Management of Haemophilia in Developing Countries: Challenges and Options

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Abstract There are significant challenges in managing haemophilia patients in developing countries. These challenges are (i) Lack of proper health care infrastructure and human resources suitable for haemophilia care (ii) Competing health care priorities of the government. (iii) Lack of penetrance of medical insurance in the population. (iv) Lesser visibility of the haemophilia patients in health care system (v) Low awareness across the medical profession, population and the policy makers about the condition (vi) Non availability of factor concentrates (vii) Inadequate utilization of knowledge for reducing factor concentrate use. (viii) Inadequate pain relief (ix) Challenges due to inhibitor developing (x) Viral hepatitis & (xi) Lack of research publications relevant to the country are some of the challenges faced by PWH for their management in developing country. The solutions are not easy but development of a strong patient organization with linkages with World Federation of Haemophilia is an important initial step. Following that internal and international twinning, use of internal sources, strong advocacy programme targeting government, doctors, opinion makers will solve many of the challenges in the time to come.

Keywords Haemophilia · Developing country · Physiotherapy · Prenatal diagnosis · Comprehensive care · Haemophilia Federation of India

Introduction

Haemophilia is a relatively rare disorder and its prevalence has been computed as 1:5000 male births for haemophilia A and 1:20,000 male births for haemophilia B [1]. In developing countries of the world 80 % of the world population lives hence it is rational to surmise that 80 % of the haemophilia populations also should be there in those parts of the world. Haemophilia management is very costly (At least 4–5000 USD/PWH/Year) and it exemplifies the paradigm high cost low volume disease [2]. Eighty percent of the world's total expenditure in haemophilia is incurred by 10–20 % of PWH living in developed countries but 80 % of PWH of the world who are in developing countries receives very little. This 80–20 divide is present across various economic, social and health related inequalities in the world [3].

When we discuss the challenges of management of haemophilia in developing countries we tend to see all the developing countries as a homogeneous entity but actually they are not. Out of 180 countries who are members of United Nations only 30 countries can be regarded as developed and the rest 150 countries are developing and in some such countries like India an individual survives with less than 1USD/day, hence are not uniform. In the present review an attempt has been made to highlight some of the salient challenges in haemophilia management in developing countries and an attempt has been made to develop solutions to these problem.

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Materials and Methods

Haemophilia Journal over last 10 year was consulted through searches on articles which has highlighted challenges in many developing countries. Pubmed was searched with terms like Haemophilia, Management Challenges, Developing Countries and specific country wide names like India, China, Bangladesh, Pakistan, Middle East, Indonesia, Thailand etc. Main challenges of haemophilia care were computed from these searches and World Federation of Haemophilia (WFH) were consulted for many of the parameters which tells us about haemophilia care in different countries. In addition author's experience of managing haemophilia care in the worlds second largest populous country both as treating haematologist, researcher and volunteer and finally President of Haemophilia Federation of India (HFI) is also reflected in this review.

Challenges

Health Care Infrastructure

One of the major challenges in haemophilia care in developing countries is the rickety health care infrastructure. When we speak of health care infrastructure it means every component of health care infrastructure i.e., Doctors, Nurses, Physiotherapists, Laboratory Technicians, Laboratories, Hospitals etc. In some ways it is ironic, because many of these countries export Doctors, Nurses and various paramedical staffs to developed countries in substantial numbers. It takes large funding resources to educate and train these human resources but once such persons are trained, better economic prospects persuade these trained resources to leave their own countries to serve financially better of countries [4].

Moreover there is also an internal migration of trained manpower which hampers proper management delivery of health care. In many countries even through migration to developed or economically well off countries have stopped internal migration i.e., from village to cities and from less developed areas of the country to more developed areas also seriously compromise the health care delivery. Number of hospitals, health centres, laboratories are also awfully inadequate. In these countries. In many of these countries health care is inadequate in the government sector but there is a thriving private health care sector where quality of health care seems to be better but cost of the care is beyond the capability of average citizen, hence most of the citizens cannot take advantage of this improved healthcare infrastructure in their own country.

It has been agreed that a PWH can get best possible care in a comprehensive care system [5]. The comprehensive care facility moves around the pivot of a haematologist (a rarity in developing country) or a physician or a paediatrician interested in hemophilia care along with haemophilia care nurse, physical therapist, pathologist interested in coagulation tests and a laboratory supporting such tests along with technicians, dentists etc. This combination is not very easy to assemble in many hospitals in developing countries. Additional specialists like orthopaedic surgeon or other surgeons, radiologist's, help may be needed from time to time for proper management of such patients.

Lack of Penetration of Medical Insurance Services

In another model of health care including haemophilia care, involvement of medical insurance services is very important. This model follows the pattern used by United States of America. In developing countries the government is often unwilling to fund high cost haemophilia care effectively and due to financial constraints deep penetration of medical insurance programme is also lacking, this leads to substantial out of pocket expenses for individual families having a PWH [6] to manage. In some developed countries like U.K. medical insurance is taken as an additional coverage by many citizen, through National Health service makes every disease treatable free of cost under its umbrella. But individual surgical procedure in NHS of UK may have a long waiting list. Due to non penetration of medical insurance facility in many developing countries PWH themselves do not get insurance cover even when they approach insurance companies to take adequate health cover.

Competing Priorities for Different Diseases

Developing countries are passing through disease transitions in which many infectious disease like malaria, tuberculosis, gastroenteritis, arbovirus infections, hepatitis, acute respiratory infections, viral haemorrhagic fevers have not been adequately controlled but diseases of the developed countries like coronary artery diseases, hypertension, diabetes, obesity, cancers, degenerative neurological and other system diseases have made their appearance. Due to dual pressure of infections and degenerative, malignant disorders the meagre health finance (1–2 % of GDP) which these countries earmark for health is largely utilized by infectious, malignant and degenerative diseases leaving very little available for diseases which are less known.

Lack of Health Care Infrastructure Makes Severe or Fatal Inherited Disorders Invisible to the Society

In a developing country where the health care infrastructure is next to non existent children born with serious genetic disorders which cannot be easily diagnosed and managed die and visibility of this disorder in the society becomes less apparent. However, whenever some basic infrastructure in these countries allow these patients to survive (Blood/plasma/cryo infusion) then these patients (PWH) survive with severe musculoskeletal deformity or other handicaps and the society starts demanding management for such patients.

Between 1940 and 1960 it was believed that haemophilia does not occur in large part of African Subcontinent, China. However as some kind of blood transfusion services were made available in almost every developing country of the world, now we keep seeing PWH in every country and there are variable amount of demand from the society to governments of these countries to develop management facility for haemophilia. Studies [7, 8] have shown that prevalence of haemophilia at birth remains constant in any population. However their apparent invisibility is due to death or non identification of cases due to lack of infrastructure.

Lack of Awareness

Lack of awareness that haemophilia as a problem exists in the society in three levels (i) at the level of society (ii) at the level of doctors and medical establishment (it is a very condition and there is no effective treatment in the prevailing view amongst many doctors in developing countries). (iii) At the level of politicians, social leaders and policy makers. This lack of awareness in terms of magnitude of the problem (Most of the developing country has poor Health statistics, and in many of these countries including India only 10–20 % of expected severe and moderate PWH has been identified), financial burden it can incur to the exchequer, improved quality of life that proper management can produce in these patients and families translates into non budgetary allocation of funds for this disease, minimum attempt to develop human resources for proper care of the disease and finally neglect of the disease by the health care establishment. The author of the article was surprised when at several cities of India the Deans, Heads of Medicine Department and Transfusion Medicine Department in several medical colleges wrote to their government that there are no haemophilia patients in the service area of those medical colleges, where in reality there were at least 170–280 severe PWH in those cities. The lack of awareness of these medical colleges about existence of so many patient with PWH stems from the fact

that these patients stopped going to medical colleges as they felt their problems were not attended adequately.

Non Availability of Factor Concentrates for PWH

Factor concentrates are one of the three pillars of successful management of severe and moderate haemophilia. WFH recognizes that at least 2 I.U./Person/Year is required to successfully manage all the PWH in any country. The usage of factor concentrates/person/year is presented in Fig. 1 [9]. It can be seen that there are wide variation in usage of factor concentrates by different developed countries as it varies between 2 and 8 I.U./person(population)/year. This wide variation of usage is due to intensity of prophylaxis (Intermediate dosage, high dosage). The factor concentrates and treatment products can be used in several ways and this can explain wide variation in the treatment of the product. Some of these ways depicts the path of evolution of treatment philosophy in the disease i.e., (i) On demand therapy (ii) Home therapy (iii) Home therapy and secondary prophylaxis (iii) Primary prophylaxis.

As described cheapest plasma derived virally inactivated factor concentrates costs an average of 3–4000 USD/year for a PWH with severe haemophilia weighing 50 kg and bleeding at least once in a month and a factor correction of 30 % is given in a single dose on demand for these episodes. Every expert in haemophilia will agree this is an inadequate therapy for severe PWH. However this therapy allows the patient to survive with musculo skeletal deformity. Even this amount of concentrates are not available to 70–80 % PWH in developing countries. Hence they have to additionally rely on liquid blood products like (i) Fresh Whole Blood (ii) Fresh Frozen Plasma (iii) Cryoprecipitate. Even when all these products are serologically tested for HIV 1 + 2, Hepatitis B&C but given for sufficient amount over sufficient length of time will produce viral infection in a large number of PWH [10–13]. This will and has produced additional mortality and morbidity. Almost all developing countries with large number of PWH infected with these viruses are sitting on a ticking time bomb and these infections in PWH produce additional challenge in their management.

Inadequate Utilization of Management Modalities Which can Reduce Factor Usage

Due to inadequate knowledge of management of haemophilia several treatment modalities like RICE (Rest, Ice & Immobilisation, Compression and Elevation) adequate pain relief, managing chronic synovitis [14, 15], use of antifibrinolytics in different ways [16, 17] with its pros and cons use of prosthetics, orthotics [18–20], proper shoes [21] physical therapy [22] are not effectively used for proper management of PWH.

Surgery and Joint Injections in Haemophilia

In developing countries a large number of PWH with severe or moderate disorders requires surgery mostly because of musculo skeletal complications of haemophilia and there is increased prevalence of fracture in PWH [21, 22]. In addition PWH also needs surgery either due to brain hemorrhage [23, 24] or due to other conditions which may be as prevalent as in non haemophilic populations. Surgical intervention in haemophilia becomes costly not only because of the cost of surgery but also because of the requirement of additional finance for factor concentrate. In addition these patients needs longer hospitalization and often their wound healing is also delayed. Moreover as many of these PWH who needs surgery has been sparingly exposed to factor concentrates there is a high risk of development of inhibitor in these patients during post operative period increasing the cost of management further along with additional morbidity due to inhibitor development [25]. Chronic synovitis is also not an uncommon problem in PWH patients and our study showed a linkage of this condition with HLA-B27. Approach to chronic synovitis generally involves regular factor replacement with intense physiotherapy over 3–6 weeks. However, this trial of secondary prophylaxis with physiotherapy is also costly for many developing countries. Open synovectomy or arthroscopic synovectomy also proved costlier in these countries hence these countries opted more often for chemical or radioactive synoviorthesis [26, 27] with good to excellent outcome. Factor concentrate requirement for radioactive synoviorthesis is drastically reduced as only single or maximum two doses of factor replacement may be required for this condition.

Inadequate Pain Relief

There are several challenges for pain relief in PWH following haemarthrosis. It may be argued that best pain relief would be not to allow any bleeding at all through prophylaxis. However, all PWH may bleed some time or other and may require pain relief. Nonsteroidal anti inflammatory drugs which are the main stay of treating usual pain, cannot be used for haemophilia patients. Cox-2 inhibitors was found to be reasonably safe. The only medicine which is extensively used for pain relief in haemophilia is paracetamol. Paracetamol is not a very strong analgesics and the activity can be improved when combine with opiates like codeine or dextropropoxyphene or similar drugs in some of the developing countries opiates are not generally available even for management of Acute Myocardial Infarction for fear of creating addiction in the society. Fentanyl skin patches which used to work well in acute pain has also been discontinued in some of the countries. Hence for pain

relief realistically only paracetamol and some Cox-2 inhibitors is available for PWH.

Challenge of Inhibitor

Development of inhibitor is one of the major challenge of haemophilia care every where in the world. There is a large variation in number of PWH developing inhibitor. It has been shown that Hispanics and patients of afrocaribbean extraction have higher prevalence of inhibitor development [28]. In the caucasian race inhibitor prevalence varies between 20 and 30 % of severe PWH [29] and some moderate or mild PWH patients with specific mutation are also at a higher risk for development of inhibitor [30]. In India which is one of the developing countries the inhibitor prevalence is around 8 % [31]. Fifty to sixty percent of these inhibitors are high titre (>5BU/ml) inhibitors. Because of the cost and need for prophylaxis rarely these patients undergo immunomodulatory therapy. Majority of these patients receives almost no treatment and a small number of patient receives by passing agent for control of isolated bleeding episodes.

Challenges of Chronic Liver Disease

Still many PWH in developing countries continue to receive blood/plasma/cryo precipitates. As a result these patients become vulnerable to HIV & Hepatitis viruses. Chronic liver disease in PWH used to be a big challenge in 1980s developing countries [32]. HIV infection in 80s wiped out a large number of PWH from developed countries but with the advent of HART (Highly Active Anti Retroviral Therapy) HIV progression has been largely controlled and high quality mandatory serological test has almost wiped out HIV as a challenge for many PWH in developing countries. However hepatitis B & C has affected a large number of PWH in these countries. Twenty–40 % of PWH is affected by these viruses and these patient in the long run 15–30 years time will develop complications of these infections in the form of chronic hepatitis (Bleeding episodes may increase), Cirrhosis and hepatocellular carcinoma. This is the price which many of the PWH in developing countries will pay in coming years in the evolution of management of this disease in their respective countries unless active care funding and management programmes are initiated.

Research in Haemophilia

In addition to management challenges researches and reports on various facets of haemophilia represents interest of medical profession and scientists of that country. Number of published papers in indexed journals (Pubmed)

from different countries is appended in Table 1. Ten developed and ten most populous developing countries have been represented for comparison.

Options

What options do the developing countries have to respond to those challenges? While it cannot be generalised for all developing countries and the adage that “Think globally act locally” holds true for these challenges too.

Health Care Infrastructure

General health care infrastructure needs to improve in every developing country. In some of the country militancy, terrorism and unstable government coupled with financial mismanagement has all but ruined the total health care infrastructure. Haemophilia is a relatively rare disease hence the challenge can be responded by creating patient's societies. These NGO's in each developing country through advocacy, negotiation, movements can build an infrastructure for haemophilia care. For example in India the organization (Haemophilia Federation of India; in short HFI or its different 77 chapters across the country) has opened blood bank services at some places, raised funds to purchase treatment products. With the financial help from factor concentrate producing industries and other industries have started to develop treatment centres (private, charitable and government), trained medical, technical, occupational therapy, physiotherapy professionals. By creating internal twinning programmes and individual fellowship programmes and an infrastructure for rendering training with existing facilities in the country HFI has built up a formidable number of trained professional for haemophilia care [33, 34]. In India over last 25 years more than 443 such personnel has been trained.

In this effort substantial help is also offered by WFH through their twinning and fellowship programmes. Developing a haemophilia registry by some of the developing countries is one of the major strategic response to force the Government of the day to take care of its own haemophilia patients. In India such a registry has come up documenting details of 16,000 patients with inherited bleeding disorders. WFH initiated a GAP (Global Alliance for Progress) [35] programme for developing this infrastructure in collaboration with government in some of the developing countries (Egypt, A part of China) and following its success WFH has now initiated a “Cornerstone” programme [36] in the same spirit but it is applicable for those countries where even minimum infrastructure for haemophilia care is non existent. Individual developed countries also have helped individual developing countries though financial and technical help to develop the

infrastructure for haemophilia care e.g., DANIDA (Danish India Development Activity) programme in India.

Slowly every developing country is also developing their own specialists in haematology and transfusion medicine through specialists training programmes. National and International haematology societies are also developing some programmes to develop trained manpower to address this important deficit in healthcare infrastructure.

Lack of Penetration of Insurance Services

This may not be relevant for every developing country. One of the ways the insurance can be made available to PWH is (i) By universal minimum value Insurance for all its citizen in the country, this may require government assistance and is being tried in some states of India, Bangladesh. (ii) Individual pregnancy may be insured for a given one time payment against several common serious genetic disorder and in case affected babies are born even after prenatal diagnosis and intervention one time big amount may be deposited by insurance company in patient's account. Authors have calculated the feasibility of this project (can be administered with finance from corporate houses, factor concentrate companies as corporate social responsibility programme).

Increasingly medical intervention is becoming ever costlier and all forms of required and possible medical intervention is impossible to be offered by any benevolent government without additional taxation on citizen or without the help of insurance companies. Hence in coming days government of different developing countries has to consider this avenue to improve patient care.

Competing Priorities for Different Diseases

Government of any country tries to put money in these areas of health care where return is maximum. In this count haemophilia ranks lower in the priority list of the diseases that the government wants to control and treat. However once the patient organization through meticulous data can show the government that developing management system for haemophilia is cost effective and will have far reaching benefit outside haemophilia per se by helping hospitals to develop good coagulation laboratory and specialists to tackle both congenital and acquired bleeding complications which causes substantial morbidity and mortality across the country. Then government in the developing countries can be goaded to take care of haemophiliacs as a part of the grand programme for tackling rationally both congenital and acquired bleeding conditions.

One of the ways haemophilia patient's organization can win is by putting forward the argument that developing

Table 1 Publication on Haemophilia from different countries between 31.08.2004 and 01.08.21014 (10 years)

Name of the developed country (publications)	Name of financially well of but developing countries.(publications)	Name of financial poor/backward countries (publications)	Name of developing countries (publications)
1. USA (1512)	1. Saudi Arabia (9)	1. Bangladesh (0)	1. China (196)
2. Italy (693)	2. Kuwait (2)	2. Ghana (0)	2. India (182)
3. U.K. (592)	3. Oman (2)	3. Morocco (5)	3. Pakistan (25)
4. Germany (358)	4. Bahrain (0)	4. Yemen (1)	4. (Egypt (23)
5. Canada (288)	5. Qatar (1)	5. Uganda (0)	5. Brazil (78)
6. Netherlands (246)	6. Libya (0)	6. Zimbabwe (0)	6. Argentina (34)
7. France (224)	7. UAE (0)	7. Algeria (1)	7. Mexico (30)
8. Japan (210)	8. Nigeria (2)	8. Kenya (2)	8. Thailand (21)
9. Sweden (191)	East European countries:		9. Malaysia (6)
10. Spain (175)	1. Poland (52)		10. Indonesia (3)
11. Denmark (142)	2. Czechoslovakia (5)		11. Singapore (19)
13. Australia (112)	3. Hungary (11)		12. Taiwan (49)
13. Belgium (74)	4. Bulgaria (8)		13. Korea (63)
14. Newzealand (40)	5. Russia (25)		
15. Switzerland (36)	6. Turkey (92)		
16. Finland (20)			
17. Portugal (10)			
18. Ireland (39)			
19. Greece (45)			
20. South Africa (50)			

good coagulation laboratory, training doctors to be expert in managing coagulation disorders and developing a good quality transfusion medicine services not only helps PWH but far more help is given in reducing maternal mortality, surgical mortalities due to thrombohemorrhagic complications and the hospital remains alert for coagulation resuscitation in various disaster like situations.

A second and more subtle way is to make influential social leaders, doctors and decision makers as partners or executive committee members of haemophilia patient's society. Familiarity with the distress of PWH by these decision makers and opinion leaders helps influencing decision making to the favour of PWH e.g., President of Russia and Princess of Thailand are important patron members for the individual country's haemophilia organization.

There is a third way of influencing decision and that is through legal routes by using Public Interest Litigation (PIL). In majority of the countries the constitution gives "Right to Life" and "Right to Health" as a corollary of right to life. PIL had proved a very powerful and important tool in India for goading government to accept haemophilia care as their responsibility.

As treatment improves and registry for PWH is made a dynamic one the visibility of PWH will increase and mortality will come down along with morbidity.

Awareness about PWH can only be improved by advocacy and through regular organization of various awareness programmes at various levels of society (work place, school, college, housing societies, rotary club and lion's club meetings in addition to regular presentation in august medical societies like API, IAP, IMA, FOGSI etc).

Non Availability of Factor Concentrate

Lack of adequate factor concentrates can only be properly addressed by patient organization through (i) Fund raising (ii) Involving companies to adopt a patient or families of an area of their interest. (iii) Raising fund directed towards specific haemophilia families. Several international organization help PWH families across the world. However major buyer for factor concentrates are governments and advocacy with the government at various levels are extremely important to ensure that products purchased is adequate in quantity, meets the quality standards of the day and is not wasted due to compartmentalization of the product at various health care facilities.

WFH provides factor concentrates through several of their programmes which includes GAP, Corner stone and other humanitarian donations. Very often In India it is extremely difficult to get these donations through because of Drug Controller General of India has very stringent

policy and extremely slow decision making process for sanctioning the use of individual donations. This needs to be rectified.

Developing plasma or recombinant factor industry in the country is unlikely to happen without international collaboration. Government of a developing country can provide several advantages to concentrate producing international companies to develop the industry in the country with varying depths of partnerships. In India on private engagement 3-4 plasma fractionation facility is already developed or developing.

Countries can collect their excess FFP and get contract fractionation done for their PWH. In addition to factor concentrates contract fractionation allows Albumin and Intravenous Immunoglobulin production. Cross subsidization of factor price is possible using a portfolio of fractionation products. National AIDS Control Organisation (NACO) which is incharge of transfusion safety programme in India is planning to collect FFP from its Blood Banks (2500) across the country and contract fractionate this material to develop factor concentrates to be used by Government Hospitals in the country, free of charge to PWH. This model can also be used by other developing countries. Several developing countries like Brazil has already started fractionating plasma to produce factor concentrates for treatment of haemophilia and allied disorders.

Project Recovery

WFH in the Melbourne Conference (2014) declared this project. As majority of the developed countries are using recombinant factor concentrates, their huge stock of FFP (Fresh Frozen Plasma) are left unused. This stock, WFH will get as humanitarian donation and will get contract fractionated. Subsequently such material can be used as humanitarian donation for care of PWH across many developing countries.

Inadequate utilization of modalities of management which reduces factor usage. To improve utilization of these techniques, require continuous training programme for various medical specialities. This can be organized by government hospitals, medical colleges, patients organization and also can be widely disseminated through websites and these various print and electronic media. In some countries locally produced vegetable products has also been successfully used to control local bleed [37, 38].

Surgery and Joint Injections in Hemophilia

Several research papers [39–41] have been devoted to describe how to minimize factor concentrate requirements with major surgery. Some text book also devoted chapters to describe in details how successful surgery is

possible with much reduced quantity of factor concentrate [42]. This information needs wide dissemination and training. Same is applicable for management of chronic synovitis [14, 15].

Inadequate Pain Relief

In modern medicine substantial pain relief should be possible in any condition. Proper use of Paracetamol, Cox-2 inhibitor, opiates, physical methods (Ice, Immobilisation), electrical stimulation should be used and health care professional needs training in this area.

Challenge of Inhibitor

Development of Inhibitor produces a real challenge for management of PWH. Though inhibitor development is very variable across the developing country the major challenge seems to be the access to bypassing agents and non availability of immune modulation and prophylaxis. All these challenges are linked to various solution options of previous challenges. Presently there is no simple solution to this challenge. More research in this area is needed which could be of help to developing countries.

Chronic Liver Disease in PWH

Huge number of PWH in developing countries have developed viral infection with Hepatitis B and Hepatitis C. Chronic active Hepatitis B is a preventable disease and every newly diagnosed PWH must receive Hepatitis B vaccination and 5 yearly booster dose. Hepatitis C is a slowly progressive disease. Twenty five –30 % of seropositive Hepatitis C patient have already eliminated their virus hence they need to be tested for viral load and properly counselled. Finally none of these patients should receive liquid blood products if possible and should always be treated with factor concentrates.

Other patients with hepatitis needs twice yearly ultrasound examination and LFT determination if they are not in a position to get costly treatment with pegylated interferon and Ribavirin or whether they have relapsed after such treatment or are infected by resistant virus. Newer orally antiviral compounds like Sovaldi (Sofusbuvir) may not be available to these patients for some time to come because of cost.

Research in Haemophilia

Research in haemophilia from developing country is still meagre compared to the laboratories from developed countries. Here is a real divide between needs of these two worlds. Whatever little research papers are coming from

developing countries are largely case reports, case series and uses of various kinds of alternative medicines [43, 44]. Research priorities of developing countries where >80 % haemophilia patients reside are different from developed countries and most of the main line journals are international journals and their readers are unlikely to be interested in the problems of developing countries. Hence there are needs either to develop ones own national journals or a journal for coagulation disorders for developing countries. The papers published from various countries on haemophilia over last 10 years and indexed in Pubmed is presented in Table 1. It can easily seen the immense disparity between the scientific development, population and number of indexed papers published on the topic. As in many other areas of scientific endeavour papers from USA out number most of the countries in the world both in quality and in quantity.

Discussion and Conclusion

There are huge number of challenges in the management of PWH in developing countries. Each country is unique and challenging for management of PWH is also likely to be unique. Some of the challenges have been discussed here. Infrastructure and Human Resource issues which are unlikely to be sorted out satisfactorily in the short time and will require long term strategic planning by government. Finance for management of PWH, finding out cases of PWH for rural areas of the country, developing a registry, factor concentrates and chronic liver disease issues are important issues. Developed world can learn how major surgeries in haemophilia could be done with minimum use of factor concentrates. Emerging problems like osteoporosis in haemophilia [45, 41], is an universal problems, malignancies in haemophilia are also being confronted [46, 47] and has not been discussed in this pages.

One of the major solution to all the challenges that a PWH faces is creation of active patient's organization. This organization should not only link individual PWH with care giving organization(hospitals) and doctors but such an NGO should oversee that PWH of the land gets rational and uptodate treatment, they are protected from transfusion transmitted infections. Advise government and various other bodies regarding various management options in haemophilia, acts as a sounding board for adopting advanced treatment options and finally interact with other similar NGOs and various corporate houses to mobilize funds and other expertise to materially improve the physical, social, economic well being of a PWH.

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