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Ethnomedicinal survey of plants used by Abagusii traditional healers of South West Kenya in the treatment of sexually transmitted diseases

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Abstract

Globally, herbal medicine contribute immensely in the healthcare system of local communities as the primary source of medicinal drugs. The emergence of single and multiple antibiotic resistant strains call for the search of alternative agents with possible antimicrobial effects from natural resources. Sexually transmitted infections (STIs) are the venereal diseases that are transmitted through sexual intercourse involving oral, vaginal and anal transmissions. The most important pathogenic causes of STIs include bacteria, viruses, and parasites. Ethnomedicinal survey of plants used by Abagusii traditional healers of South West Kenya in the treatment of sexually transmitted diseases was carried out and 19 plant species representing 15 genera and 12 families were botanically identified. It was noted that the medicinal plants used may serve as a source of new and effective drugs and also act as an additional source of health manpower. This study found out that the Abagusii traditional healers have vast knowledge of their flora. This study also revealed that there was a rapid disappearance of many indigenous herbal medicinal plants, hence the need for awareness for conservation measures to be emphasized.

Keywords: Medicinal plants, venereal infections, gonorrhoea, Gusii, Kenya

1. Introduction

Herbal drugs have been used since ancient times as medicines for the treatment of a range of human infections and have a proven role in the world of health ^[21]. Most of the medicinal plants are locally available, especially in developing and underdeveloped countries. Additionally, these plants are less susceptible to the emergence of drug resistance as observed in other medicines. Medicinal plants have important contributions in the healthcare system of local communities since herbal treatment form primary sources of medicine for the majority of rural inhabitants ^[35].

Plants have not only nutritional value but also, in the eyes of the local people, they have medicinal and ritual or magical values ^[11]. Usually, ethnomedicinal treatment systems are diverse across cultures. Thus, medicinal plants are widely used in the treatment of numerous human and livestock diseases in different parts of the world. Medicinal plants play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelties in drugs ^[22]. The knowledge and use of plants is an integral part of many ethnic rural cultures in world, the extent of which is yet to be studied in-depth ^[10].

Medicinal plants have a long history of use and their use is widespread in both developing and developed countries ^[5]. Herbal medicines offer substantial means for treatment of many diseases that are obstinate and incurable in other systems of medicine. From their very advent, human beings have suffered from various ailments. Lacking any other means, they have possibly relied on medicinal plants for treatment of ailments. It has been reported that using of medicinal plants goes back to thousands of years ago and is common in all indigenous people throughout the world ^[3]. A number of modern drugs currently in use have been obtained through further experimentation of medicinal plants used by indigenous people ^[37]. Sexual contact is the most common but not the only means of transmission of these infections. It is now well established that STIs (both ulcerative and non-ulcerative) increase the risk of transmission of other STIs, including AIDS because of changes in the normal vaginal epithelium ^[12].

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The contemporary treatments for AIDS and other STIs comprises of drug administration by various routes such as oral, parenteral, and topical (vaginal and rectal). Since sexual mode of transmission is the most common cause of occurrence of STIs, vaginal and rectal approaches are becoming significant for prevention of their transmission [2]. In the last decade, major advancements have been reported in the field of 'microbicides', usually compounds or formulations which when applied topically (vaginal or rectal) can prevent the transmission of STIs including AIDS [9]. These include a few from plant sources such as gossypol derivatives, Praneem polyherbal preparations and antibodies [34]. A large number of active agents are available for the symptomatic treatment of STIs. Emergence of drug resistant strains and dose limiting toxic effects has complicated the treatment of these infectious diseases. These complications have necessitated the search for new antimicrobial substances from various sources.

Extracts of plants and phytochemicals have been shown to possess activity against sexually transmitted pathogens and may be a good source of new active agents [17]. Several plants have been screened for activity against STIs on the basis of ethnopharmacological data and some of these screening programs have yielded potential leads [15, 26]. In Europe, the use of medicinal plants for symptomatic treatment of STIs dates back at least to 1574 when 'sarsaparilla' (*Smilax officinalis*, family *Liliaceae*) was first introduced for the treatment of syphilis. Sarsaparilla was a better alternative to mercury, the standard medical treatment for syphilis during that period. In clinical studies, sarsaparilla was observed to be effective in about 90% cases of acute syphilis and 50% chronic cases [20]. Since then, medicinal plants have been used for the treatment of STIs without any scientific evidence in traditional systems of medicine. In the last century enormous efforts have been made to select the plants, isolate the active principles and screen the crude extract/ fractions/compounds for activity against various sexually transmitted pathogens, and elucidate their mechanism of action.

Urinary tract infections and sexually transmitted diseases (STIs) like syphilis and gonorrhoea are prevalent throughout the world. Gonorrhoea is caused by the microorganism, *Neisseria gonorrhoeae*, and is one of the most common sexually transmitted infections in developing countries. Symptoms of this disease in men include burning or pain during urination, increased urinary frequency, discharges from the penis, red or swollen opening of the urethra and tender or swollen testicles. In women, the symptoms include burning and pain while urinating, vaginal discharge, increased urination, severe pain in lower abdomen and fever [18].

Recent years have witnessed the emergence of various strains of the gonorrhoea-causing microorganism, which are resistant to the conventional antibiotics used for treatment of this disease [14]. There has been an increase in worldwide realization of the use of medicinal plants in various traditional health systems of developing countries. For instance, recent estimates by the World Health Organization [36] revealed that about 80% of the population in Africa relies on traditional medicine of which the botanicals constituted greater components. It is estimated that about 30,000 botanical species are now recorded for their medicinal properties [38]. *Trichomonas vaginalis* is a

prevalent urogenital infective agent in both developed and in developing countries [33, 39].

Trichomoniasis is a sexually transmitted disease and the most common cause of vaginal discharge [4]. Clinically, trichomoniasis ranges from an asymptomatic state to an acute inflammatory disease [24]. These infections have been linked to various pathological manifestations, including atypical pelvic inflammatory disease and sterility [32]. In the case of pregnant women, it can lead to preterm delivery and low birth weight of the infant [6]. *Trichomonas vaginalis* infection also predisposes carriers to HIV infections [8]. The drug of choice for therapy of trichomoniasis has been metronidazole. However, there is evidence of emerging resistance of modern drugs towards conventional drugs as observed by [27]. In this study, an attempt has been made to survey plants used by the Abagusii community for the treatment of sexually transmitted diseases.

2. Materials and Methods

2.1 Research Design

An ethno medicinal survey was conducted in Gusii (Nyamira and Kisii) Counties in South Western Kenya in order to obtain ethno-botanical information from traditional healers on medicinal plants used in treatment of sexually transmitted infections.

2.2 Description of the Study Area

The study was conducted in Kisii and Nyamira (Gusii) Counties of Kenya. Kisii and Nyamira Counties lie between latitude 0° 35' and 1° 88' South and longitude 34° 03' and 35° 05' east. Kisii and Nyamira Counties covers total area of 2214.3 km² and a population of 1,879,839 inhabitants, based on population census of 2019. Over 67% of this population is living below the poverty line [16]. There are fourteen administrative sub-counties within the two counties namely: Manga, Masaba North, Borabu, Nyamira North, Nyamira South, Gucha, Gucha South, Kisii South, Kisii Central, Marani, Masaba South, Nyamache, Sameta and Kenyenia. More than 70 percent of the population is involved in agriculture related activities as a means of livelihood thus the need for more investment in agriculture. Main economic activities of the area include: maize farming, tea production, brick making and dairy farming.

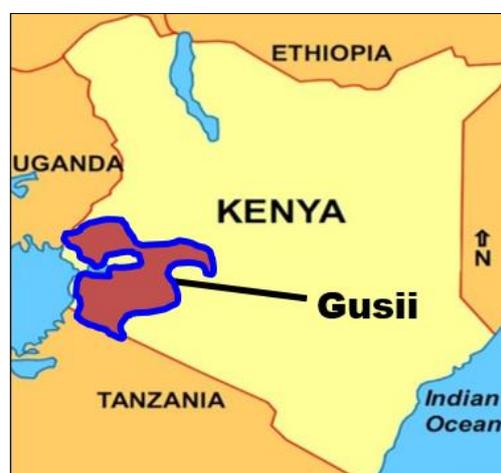


Fig 1: Kisii and Nyamira Counties, Nyanza Province of Kenya, where the research was undertaken. Adopted from Google Maps on 17/5/2020

2.3 Data Collection

Visitation of a number of households in the Gusii community was done. Information on ethno-medicinal uses collected from the traditional healers was entered into questionnaires and field notebooks. The healers were quizzed about their knowledge, methods of diagnosis, preparation of herbal potions and the treatment of sexually transmitted infections. The specific plant part (s) used along with the methods of preparation were recorded. This work was done between the months of January and February 2020; a period of heavy rains when there was plenty of vegetation.

The plant specimens were collected and pressed in a plant press and placed in the herbarium to dry under room temperature. Their vernacular names were recorded while in the field. The plants collected were then identified using the East African Herbarium. For each plant specimen collected, the vernacular name, botanical name and ethno medical uses(s), method of preparation of the medicinal potion and toxic effect, if any, were documented.

3. Results

Nineteen plant species representing 15 genera and 12 families commonly used by the Abagusii traditional medical practitioners in treatment of sexually transmitted infections were botanically identified. Their families, botanical names, vernacular names, part(s) used, preparations and dosage were determined and the results are presented as follows;

3.1 Agavaceae

3.1.1 *Agave Americana* L. (exotic) (N001)

Vernacular name: Rikonge

Uses and preparation: Most sexually transmitted infectious such as syphilis and gonorrhoea.

2-3 cups of an infusion made of 50 g of roots or ground leaves per litre of water, sweetened with honey are drunk three times daily as a remedy for edema and the retention of fluids in the body system.

3.2 Amaranthaceae

3.2.1 *Achyranthes aspera* L. (N002)

Vernacular name: Esarara

Uses and preparation: Syphilis.

10 g of the ash of the burnt ash of the dried whole plant is mixed with 1 glass of water and boiled. 2-3 cups of this decoction are drunk three times daily after every meal as a remedy. Alternatively, 100 g of fresh leaves are macerated and then mixed with flour, and boiled to make a paste which is used as a poultice and applied on boils and abscesses to hasten their maturity so that the pus can be squeezed out of them and herbal treatments applied to hasten their healing.

3.3 Apocynaceae

3.3.1 *Urissa edulis* (Forssk.) Vahl. (N003)

Vernacular name: Omonyangateti

Uses (s) and preparation: Gonorrhoea

3-4 cups of a decoction prepared from 10 g of root material in 1 litre of water and sweetened with a cup of honey are drunk daily as a remedy.

3.3.2 *Rauwolfia caffra* Sond. (N004)

Vernacular name: Omomure

Use(s) and preparation: Gonorrhoea, Syphilis another sexually transmitted diseases.

3 cups of a decoction made from 10-15 g of dry powdered root material in 1 litre of water are drunk daily.

3.3.3 *Tabernaemontana stapfiana* Britten (N005)

Vernacular name: Omobondo.

Use(s) and preparation: Gonorrhoea, syphilis and other common sexually transmitted diseases.

2-3 cups of a decoction made from 10-15 g of dry powdered root material in 1 litre of water are drunk daily.

3.4 Caesalpiniaceae

3.4.1 *Caesalpinia decapetala* (Roth) Alston (exotic) (N006)

Vernacular name: Ekenagwa

Use(s) and preparation: Gonorrhoea

3-5 cups of a decoction made from 100 g of root material are drunk daily.

3.4.2 *Cassia didymobotrya* Fresen (Syn *Senna didymobotrya* (Fresen.) Irwin and Barneby) (N007)

Vernacular name: Omobeno

Use(s) and preparation: Gonorrhoea, syphilis, backaches and headache.

50 g of ground leaves and 50 g of ground stems are mixed with 1 litre of water. This decoction can also be made with leaves only in a proportion of 100 g of leaves per litre of water. This is then boiled for twenty minutes. 3-4 cups are drunk daily as a remedy for gonorrhoea. 50 g of leaves and 50 g of roots are boiled in one litre of water and one cup of the decoction is drunk after every meal as a remedy for headache and backaches.

3.4.3 *Cassia floribunda* Cav. (Syn *Senna septemtrionalis* (Viviani) Irwin & Barneby) (N008)

Vernacular name: Omobeno omwagarori.

Use(s) and preparation: Purgative; gonorrhoea, syphilis, backaches and headache.

50 g of ground leaves and 50 g of ground stems are mixed with 1 litre of water. This decoction can also be made with leaves only in a proportion of 100 g of leaves per litre of water. This is then boiled for twenty minutes. 3-4 cups are drunk daily as a remedy for gonorrhoea. 50 g of leaves and 50 g of roots are boiled in one litre of water and one cup of the decoction is drunk after every meal as a remedy for backaches and headache.

3.5 Aricaceae

3.5.1 *Carica papaya* L. (exotic) (N009)

Vernacular name: Ripaipai

Use(s) and preparation: Common venereal diseases such as syphilis and gonorrhoea, sterility in women. An infusion made from 10 g of the leaves of the male plant per litre of water are taken for the treatment of sexually transmitted diseases while 3 cups of this decoction are drunk daily as a remedy for sterility in women.

3.6 Compositae

3.6.1 *Crassocephalum vitellinum* (Benth.) S. Moore. (N010)

Vernacular name: Entamame

Use(s) and preparation: Gonorrhoea, syphilis and common sexually transmitted infections.

1 cup of the same decoction is drunk three times daily after every meal as a remedy for gonorrhoea; 10 g of flowers are

macerated and mixed with 1 g of common salt and directly applied to stop a bleeding wound to stop the flow of blood and to hasten the healing process.

3.7 Flacourtiaceae

3.7.1 *Dovyalis abyssinica* L. (N011)

Vernacular name: Omokorogonywa

Use(s) and preparation: Gonorrhoea

3-4 cups of 20 g of the root decoction made in 1 litre of water boiled with fat is drunk as a remedy.

3.8 Mimosaceae

3.8.1 *Mimosa pudica* (L.) Del. (N012)

Vernacular name: Ekiebundi

Use(s) and preparation: Syphilis, gonorrhoea and other sexually transmitted diseases.

3-4 cups of a strong decoction of 100 g of the whole plant per litre of water are drunk for days for sexually transmitted diseases.

3.9 Papilionaceae

3.9.1 *Erythrina abyssinica* DC. (N013)

Vernacular name: Omotembe

Use(s) and preparation: Gonorrhoea, syphilis and other sexually transmitted diseases.

3-4 cups of the decoction made from 20 g of finely ground bark and 10 g of the root tissue in 1 litre of water are drunk for the treatment of sexually transmitted infections such as gonorrhoea and syphilis.

3.10 Proteaceae

3.10.1 *Faurea saligna* Harr. (N014)

Vernacular name: Omosasa omwagarori

Use(s) and preparation: Common venereal diseases such as gonorrhoea

3-4 cups of a decoction made from 15-20 g of the roots in 1 litre of water are drunk daily.

3.11 Rhamnaceae

3.11.1 *Rhamnus staddo* A. Rich. (N015)

Vernacular name: Omonyango

Use(s) and preparation: Most venereal diseases such as gonorrhoea and syphilis.

3-4 cups of a decoction made from 20-30 g of the leaves and 15-20 g of the roots in 1 litre of water are drunk daily.

3.11.2 *Rhamnus prinoides* L' He'rit. (N016)

Vernacular name: Omong'ura

Use(s) and preparation: Gonorrhoea.

3-4 cups of a decoction made from 100 g of ground roots in 1 litre of water are drunk daily.

3.12 Solanaceae

3.12.1 *Solanum acueastrum* Dunal (N017)

Vernacular name: Omotobo

Use(s) and preparation: Gonorrhoea, vomiting, syphilis and abdominal pains.

50 g of root material per 250 ml of water is made into a decoction. 1 cup of this decoction is drunk three times daily as a treatment for gonorrhoea, vomiting, syphilis and abdominal pains.

3.12.2 *Solanum incanum* L. (N018)

Vernacular name: Omoratora

Use(s) and preparation: Gonorrhoea, syphilis and other common venereal infections

50 g of root material per 250 ml of water is made into an infusion. 1 cup of this infusion is drunk three times daily as a treatment for gonorrhoea, syphilis and other sexually transmitted infections.

3.12.3 *Solanum mauritianum* Scop. (N019)

Vernacular name: Omonsarigo

Use(s) and preparation: Syphilis, gonorrhoea, herpes and itching in the vagina or anus. 3-4 cups of a decoction made from 100 g of ground leaves in 1 litre of water are drunk daily. Lotions with the fresh juice of the leaves and stems are applied directly on the affected parts (itching parts).

4. Discussion

The study findings revealed that the Abagusii traditional healers used different plant species from the same family to treat the same disease condition(s). Apocynaceae, Caesalpiniaceae and Solanaceae were the most important families, given their number of taxa used to treat STIs in this study. Other important family included Rhamnaceae. These findings are in agreement with those obtained by ^[1, 23] that Apocynaceae, Papilionaceae, Malvaceae and Sapotaceae were commonly used medicinal plants in treatment of sexually transmitted infections in Nigeria. However, in an ethnobotanical survey conducted among the people of Zegie Peninsula in Ethiopia ^[29], reported that out of 44 families used by the people, Euphorbiaceae was among those that provided the largest number of medicinal plants.

Similarly, in another study conducted in Katima Mulilo, Caprivi region, Namibia, to determine the medicinal plants used to manage HIV opportunistic infections, Anacardiaceae was reported as one of the families mostly used to treat such conditions ^[7]. Asteraceae was also observed to be the second largest family to treat urinary tract infections (UTIs) and STIs in different tribes of Bangladesh ^[13], while Malvaceae was mentioned as one of the important families in Indian ethnomedicine. The findings revealed that the use of leaves offers the advantage of utilising the biodiversity on a sustainable basis over the root or whole plant, since the leaves are regenerative.

In support of these findings ^[29, 31], observed that the use of leaves and roots are found commonly in several reports of ethnobotanical studies. The most popular method of herbal preparation used in this survey was decoction and infusion. These findings concurs with the general pattern of medicinal plant use in Africa as noted by African Plants Database 2011 and International Plant Names Index 2011 as noted by ^[19]. In support of these findings, in some other parts of the world also, decoction was indicated as a common method of herbal preparation ^[25, 28].

5. Conclusion

The Abagusii community had a variety of botanicals which were potentially able in the treatment of sexually transmitted infections. The medicinal plants used may serve as source of new and effective drugs and can act as additional source of health manpower. Most modern drugs have become ineffective due to the emergence of resistant strains of pathogens (bacteria, fungus or parasites). Some allopathic drugs addresses either the disease symptoms without curing the infection or have severe side-effects.

In re-focusing of indigenous utilisation of medicinal plants, scientific studies based on indigenous uses have reported that herbal drugs can be an effective way towards rapid discovery of novel compounds with therapeutic potential. The use of medicinal plants for treatment of STIs offers in the scientific evaluation of these medicinal plant species can lead to discovery of novel drugs with which multi-drug resistant microbial strains can be addressed.

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7. Conflict of interest

The authors declare that there is no conflict of interest in the publication of this work.

8. References

- Ajibesin KK, Ekpo BA, Bala DN, Essien EE, Adesanya SA. Ethnobotanical survey of Akwa Ibom State of Nigeria. *J Ethnopharmacol.* 2008; 115:387-408.
- Allsworth JE, Lewis VA, Peipert JF. Viral sexually transmitted infections and bacterial vaginosis; 2001–2004 National Health and Nutrition Examination Survey data. *Sexually Transmitted Diseases.* 2008; 35(9):791-796.
- Ayelaagbe O, Adeniyi BA, Fatusin OF. *In vitro* antimicrobial activity & phytochemical analysis of *Jatropha curcus* roots. *International Journal of Pharmacology.* 2007; 3(1):106-110.
- Azam MD, Jamal F. An ethnomedicinal survey among the Marakh sector of the Garo tribe of Mymen Singh dist. Bangladesh. *International Journal of Pharmaceutical Technology & Research.* 2012; 4(1):141-149.
- Berec L, Janoušková E, Theuer M. Sexually transmitted infections and mate-finding Allee effects. *Theoretical Population Biology.* 2017; 114:69–59
- Bhargava D, Kar S, Narayan J. Screening of antigonorrhoeal activity of some medicinal plants in Nepal. *International Journal of Pharma & Biosciences.* 2011; 2(1):203-212.
- Chinsebu KC, Hedimbi M. An ethnobotanical survey of plants used to manage HIV/AIDS opportunistic infections in Katima Mulilo, Caprivi region, Namibia. *J Ethnobiol Ethnomed.* 2010; 6:25.
- Cohen J. HIV transmission- AIDS researchers look to Africa for new insights. *Science,* 2000, 287-942
- Forbes A. Beyond Latex: Will microbicides offer an alternative to condom? *Body positive march 200,* 2000; XIII(3). <http://www.thebody.com/bp/maroo/marooIX.html>.
- Geremew RA, Agizie BM, Bashaw AA *et al.* Prevalence of selected sexually transmitted infection (STI) and associated factors among symptomatic patients attending Gondar Town hospitals and health centers. *Ethiopian Journal of Health Sciences.* 2017; 27(6):600–589.
- Giasecke J. *Modern Infectious Disease Epidemiology.* Boca Raton, FL: CRC Press, 2017.
- Hossan MS, Hanif A, Agarwala B, Sarwar MS, Karim M, Rahman MT *et al.* Traditional use of medicinal plants in Bangladesh to treat urinary tract infections and sexually transmitted diseases. *Ethnobotany Research and Applications.* 2010; 8:61.
- Jahan R, Seraj S, Islam F. Medicinal plants used by folk & tribal medicinal practitioners of Bangladesh for treatment of Gonorrhoea. *American Eurasian Journal of sustainable agriculture.* 2011; 5(3):358-363.
- Haroon SM, Shahid S, Ammar Hussain S *et al.* Comparative Study of Antioxidant Activity of Flower of Aloe vera and Leaf Extract of Aloe ferox. *Journal of Basic and Applied Sciences.* 2018; 14:196–191.
- Kambizi L, Afolayan AJ. Ethnobotanical study of plants used for the treatment of STD in Gurube dist. Zimbabwe. *Journal of Ethnopharmacology.* 2001; 77; 5-9.
- Kenya National Bureau of Statistics (KNBS). *Economic Survey.* Government Printer: Nairobi; 2019 http://www.ibe.UNESCO.org/National_Reports/ICE_2008/Kenya_NR08.pdf
- Kojima N, Klausner JD. Improving management of sexually transmitted infections in those who use pre-exposure prophylaxis for human immunodeficiency virus infection. 2018; 32(2):275–272.
- Mongalo N, McGaw L, Finnie J *et al.* Pharmacological properties of extracts from six South African medicinal plants used to treat sexually transmitted infections (STIs) and related infections. *South African Journal of Botany.* 2017; 112:290–295.
- Mulaudzi RB, Ndhlala AR, Van Staden J. Ethnopharmacological evaluation of a traditional herbal remedy used to treat gonorrhoea in Limpopo province, South Africa. *South African Journal of Botany.* 2015; 97:122–117
- Murray MT, Pizzorno JE. *Textbook of natural medicine.* Churchill living China, 1999.
- Peder L, Nascimento B, Plewka J *et al.* Prevalence and predictors associated with sexually transmitted infections in patients in Southern Brazil. *International Journal of Infectious Diseases.* 2018; 73:335.
- Pramono E. The commercial use of traditional knowledge and medicinal plants in Indonesia multistake holder dialogue on Trade, Intellectual property and biological resources in Asia, BRAC centre for development management, April 19-21, Rajendrapur, Bangladesh, 2002, 1-13.
- Press S. *Do-it-yourself herbal medicine: home-crafted remedies for health and beauty.* Berkeley, CA: Arcas Publishing, 2015.
- Rahmatullah MD, Atikur Rahman MD, Farhan MD, Hasan M. An ethnomedicinal survey conducted amongst folk medicinal practitioners in the two southern districts of Noakhali & Feni, Bangladesh. *American-Eurasian journal of Sustainable Agriculture.* 2011; 5(1):115-131.
- Rahmatullah M, Rahman ME, Hasan E, Ahmed R, Jamal F, Jahan R *et al.* A survey of medicinal plants used by the folk medicinal practitioners of Shetabganj village in Dinajpur district, Bangladesh. *Am-Eurasian J Sustainable Agric.* 2010; 4:196-3.
- Rajbhandari M, Wegner U, Julich M, Mentel R. Screening of Nepalese medicinal plants for antiviral

- activity. *Journal of Ethnopharmacology*. 2001; 74:251-55.
27. Samuel A, Chellapan DK, Gopinath R. Ethnomedicinal survey of plants used by the Orang Asli in Kampung Bawong, Perak, West Malaysia. *Journal of Ethnobiology & Ethnomedicine*. 2010; 6(5):1-6.
28. Sankaranarayanan S, Bama P, Ramachandran J, Kalaichelvan PT, Deccaraman M, Vijayalakshimi M *et al*. Ethnobotanical study of medicinal plants used by traditional users in Villupuram district of Tamil Nadu, India. *Journal of Medicinal Plants Research*. 2010; (4):1089-11.
29. Sanz-Biset J, Campos-de-la-Cruz J, Epiqui n-Rivera MA, Ca nigueral S. A first survey on the medicinal plants of the Chazuta valley (Peruvian Amazon). *Journal of Ethnopharmacology*. 2009; 122:333-62.
30. Teklehaymanot T, Giday M. Ethnobotanical study of medicinal plants used by people in Zegie Peninsula Northwestern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*. 2007; 3:12.
31. Tene V, Malago O, Finzi PV, Vidari G. An ethnobotanical survey of medicinal plants used in Loja and *Zamora chinchipi*, Ecuador. *Journal of Ethnopharmacology*. 2007; 111:63-81.
32. Umoh U, Ajibesin K, Bala D. The use of medicinal plants to treat STD in Nigeria: Ethnomedicinal survey of Niger Delta Region. *International Journal of Green Pharmacy*, 2011, 181-192.
33. Van Der Pol B. *Trichomonas vaginalis* infection: the most prevalent nonviral sexually transmitted infection receives the least public health attention. *Clinical Infectious Diseases*. 2007; 44(1):25–23.
34. Vermani K, Garg S. Herbal medicines for STIs & AIDS. *Journal of Ethnopharmacology*. 2002; 80:49-66.
35. Wardlaw AM, Agrawal AF. Sexual conflict and sexually transmitted infections (STIs): coevolution of sexually antagonistic host traits with an STI. *The American Naturalist*. 2018; 193(1):E000.
36. World Health Organization. Prevalence and incidence of selected sexually transmitted infections, *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, syphilis and *Trichomonas vaginalis*: methods and results used by WHO to generate 2005 estimates. Geneva: World Health Organization, 2011.
37. Sinha DJ, Vasudeva A, Gowhar O *et al*. Comparison of antimicrobial efficacy of propolis, *Azadirachta indica* (Neem), *Melaleuca alternifolia* (Tea tree oil), *Curcuma longa* (Turmeric) and 5% sodium hypochlorite on *Candida albicans* biofilm formed on tooth substrate: an *in-vitro* study. *Journal of Pharmaceutical and Biomedical Sciences*. 2015; 5(6):474–469 38.
38. Koyade J, Koyade GM. Ethnomedicinal survey of botanicals used in treating STD in Ekitti state Nigeria. *Ethnobotanical leaflets*. 2008; 12:44-55.
39. Stemmer SM, Mordechai E, Adelson ME *et al*. *Trichomonas vaginalis* is most frequently detected in women at the age of peri-/premenopause: an unusual pattern for a sexually transmitted pathogen. *American Journal of Obstetrics and Gynecology*. 2018; 218(3):328.e1–328, e13.