



Review Article

DOMINANCE OF HERBAL MEDICINES IN TREATING SICKLE CELL ANEMIA

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ABSTRACT

Sickle cell disease (SCD) is a genetic blood disorder that affects the shape and transportation of red blood cells (RBCs) in blood vessels, leading to various clinical problems. Several drugs are available for treating SCD, these medicines are insufficiently effective, toxic, or too expensive to be used. So there is a need to arise a safe, effective, and inexpensive therapeutic agent from indigenous plants used in ethnomedicines. SCD is affecting millions of people worldwide. Due to lack of progress in drug discovery and appropriate treatment methods, victims often turn to traditional Ayurvedic medicines that take advantage of the plant extracts. The use of complementary and alternative medicine (CAM) has been thought worldwide, most especially in patients with chronic diseases. SCD is one of such chronic diseases. Sickle cell anemia (SCA) has been treated for ages with natural products, especially herbs and Ayurvedic medicines worldwide. The proven medicines for sickle cell anemia includes, the use of hydroxyurea, folic acid and amino acids supplementation that manage the condition of blood transfusions and stabilize the patient's hemoglobin level. But these clinical treatments are quite expensive and have attendant risk factors. As a research for medicinal plants into anti-sickling properties has been satisfy, so the alternative therapy of using phytomedicines has proven to reduce the crisis and reverse for sickling of RBC's. As the use of medicinal plants and nutrition in managing SCD is gaining attention so the enormous benefits of phyto-medicine and nutraceuticals are discussed in this paper. Here in we have summarized the use of tradition Ayurvedic medicines in treating SCA.

KEYWORDS: Ayurvedic Medicines, Sickle Cell Anemia, Diseases, Haemoglobin.

INTRODUCTION

Red Blood Corpuscles (RBC) contains a number of components and one of the important components is Hemoglobin, it helps in transport of oxygen throughout the body. Hemoglobin A (Hb A), the most common form, is composed of two α - and two β -globin chains.^[1,2] Normal RBCs have a flexible biconcave disk-like shape that allows for unimpeded passage through microvasculature with an approximate 120 day life span^[3]. Normal RBCs are mainly composed of Hb A, and have a biconcave shape which allows them to pass through small blood vessels. Sickle cell anemia is a genetic disorder of hemoglobin ^[1]. SCA is a genetic haemoglobin path in which the 6th amino-acid of the beta chain of hemoglobin molecule (glutamic acid) is substituted by valine. The disease is characterized by chronic hemolytic anemia accompanied often with fever, infections and unpredicted painful crises due to vaso-occlusion of sickle erythrocytes trapped in small vessels. This is the result of hemoglobin

polymerization, which causes them is shape of erythrocytes (sickle erythrocytes)^[4].

Under hypoxic condition, HbS polymerizes, resulting in rigid and distorted RBCs termed "sickle cells", which cause impaired microcirculation, hemolysis, and reduce the life span of RBC. Numerous clinical manifestations of SCD include pain, vaso-occlusive crisis, splenic sequestration, acute chest syndrome, aplastic anemia, hemolytic anemia, and stroke. The rigidity of a sickle cell renders it fragile and susceptible to osmotic lysis. A normal red blood cell is flexible and elastic, which allows it to move through narrow blood vessels. Thus, sickle cells are described as being inflexible i.e., rigid and distorted because their resistance to hemolysis is reduced. As cells are inflexible it cannot expand and therefore cannot easily move along the narrow human blood vessels. When the osmotic fragility decreases, the resistance increases. Therefore, when the reduction in osmotic fragility takes place by antisickling agents is an advantage in that it increases the RBCs' so

resistance to lysis. In other words, a rigid and distorted red blood cell with low elasticity can be fragile and it may be break with little stress^[3].

The sickle cell membrane has abnormally high ion permeability which induces dehydration of the red cells, principally, through Ca-activated K-efflux and K-Cl cotransport. The dehydration of cells causes an increase of cell density and forms what we call “dense cells.” In the dense cells, the hemoglobin concentration (MCHC) increases, and thus, it promotes hemoglobin polymerization and cell sickling^[5].

In 1970s studies at Ibadan and Ife described the first series of herbal remedies for SCA. Then in 1990s biomedical scientists from Ibadan, Ife, and Zaria developed Niprisan form the African areas which was launched in 2006. Before the franchise to produce Niprisan was licensed to a US drug firm, NIPRD in 2001. The disease was first named as “sickle-cell anemia” in 1922^[6].

In countries such as India, herbal medicines have an important role in public health, as these medicines are used for meeting the health desires of the population. This role is attributed to the widely spread acceptance of traditional medicine worldwide, and its strong link to cultural beliefs, affordability, and confidence in traditional medicine practitioners^[7]. So the practice of traditional medicine is spread worldwide. In industrialized countries, over 50% of the population use adaptations of traditional medicines called complementary or alternative medicines (CAM)^[4] It

is estimated that about 5% of the world population are carriers of SCD or Thalassemia^[8]. The sickled shaped red cells then increase the viscosity of the blood and the clumping of the red cells, as well as being destroyed in the reticulo-endothelial system. Starving of the end organs from necessary blood and oxygen leads to the various manifestations such as pain, anaemia and other effects in almost all organs of the body. In an effort to increase the production of red cells, the marrow overworks and enlarges thus producing the abnormal physique associated with the disease. The crises are formed due to stress and infections^[9].

The use of traditional medicine by using medicinal plants has a long history in many cultures. This type of health care is described as herbalism or botanical medicine. Along with growing sophistication lifestyles among the world populations makes it imperative to refer to herbal practice as alternative or complementary medicine, to demand to a cross section of people irrespective of their cultural affiliation. This type of herbal practice is gaining attention. Two-thirds of the world’s population (mainly in developing countries such as China and India) relies entirely on such traditional medical therapies as their primary form of health care. The use of traditional medicine is important for the treatment and management of a number of diseases in the African continent, as a lack of basic health care and medical human resources make it difficult to treat rural populations^[10].

RESULTS AND DISCUSSION

	Medicinal Plants	Medicine names	Results
1	<i>Zanthoxylum zanthoxyloides</i> (Lam.)	Niprisan Drepanostat Faca	Hydro ethanol extracts of Facavr and Drepanostatvr showed low anti-sickling activity, inhibiting less than 10% of the sickling process ^[1]
2	Herbal formulation prepared from the dried leaves of <i>Calliandra portoricensis</i> (Leguminosae), barks of <i>Canarium schweinfurthii</i> (Burseraceae) and roots of <i>Uvariachamae</i> (Annonaceae).	Hepacare	Hepacare is favorable in the prevention of CCl 4 -induced hepatocellular injury, by scavenging reactive free radicals, and boosting endogenous antioxidant systems. ^[11]
3	The extracts of the bark of trunk and branches of <i>C. pentandra</i> and that of the roots of <i>Q. africana</i>	--	This study suggests that the aqueous extract of <i>C. pentandra</i> may contain active components that reduce the thrombin activity and prolong the plasma clotting time by affecting the coagulation intrinsic pathway. ^[4]
4	Extract of <i>Ceiba pentandra</i>	BEAT-SS and	The extract inhibited the secretion of the

	and <i>Quassia africana</i> Baill	DOCABE	fibrinolytic proteins without affecting their synthesis by endothelial cells. ^[12]
5	Extract from the seeds of <i>Piper guineense</i> , the flower buds of <i>Eugenia caryophyllata</i> , the stem parts of <i>Pterocarpus osun</i> , the leaf stalk of <i>Sorghum bicolor</i> , and trona in a local gin, "ogogoro".	NIPRISAN	Niprisan has started a Phase III clinical trial as there is sufficient safety and efficient data has been provided to USA FDA and also the US FDA Botanical Review Team (BRT) suggested a simpler formulation of Niprisan. ^[6-8]
6	Extracts of the roots of a plant <i>Cissus populnea</i>	--	It is concluded that there is justification for the use of this herbal formula in traditional medicine for the treatment of sickle cell anaemia patients. ^[3]
7	Aqueous extracts of <i>Cajanuscajan</i> leaf and seed, <i>Zanthoxylum zanthoxyloids</i> leaf, and <i>Carica papaya</i> leaf	--	The medicinal plant extracts were able to reduce the percentage of sickled cells, the rate of hemoglobin polymerization, and the osmotic fragility of human sickled RBCs. ^[13]
8	<i>Scopariadulcis</i>	--	In the management of Sickle cell disorders The antisickling results confirmed traditional usage of <i>Scopariadulcis</i> and also a candidate for further investigations. ^[13]
9	Extracts from <i>S. monostachyus</i> , <i>C. papaya</i> seed oil and <i>I. involucrata</i>	--	Extracts from <i>S. monostachyus</i> , <i>C. papaya</i> seed oil and <i>I. involucrata</i> exhibited particular anti sickling properties combined with the potential to reduce stress in sickle cell patients. Each plant individually or in combination may be useful for the management of sickle cell disease. ^[10]
10	The green tea (GTE or tea polyphenols) and aged garlic (AGE) extract.	--	The inhibitory mechanism of these compounds may be related to anion transport inhibition, although involvement of their antioxidant activities. ^[5]
11	Aged garlic extract (AGE)	--	The enormously stretched sickle-shaped cells are formed by the repeated deoxy cycling; the erythrocyte membrane becomes susceptible to oxidative injury by reactive oxygen species. The protection of the erythrocyte membrane from an oxidative injury would prevent the membranes from becoming leaky to the calcium ion, thus the activation of the calcium-activated potassium efflux channel and the formation of dense cells has been inhibited. And it also developed a new ex vivo method of studying the possible efficacy of antioxidants taken orally on the dense cell formation in sickle cell patients. ^[14]
12	Extracts of the steam bark and leaves of <i>Khayasenegalenis</i>	--	--
13	Extractives from the seeds of <i>Cajanuscajan</i> plant	--	Sickling inhibition was observed to be effective with the extract which contains a mixture of phenylalanine (0.69mg/ml) and p-

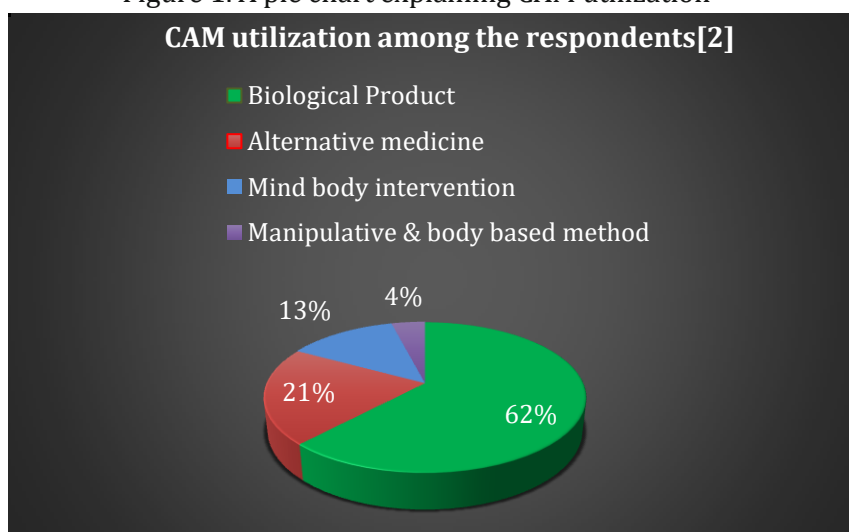
			hydroxybenzoic acid (10.5g/ml), equivalent to those found in bean extract. ^[15,16]
14	<i>F. xanthoxyloides</i> root	--	the amount of carboxylic acid present in an extract is an indication of antisickling potency, the present report on quantitation of the total acids in the antisickling fraction of the individual species of <i>Fagara</i> has provided therefore a chemical index of the relative antisickling activity of these species. ^[17]

Effect of using Ayurvedic Medicine over Alternative Medicines

Complementary and alternative medicines were use among patients with sickle cell disease in a tertiary hospital in Lagos, South West, and Nigeria.^[18]

So the results were found that out of the 200 respondents interviewed 113 (56.5%) were males and 87 (43.5%) were females with of 1.3:1 male-female ratio. In Figure 1 a pie chart, the pattern of categories of CAM utilization among the respondents biological products were the most commonly utilized CAM among SCD patients. A total of 156 (62.9%) respondents used biological products such as aloe vera, ginger, garlic etc. The 52 (20.9%) reported use of alternative medical systems of the respondents, while other categories of CAM used were mind-body interventions 30 (12.1%) and manipulative body-based methods 10 (4.0%) respectively.

Figure 1. A pie chart explaining CAM utilization^[18]



This is summarization of some of the tradition Ayurvedic medicines used in treating SCA

CONCLUSION

In this review we have tried to summarize the different Ayurvedic plants used to treat sickle cell anemia. Ayurvedic plants like garlic, *Cajanus cajan* plant, *F. xanthoxyloides* root, *Khayasenegalenis*, *Cissus populnea* and many more are listed herein so that these plants should be explored for their target specificity against sickle cell anemia.

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