool.

Confidentiality; we will ensure that information collected is kept confidential and only use for purpose of study.

Benefits; you will benefit from clinical evaluation and proceed with management of complications if there is any. The information obtained will guide the clinicians and orthopedic surgeons to know burden and pattern of complications in peoples living with hemophilia and plan for multidisciplinary team approach for appropriate management.

Statement of consent for adults

I certify that I have read this form and purpose of this study and my role in it has been fully explained to me. I do understand confidentiality will be maintained and my identity will not be disclosed. This is voluntary study and I may withdraw at any given time if I wish. I hereby willingly agree to participate on it.

Participant's name ---------- signature(thumbprint)----------

Date ----------

Statement of consent for minors

I certify that I am the parent/guardian to ----------and have read this form and the purpose of this study and the role of my child in it has been fully explained to me. I do understand confidentiality will be maintained and my child's identity will not be disclosed. That this is a voluntary study and I my withdraw at any given time if I wish. I hereby willingly agree to participate in it.

Parent/ guardian's name ---------- signature (thumbprint)

Date----------

Investigator statement

I confirm that I have clearly explained to the participant about the study and the participant has consented to participate voluntarily without any pressure.

Investigator's signature ---------- date ----------

8.2 DATA COLLECTION SHEET

PATIENT DETAILS

1, Age in years

2, Gender?

3, Hemophilia type?

4, Age at diagnosis in months?

5, Site of first bleeding?

8, Factor level in percent?

9, Mode of treatment- no or minimal transfusion therapy, episodic transfusion for most of bleeding episodes maintenance or prophylactic therapy home, self-transfusion program

History details

History or Prescence of hematoma? Yes/ no

Site of hematoma? Joints, muscle, GIT, CNS, Genitourinary

History or Prescence of pseudotumor? Yes/no

Site of pseudotumor? Arm, forearm, thigh, calf, trunk and pelvis

History or presence of pathological fracture? Yes/ no

Site of pathological fracture?

History or presence of peripheral nerve palsy? Yes/ no

site of peripheral nerve palsy?

Require an aid for ambulation? Yes/no

Type of ambulation: brace or orthosis, cane, crunches, or wheelchair

JOINT EVALUATION

Joint pain? No, mild, moderate or severe

Site of joint pain? right elbow, left elbow, right knee, left knee, right ankle, left ankle, shoulders, wrist, hip

Joint bleeding? None, 1-3 mnor, 1-2 major and 4-6 minor, 3 or more major and 7 or more minor

site of joint bleeding? right elbow, left elbow, right knee, left knee,shoulders, wrist, hip

Right elbow swelling?Absent, present present with synovitis,

left elbow swelling? absent, present present with synovitis

Right knee swelling?Absent, present present with synovitis

left knee swelling?Absent, present present with synovitis

Right ankle swelling?Absent, present present with synovitis

left ankle swelling?Abscent, present present with synovitis

Shoulder swelling? absent present present with synovitis

Hip swelling? Absent, present with synovitis?

Wrist swelling? Absent, present with synovitis?

Muscle atrophy?Absent, present

site of muscle atrophy?

Right knee angular deformity? 0–7-degree valgus, 8–15-degree valgus or 0–5-degree varus, >15-degree valgus or >5-degree varus

left knee angular deformity? 0–7-degree valgus, 8–15-degree valgus or 0–5-degree varus>15-degree valgus or >5-degree varus

Right ankle deformity no deformity? <10-degree valgus and <10-degree varus, >10-degree valgus and >5-degree varus

left ankle deformity no deformity? <10-degree valgus and <10-degreevarus, >10-degree valgus and >5-degree varus

Crepitus on motion?None/present

Site of crepitus on motion?

Right elbow Range of motion? total full ROM loss < 10%, total full ROM loss 10-30%, total full ROM loss >30%

left elbow range of motion? total full ROM loss < 10%, total full ROM loss 10-30%, total full ROM loss >30%

Right knee range of motion? total full ROM loss < 10%, total full ROM loss 10-30%, total full ROM loss >30%

Left knee range of motion? total full ROM loss < 10%, total full ROM loss 10-30%, total full ROM loss >30%

Right ankle range of motion? total full ROM loss < 10%, total full ROM loss 10-30%, total full ROM loss >30%

left ankle range of motion? total full ROM loss < 10%, total full ROM loss 10-30%, total full ROM loss >30%

> 15 degrees fixed flexion contracture? yes/no

site of >15 degrees of fixed flexion contracture? right hip, left hip, right knee, left knee, right ankle, left ankle, right elbow, left elbow

Right elbow joint instability?Abscent, present but functions are not affected, present and functions are affected.

left elbow joint instability? absent, present but functions are not affected, present and functions are affected.

Right Knee instability?Absent, present but functions are not affected, present and functions are affected.

left knee instability?Abscent, present but functions are not affected, present and functions are affected

Right ankle instability?Absent, present but functions are not affected, present and functions are affected.

left ankle instability?Abscent, present but functions are not affected, present and functions are affected

total number of affected joints?

8.3 WFH PHYSICAL EXAMINATION (GILBERT) SCORE

Physical finding	Score	Scoring key
Swelling	0 or 2 + (S)	0 = absent 2 = present (S) if chronic synovitis
Muscle atrophy	0-1	0 = ≤ 1cm 1= 1cm
		Axial deformity measured in knee and ankle only
Knee	0-2	0 = 0-7 degrees valgus 1 = 8-15 degrees valgus 0r 0-5 degrees varus 2 = > 15 degrees valgus or > 5 degrees varus
Ankle	0-2	0 = no deformity 1 = < 10 degrees valgus or < 5 degrees varus 2 = > 10 degrees valgus or > 5 degrees varus
Crepitation on motion	0-1	0 = none 1 = present
Range of motion	0-2	0 = loss of < 10 % of total full range of motion 1 = loss of 10 – 33 % of total full range of motion 2 = loss of > 33 % of total full range of motion
Flexion contracture	0 or 2	0 = < 15 degrees of fixed flexion contracture 2 = ≥ 15 degrees of fixed flexion contracture

Instability	0-2	0 = no 1 = present but neither interferes with function nor requires bracing 2 = present and interferes with function or requires bracing
Total	0-12 0-10	Knee and ankle elbow