Assessment of healthcare measures, healthcare resource use, and cost of care among severe hemophilia A patients in Mumbai region of India

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ABSTRACT

Background: In India, the low public health priority given to rare disorders such as hemophilia hinders their management and optimal care, leading to relatively poor health outcomes. This study aims to profile the multidimensional health status of patients with severe hemophilia A, and its association with the use of healthcare resources and the cost of care in Mumbai region of India. Subjects and Methods: A cross-sectional, single-center study was conducted during January–May 2011, among 160 patients diagnosed with severe hemophilia A in Mumbai region of India. Their health status was documented using the Hemophilia Utilization Group Study’s validated instrument of Functional Health Status Measure (FHS) and a single item of Self-care Measure. Results: Of 160 patients, 55% (n = 88) scored on the lower side on the FHS, with an average score of 6.65 ± 2.85. The use of healthcare resources and cost of treatment were considerable for patients with a lower mean rank score on the FHS and a higher mean rank score on the self-care measure. The consumption of clotting factor concentrates (CFCs), number of visits to a health facility and incidence of inpatient episodes were significantly associated with a relatively low score on the FHS. Similarly, a higher cost of treatment, in terms of the cost of CFCs, direct cost, emergency room cost, and indirect cost, were significantly associated with a lower score on the FHS. Conclusion: The health status of patients with severe hemophilia A is compromised and has a significant impact on the use of healthcare resources and the cost of treatment.

KEY WORDS: Cost, functional health status, healthcare resources, hemophilia

Introduction

Hemophilia is a rare congenital disorder with clinically well-established health condition across severity. Worldwide, hemophilia has an incidence of 1 in 10,000 births, and hemophilia A constitutes 70% of the case burden, compared to hemophilia B. The number of reported cases of hemophilia in India is 17,470, which makes it the country with the second highest global burden of the disorder. The clinical manifestations of hemophilia include spontaneous bleeding diathesis progressing to abnormalities of the coagulation cascade, representing multiple joint arthropathies; septic arthritis; myositis ossificans; and muscle atrophy. The clinical manifestations contribute to functional disability, morbidities, and premature mortality, especially in the case of untreated patients or those receiving suboptimal treatment. The optimal management of the disorder is hampered by the prohibitive costs of treatment that compromises the acute management of bleeds during emergencies, leading to serious and debilitating health outcomes that are life-threatening. The cumulative effects of these adverse situations, therefore, merit assessment.

Globally, studies have documented the assessment of patient-reported outcomes, focusing on patients’ perspectives
on the impact of hemophilia, as well as of treatment and the provision of healthcare.[6,7] The functional health status (FHS) measure of the Hemophilia Utilization Group Study (HUGS) and self-care measure are patient reported outcomes used in hemophilia clinical research. These measures are used to study the association of the FHS with the use of healthcare resources, health expenditure, and the clinical outcome of the treatment of hemophilia.[6,7] The HUGS-FHS and self-care measure was first used among persons living with hemophilia (PWH) in the year 1995 at the Hemophilia Treatment Centers in California, USA. These measures scored by provider interview and retrospective chart review of health services provided to PWH.[6,7] The HUGS-FHS subsequently replicated in other research related to PWH in other parts of the world.[8,9] The self-care measure is similar to those validated by Globe et al.[9] for PWH and by Justice et al.[10] for patients hospitalized with AIDS. However, such data are sparse in India. This study aimed to assess the health status of patients with severe hemophilia A and its association with the use of healthcare resources and the cost of treatment in Mumbai region of India. The study used the cost of illness approach from the societal perspective.[10]

**Subjects and Methods**

**Ethics**

The study was approved by the Committee for Academic Research Ethics of Seth G. S. Medical College and King Edward VII Memorial Hospital, Mumbai, India. Informed consent of the participants was taken before enrollment in the study.

**Study design**

This was a cross-sectional, single-center study of patients with severe hemophilia A from the western zone Mumbai and suburban region. Those suffering from mild and moderate hemophilia A, as well as hemophilia B, were excluded from the study. On an average, the severity of hemophilia shows significant relationships across clinical, social, and psychological functioning compared with mild and moderate hemophilia.[11] Patients with severe hemophilia A with a bleeding phenotype and reported a catastrophic bleeding episode during the reference from January 2010 to December 2010, and who subsequently used healthcare resources, were recruited from the 2010 database of the Hemophilia Society, Mumbai Chapter. The patients were from all age groups. Data were collected for 5 months, from January 2011 to May 2011.

**Assessment of healthcare measures**

Two healthcare measures were used to assess the health status of the patients. These measures reported from patients perspectives.

**Self-care status**

This scale has four-point items and measures the patient’s ability to maintain basic self-care. This is a validated tool that is applied in chronic illness, such as in the case of hospitalized AIDS patients, and has been found to be predictive survival.[12] On this scale, the highest score represents the lowest ability to maintain self-care (score = 4 indicates the need for total care by nurse/others).

**Functional health status measure**

HUGS functional health status measure refers to the ability to engage in daily activities and encompasses the physical, cognitive and social functioning required for everyday life. This FHS measure had a 10-point scale summing scores from four categories: Orthopedic status (0–4 points), work/school/usual activities status (0–2 points) social interaction (0–2 points), and overall well-being (0–2 points). A score of 7 and above denotes a higher FHS.[9]

**Validation of scale**

The scale was validated in the Indian context. The items of the questionnaire were validated by evaluation by 21 experts, using Fleiss’ kappa (=0.625), which is considered as substantial agreement. After validation, the items and their options were translated into the local language. The translated questionnaire was then assessed by five experts for validation, using Fleiss’ kappa. The observed agreement among the five experts was 0.819, which is considered as “almost perfect agreement.” The internal consistency of the subscales representing the HUGS FHS measure was confirmed after administering the questionnaire to 21 patients, using Cronbach’s Alpha Coefficient (value = 0.793).

**Study variables**

Home visits were paid to collect information on sociodemographic, clinical, and cost variables. Data were collected on the economic status of the household, using an abridged version of consumption expenditure instrument.[12] This included expenditure on durable and nondurable items and the cost of healthcare for other family members. Expenditure on the treatment of hemophilia was taken as the observed expenditure incurred over a 12-month recall period. The expenditure on treatment was bifurcated as direct costs and indirect costs. The former included the cost incurred for the purchase of clotting factor concentrates (CFCs), cost incurred for hemostatic drugs, hospitalization costs, physicians’ charges, and cost of transportation. The indirect costs included loss of wages during the symptomatic and recovery periods. The authenticity of the data on the clinical variables was confirmed by cross-checking the medical records of the patients and the purchase of CFCs with the records of the Hemophilia Society, Mumbai Chapter.

**Statistical analysis**

The data were analyzed using SPSS (Window version 20.0, SPSS Inc., Chicago, IL, USA). The descriptive statistics were assessed. Nonparametric tests were used for bivariate analysis, as the data were not normally distributed. The Mann–Whitney U-test was used to compare the FHS and self-care health status scores by selected background characteristics and clinical profile characteristics. The Mood’s median test was used to compare the median among sociodemographic and cost-related variables by measures of functional and self-care health status. P < 0.05 was considered statistically significant.
Results

A total of 283 patients fulfilled the inclusion criteria for the study from among 1600 patients entered in the database of the hemophilia registry. However, only 160 (56.53%) of these patients were recruited as the addresses and contacts of 67 (23.67%) patients were reported incorrectly; 12 (4.24%) patients had died; 15 (5.30%) refused to participate in the study; and 29 (10.24%) with biologically severe hemophilia A did not have a bleeding phenotype. The study shows the findings of both health status measures: FHS and self-care status. The FHS in terms of social interaction and ability to attend school was noticeable: social isolation –11.9% and disability to attend the work/school –13.1%. The prevalence of FHS in terms of orthopedic condition-bedridden (3.1%) and overall well-being– extremely ill (9.4%) were less, however, patients experiencing bouts of disability requiring assistance were considerable (43.8%). The prevalence of self-care status in terms of assistance needed was 11.3% and prevalence of dependent on others was 5.6%. Table 1 presents the socio-demographic and clinical characteristics of the patients with severe hemophilia A.

The annual average median costs of hemophilia treatment are INR 17,551 (standard deviation = 30,769). Table 2 shows the association between the cost of treatment, utilization of healthcare

Table 1: Socio-demographic and clinical characteristics of patients with severe hemophilia A, Mumbai, India [n = 160]

| Socio-demographic characteristics | n  | %  | Clinical characteristics of patients | n  | %  |
|-----------------------------------|----|----|--------------------------------------|----|----|
| Age                               |    |    | Co-morbidity status                  | 36 | 22.5 |
| < 5 years                         | 19 | 11.9| Types of co-morbidities [n=36]       |    |     |
| 6-18 years                        | 60 | 37.5| HIV                                 | 4  | 11.1 |
| 19-35 years                       | 57 | 35.6| HBV                                 | 4  | 11.1 |
| 35+ years                         | 24 | 15.0| HCV                                 | 23 | 63.9 |
| Median age of patient 19 years [I.Q.R. 19 years] |    |    | Other co-morbidities                | 12 | 33.9 |
| Educational attainment            |    |    | Catastrophic bleeds at multiple sites [annual bleed episodes] | 122 | 76.3 |
| Underage for education            | 23 | 14.4| Joints                              | 6  | 3.8 |
| Primary school                    | 18 | 11.3| Muscle                              | 34 | 21.3 |
| Middle-level school               | 48 | 30.0| Dental                              | 24 | 15.0 |
| Secondary-level school and above  | 44 | 27.6| Genito-urinal                       | 15 | 9.4  |
| Graduate and postgraduate         | 22 | 13.7| Accident/trauma                     | 11 | 6.9 |
| Professional education            | 5  | 3.1 | CNS                                 | 8  | 5.0 |
| Working status                    |    |    | Surgical bleeding at multiple sites [annual bleed episodes] | 122 | 76.3 |
| No                                | 95 | 59.4| Gastrointestinal                    | 5  | 3.1 |
| Yes                               | 65 | 40.6| Other sites                         | 6  | 3.8 |
| Type of employment                |    |    | Disability status                   | 78 | 48.8 |
| Unemployed                        | 95 | 59.4| Congenital history                  | 63 | 39.4 |
| Employed (government/private sector) | 60 | 37.5| No. of bleeding episodes             | 84 | 52.5 |
| Self-employed                     | 5  | 3.1 | < 2 episodes                        | 76 | 47.5 |
| Occupation                        |    |    | 2+ episodes                         | 59 | 36.9 |
| Unemployed/children               | 95 | 59.4| Hospitalization                     | 69 | 43.1 |
| Unskilled worker                  | 40 | 25.0| Utilization of healthcare facilities | 11 | 6.9 |
| Skilled worker                    | 16 | 10.0| Public hospital                     |    |     |
| Professional                      | 9  | 5.6 | Private hospital                    |    |     |
| Marital status                    |    |    | Both                                | 80 | 50.0 |
| Unmarried                         | 124| 77.5| Therapeutic modality                |    |     |
| Married                           | 36 | 22.5| CFCs                                | 119| 74.4 |
| Type of family                    |    |    | Cryoprecipitate                     | 21 | 13.1 |
| Nuclear                           | 100| 62.5| Both                                | 19 | 11.9 |
| Joint                             | 60 | 37.5|                                    |    |     |
| Religion                          |    |    |                                      |    |     |
| Hindu                             | 111| 69.4|                                      |    |     |
| Muslim                            | 41 | 25.6|                                      |    |     |
| Others Christian/Sindhi           | 8  | 5.1 |                                      |    |     |
| Place of residence                |    |    |                                      |    |     |
| Mumbai                            | 53 | 33.1|                                      |    |     |
| Mumbai suburban                   | 70 | 43.8|                                      |    |     |
| Part of urban Greater Mumbai [Vasai/Virar/Vashi/Thane] | 37 | 23.1| Both                                | 19 | 11.9 |
| Total                             | 160| 100|                                      |    |     |
In addition to this, adult hemophilic patients had a cumulative effect on the health status of patients with severe hemophilia. The healthcare utilization in terms of number of IU CFCs used among hemophilia patients was significantly associated with functional (median no. units used: 2000 vs. 1000, \( P = 0.007 \)) health status; which suggests that it significantly more used among “low” functional status patients as compared to their counterparts. In addition, the total number of physician contacts also associated with FHS. The data showed that “low” FHS patients were more likely to contact physician (median no. of total physician visits: 8 vs. 6, \( P = 0.002 \)) as compared to patients having “high” FHS. Similarly, in terms of cost, total direct cost (median direct cost: 19560 vs. 11,200, \( P < 0.001 \)), total cost of CFCs (median CFC cost: 12750 vs. 5950, \( P < 0.0001 \)) and emergency care cost (median emergency care cost: 18842 vs. 7500, \( P = 0.001 \)) was significantly associated with FHS. It has been observed that total direct cost, CFCs cost, and emergency care cost was significantly more likely among “low” FHS patients as compared to “high” FHS patients. Similarly, in case of self-care health status, the patients having “high” self-care health status were associated with more use of CFCs units (median no. of total CFCs units used: 1134 vs. 2500, \( P = 0.006 \)), higher direct cost (median direct cost: 12889 vs. 19129, \( P = 0.002 \)), higher CFCs cost (median CFC cost: 7650 vs. 12450, \( P = 0.027 \)), and higher emergency care cost (median emergency care cost: 10511 vs. 18850, \( P = 0.003 \)).

**Discussion**

Of the study population, 10.24% (\( n = 29 \)) had biologically severe hemophilia A with no bleeding phenotype. These findings are commensurate with a previous research study.\(^{11}\) The average score for the HUGS-FHS in our sample was 6.65, denoting that patients with severe hemophilia A have a lower FHS. It also implies that these patients have a relatively high disease burden. Our results confirm the negative impact of a poor health status, which increases the likelihood of absenteeism from school/work (43.1%). This has interfered with these patients’ performance and ability to attend school/work (13.1). The result is scholastic backwardness and lower social competencies, and a decreased ability to make social adaptations among children with hemophilia.\(^{14,15}\) As for adult PWH, the findings speak of downward social mobility in occupational career, which contributes to the person’s economic burden.\(^{16}\)

In India, high costs of treatment products and lack of comprehensive hemophilia care at the three-tier public health systems makes adult patients with hemophilia at an increased risk of musculoskeletal deformities and comorbidities.\(^{17,18}\) In addition to this, adult hemophilic patients are not immune to the usual diseases of aging seen in the general male population such as cardiovascular diseases, and various cancers resulting in poor health status.\(^{19}\)

This commensurate with our study finding of lower health status of adult patients with hemophilia on both measures. The data [Table 3] show a lower mean rank on FHS and a higher mean rank for self-care scale for PWH who suffer with comorbidity and disability. Lack of specialized training of frontline healthcare providers, such as family physicians, to administer timely treatment make disability an inevitable consequence of hemophilia with its social costs.\(^{13}\) The dubious safety of blood transfusion practices and absence of an effective system of viral inactivation increased the risk of transfusion-transmitted infection among Indian patients and had a cumulative effect on the health status of patients with hemophilia.\(^{18}\) Further, study findings show that patients who avail treatment product at home to treat emergency bleeds

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**Table 2: Association of treatment cost, healthcare utilization, and measures of health status among patients with severe hemophilia A, Mumbai, India (\( n = 160 \))**

| Sociodemographic and clinical profile characteristics | Functional health status | \( P^* \) | Self-care health status | \( P^* \) |
|-------------------------------------------------------|--------------------------|-----------|-------------------------|-----------|
| Patient characteristics                               |                          |           |                         |           |
| Median age (years) (IQR)                              | Low (\( n = 85 \))       | 20 (18)   | 17 (21)                 | 0.693     |
|                                                       | High (\( n = 75 \))      | 18 (20)   | 22 (22)                 | 1.795     |
| Median annual utilization                             |                          | 0.405     | 1.975                   |
| Total units of CFCs used (IU/person) (IQR)            | Low (\( n = 93 \))       | 2000 (3540) | 1134 (2495) | 0.007 |
|                                                       | High (\( n = 67 \))      | 1000 (2750) | 2300 (3550) | 7.421 |
| Total physician contacts (IQR)                        | Low (\( n = 37 \))       | 8 (8)     | 6 (5)                   | 0.778 |
|                                                       | High (\( n = 22 \))      | 4 (6)     | 7 (8)                   | 0.378 |
| Total emergency care cost (IQR)                       | Low (\( n = 101 \))      | 18,842 (20,997) | 18,842 (20,997) | 0.827 |
|                                                       | High (\( n = 59 \))      | 7500 (13,480) | 20,821.5 (38,455) | 0.110 |
| Total indirect cost (IQR)                             | Low (\( n = 81 \))       | 4000 (8200) | 10,511 (14,387) | 0.010 |
|                                                       | High (\( n = 32 \))      | 3000 (3500) | 22,858 (35,990) | 0.079 |

\( ^* P \) values are generated using the Mann-Whitney test, Cost in INR (Indian rupees), On self-care scale, score on low health status indicates higher health status of PWH, IQR: Interquartile range, CFCs: Clotting factor concentrates, PWH: Persons living with hemophilia, IU: International units
shows better health status, as traveling exaggerates bleeds in overcrowded public transport and increases the risk of musculoskeletal complications and deaths from hemorrhage. Kar et al. [16] study reveals that PWH who had access to CFCs at home had less disability than those without access to treatment products at home. In India, about 25% of patients with hemophilia are hepatitis C virus (HCV)-infected and malignancies, specifically hepatocellular carcinoma among HCV-infected patients and non-Hodgkin’s lymphoma among HIV-infected patients, are on the rise. [20]

Those who had a lower score on the FHS and higher score on the self-care status at clinical parameters such as hemophilic arthropathy, comorbidity, and the number of bleeding episodes must have had a greater need to use healthcare resources and therefore, spent more on treatment [Table 2]. Our findings are similar to those reported by various international studies. People with comorbidities were found to have poorer health outcomes, and required complex medical and surgical interventions; this was one of the prime predictors of the costs of treatment for hemophilia. [21,22] The study of Heemstra et al. [21] on Canadian patients with severe hemophilia A found that transfusion-transmitted infections led to a rise in the cost of healthcare. Further, the presence of arthropathy is likely to increase the frequency of spontaneous bleeds in the affected joints and this, in turn, increases the cost of treatment. A study by Globe et al. reported that disability was one of the prime determinant of the cost of treatment. [7] As the severity of hemophilia warrants frequent visits to a health facility, the use of healthcare resources is considerable. [6,7] Hospitalization compels PWH and their caregivers to abstain from work for a prolonged period as the period of convalescence is long, resulting in high indirect costs. These findings are commensurate with those of previous studies. [18]

Although there has been a great improvement in the treatment of hemophilia across the world, the issues of pharmacokinetics

Table 3: Comparison of Functional Health Status Measure and Self-care Measure by selected socio-demographic and clinical profile characteristics of patients with severe hemophilia A, Mumbai, India (n=160)

| Sociodemographic and clinical profile characteristics | n | Functional health status | Self-care health status |
|--------------------------------------------------------|---|--------------------------|-------------------------|
|                                                        |   | Mean rank | Mann-Whitney U statistics | P* | Mean rank | Mann-Whitney U statistics | P* |
| **Sociodemographic characteristics**                    |   |   |                          |    |   |                          |    |
| Age/patient category                                    |   |   |                          |    |   |                          |    |
| Children                                               | 80 | 83.3 | 2972.5 | 0.431 | 77.9 | 2988.5 | 0.416 |
| Adults                                                 | 80 | 77.7 |          |    | 83.1 |          |    |
| Place of residence                                      |   |   |                          |    |   |                          |    |
| Urban with care center                                  | 53 | 87.2 | 2481.0 | 0.192 | 78.9 | 2749.5 | 0.725 |
| Urban without care center                               | 107| 77.2 |          |    | 81.3 |          |    |
| **Clinical profile characteristics**                    |   |   |                          |    |   |                          |    |
| Congenital history                                      |   |   |                          |    |   |                          |    |
| No                                                     | 97 | 83.0 | 2811 | 0.386 | 76.7 | 2687.0 | 0.147 |
| Yes                                                    | 63 | 76.6 |          |    | 86.4 |          |    |
| Comorbidity                                             |   |   |                          |    |   |                          |    |
| No                                                     | 124| 84.1 | 1789.0 | 0.07 | 76.9 | 1782.5 | 0.038 |
| Yes                                                    | 36 | 68.2 |          |    | 93.0 |          |    |
| Disability (hemophilic arthropathy)                     |   |   |                          |    |   |                          |    |
| No                                                     | 82 | 95.3 | 1987.5 | <0.001 | 69.7 | 2311.0 | 0.001 |
| Yes                                                    | 78 | 65.0 |          |    | 91.9 |          |    |
| Number of bleed episodes                                |   |   |                          |    |   |                          |    |
| <2 episodes                                             | 84 | 88.0 | 2563.5 | 0.029 | 75.7 | 2790.5 | 0.122 |
| ≥2 episodes                                             | 76 | 72.2 |          |    | 85.8 |          |    |
| Therapeutic modality                                    |   |   |                          |    |   |                          |    |
| CFCs                                                   |   |   |                          |    |   |                          |    |
| No                                                     | 41 | 87.2 | 2163 | 0.273 | 75.2 | 2222.0 | 0.338 |
| Yes                                                    | 119| 78.2 |          |    | 82.3 |          |    |
| Cryoprecipitate                                         |   |   |                          |    |   |                          |    |
| No                                                     | 139| 77.7 | 1064.0 | 0.043 | 82.8 | 1146.5 | 0.075 |
| Yes                                                    | 21 | 99.3 |          |    | 65.6 |          |    |
| Availability of CFCs at home                            |   |   |                          |    |   |                          |    |
| No                                                     | 123| 78.7 | 2055.5 | 0.366 | 81.3 | 2178.5 | 0.658 |
| Yes                                                    | 37 | 86.5 |          |    | 77.9 |          |    |

* P values are generated using the Mann-Whitney U-test. CFCs: Clotting factor concentrates
and cost of treatment still plague the hemophilia community in low- and middle-income countries. The diversity of baseline factor levels, as well as in the site and severity of bleeds, make it difficult to draw up prescriptive guidelines to restore baseline functionality. Considering that treatment is not standardized, it is important to assess the FHS and self-care status as a part of the routine clinical check-up of patients with severe hemophilia. The study contemplates several practical implications for the improvement of health status of patients with hemophilia. It is imperative to make physiotherapy, a psycho-social rehabilitation program and early medical intervention as components of comprehensive care across the three-tier health system. At present, treatment for hemophilia is available only in tertiary hospitals in the city of Mumbai. Interventions can be made more cost-effective by establishing day-care centers at every district hospital for the expeditious treatment of bleeds in an emergency and treatment by trained family physicians.

Early optimization of treatment to restore and maintain joint function will help to avoid sequelae later on in life. Graded exercise programs, including manual and ballistic techniques tailored to the site and severity of the injury, will result in anatomical and functional recovery, improve muscular strength, reduce postural imbalance and encourage patients to comply with and participate in the treatment process. Good clinical judgment should be exercised in musculoskeletal management, and prosthetics, orthotic devices, and walking aids must be recommended only if needed. Postural, kinesthetic, and proprioceptive training should be a part of regular sessions.

In recent years, the provision of care to patients with hemophilia has seen considerable changes in India. The spate of public interest litigations across various states, such as Uttar Pradesh, Delhi, and Maharashtra, has ensured that free CFCs are provided to the people, especially those below the poverty line and particularly during emergencies, at designated public health centers. For this purpose, the Maharashtra government has established day-care centers for PWI in several districts: Nashik, Amravati, Satara, Pune (Sassoon Hospital and Civil Hospital) and Mumbai. The government has allocated funds for the provision of free CFCs through the National Health Mission, Maharashtra, under the National Hematology Program. Similarly, the inclusion of PWH in the Disability (Persons with Disabilities [Equal Opportunities, Protection of Rights and Full Participation]) Act, 2017 aims at mainstreaming PWH in society. To mitigate the costs of hemophilia treatment, the state of Maharashtra has made a wider provision for medical social insurance for poor inpatients across 35 districts under the Rajiv Gandhi Jeevandayi Arogya Yojana.

We validated the FHS and self-care measures in Indian patients with hemophilia and found them to be suitable, reliable, and valid. The study uses uniform measures for pediatric and adult PWH hence the limitation. These measures are disease specific and not age specific. Studies on rare diseases fraught with methodological challenges in a country where patients were scattered over wide geographical regions a characteristic of low-density disorders. Hence, application of age-specific scale would make the sample exiguous for subgroup analysis. Second, the provision of retrospective data on the costs of treatment is subject to underestimation or overestimation of the costs, increasing the possibility of recall bias, hence the limitation. We recommend future multicentric research, on the clinical phenotype across the severity of hemophilia A and B to augment sustainability of the national hematology program and a continuum of care for this vulnerable group of patients with a rare disease.

Conclusion

FHS and self-care measures are suitable for application among hemophilia patients in the Indian context. The lower health status of patients with severe hemophilia A has had a significant impact on the use of healthcare resources and the cost of treatment in Mumbai region of India.

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Conflicts of interest
There are no conflicts of interest.

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