Ethnogynaecological medicinal plants used by Tanzanian communities against female infertility and menstrual disorders - A comprehensive review

David Sylvester Kacholi, Olivia John Kalokora, Halima Mvungi Amir and Neema Gideon Mogha

Correspondence

David Sylvester Kacholi[1*], Olivia John Kalokora[1], Halima Mvungi Amir[1] and Neema Gideon Mogha[1]

[1]Department of Biological Sciences, Dar es Salaam University College of Education (DUCE), University of Dar es Salaam (UDSM), P. O. Box 2329 Dar es Salaam, Tanzania

*Corresponding Author: kacholi78@gmail.com or david.kacholi@udsm.ac.tz

Ethnobotany Research and Applications 26:69 (2023) - http://dx.doi.org/10.32859/era.26.69.1-25
Manuscript received: 06/09/2023 - Revised manuscript received: 30/11/2023 - Published: 03/12/2023

Review

Abstract

Background: Tanzania's rural population trusts medicinal plants (MPs) to manage gynaecological disorders due to their easy accessibility and affordability. Despite MPs' crucial role in treating various diseases in the country, no study has explicitly compiled MPs used for gynaecological disorders. This review documents MPs used to treat women's infertility and menstrual disorders across the Tanzanian communities.

Methods: A systematic evaluation of published literature was done using electronic databases, such as Google Scholar, Web of Science, Science Direct, PubMed, and Wiley Online Library, to gather all available evidence as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Twenty-nine articles with relevant information were selected and analysed.

Results: A total of 172 MPs representing 53 families and 140 genera were documented for their therapeutic uses against infertility and menstrual disorders. Fabaceae was the dominant family with the highest number of MPs (14.0%), followed by Rubiaceae (7.0%), and Phyllanthaceae and Malvaceae (with 5.2% each). Tree (55.8%) and root (70.0%) were the most utilised life form and plant part for remedy formulation, respectively. Most MPs (81.0%) were collected from the wild environments. Decoction (76.0%) and oral (98.0%) were the dominant preparation and administration methods, respectively. 63.3% and 28.5% of the recorded MPs were used to treat infertility and menorrhagia, respectively.

Conclusion: This review unveils a rich diversity of MPs used by Tanzanians against infertility and menstrual disorders. Moreover, it is a valuable inventory for future validation of traditional medicinal knowledge with phytochemical and pharmacological studies, and formulation of modern drugs.

Keywords: Amenorrhoea, dysmenorrhoea, ethnobotany, menorrhagia, menstruation, traditional knowledge

Background

African women constitute 51% of the continent's population and remain the mainstay of the continent's economic development (Ogunlakina & Sonibare 2020). However, women's reproductive health conditions are often neglected, thus, restricting clinical studies on the subject matter (Wood *et al.* 2022). Regrettably, they are overwhelmed by several gynaecological health challenges, including infertility and menstrual disorders (Mascarenhas *et al.* 2012). Gynaecological disorders refer to illnesses associated with the female reproductive system. Worldwide, gynaecological disorders are major social problems to public health, whereby women suffer from extreme disquiet by various disorders that lack curative medical care (Afrin *et al.* 2021, Ciebiera *et al.* 2021). Consequently, promoting primary and secondary prevention is crucial for improving female reproductive health (Izetbegovic *et al.* 2013). Although indigenous communities are generally less empowered, they are traditionally and culturally rich (Balamurugan *et al.* 2018, Kacholi & Amir 2022). Thus, the healthcare systems of the indigenous communities are still based on traditional knowledge systems, particularly MPs, for curing various ailments, including infertility and menstrual disorders (Akour *et al.* 2016, Jiao *et al.* 2022, Steenkamp 2003, Vineeta *et al.* 2022).

Infertility refers to failure to achieve a successful pregnancy after one year of sexual intercourse. Worldwide, infertility affects 15% to 17% of couples, with about 50% associated with female infertility disorders (Akbaribazm *et al.* 2021), most of which are from developing countries (Vander Borght & Wyns 2018). The disorder may be caused by various factors, including ovulatory disease, endometriosis, pelvic adhesions, tubal blockage, hyperprolactinemia, and other uterine anomalies (Walker & Tobler 2022). Menstrual disorders refer to physical or emotional problems that affect normal menstruation and bring discomfort associated with heavy or light bleeding and sometimes missed periods. The most prominent menstrual problems are amenorrhea, menorrhagia, oligomenorrhea, polymenorrhea, hypomenorrhea, and dysmenorrhea (Esimai & Esan 2010, Majeed *et al.* 2022). The consequences of infertility and menstrual disorders include interpersonal relationship problems, decreased self-esteem, shame, social isolation, risk of harm to mental health, depression, anxiety, despair, guilt, and worthlessness (Abrao *et al.* 2013).

Traditional MPs remedies are the primary therapy for most rural communities in Tanzania and elsewhere (Hilonga *et al.* 2019, Maregesi *et al.* 2007, Mogha *et al.* 2022, Pala *et al.* 2019, Raj *et al.* 2018). Various indigenous communities use different approaches to treat ailments (Akour *et al.* 2016, Patel & Patel 2012). This is because modern medical health facilities in many rural settings are scarce and, when available, are inaccessible due to distance or inability to pay by most of the rural population. In this case, the only alternative is traditional medicines, especially MPs, which are affordable, readily available, and culturally acceptable (Kacholi & Amir 2022a, Shangali *et al.* 2008). Additionally, women who live in rural settings are economically and educationally disadvantaged. Hence, they are generally reluctant to go for treatments from modern health facilities, and instead, they prefer to consult local village midwives for gynaecological disorders who utilise MPs as part of their *materia medica* (Balamurugan *et al.* 2018).

Though various ethnobotanical studies (Amri & Kisangau 2012, Augustino *et al.* 2011, Kacholi & Mvungi 2022, Maregesi *et al.* 2007, Moshi *et al.* 2010, 2012) have been conducted in Tanzania, no study has unequivocally compiled a list of MPs used to manage female infertility and menstrual disorders. Therefore, this review aims to document a list of MPs used to treat women's infertility and menstrual disorders across the Tanzanian indigenous communities.

Methodology

Literature search strategy, inclusion and exclusion

All relevant literature on MPs used for gynaecological disorders, especially infertility and menstrual disorders, were sourced from various online databases and search engines such as Google, Google Scholar, African Journals Online (AJOL), Web of Science, Scopus, Science Direct, PubMed, Wiley Online Library, Academia, and Springer Link following procedures hitherto used (Mogha *et al.* 2022, Omara 2020). The searches were performed independently in all the databases. Key search words such as 'Ethnobotany' or 'ethnobotanical' or 'ethnomedicine' or 'ethnomedicinal' or 'ethnopharmacology' or 'ethnopharmacological' or 'traditional medicines' or 'medicinal plants' or 'herbal plants' or 'herbal remedies' or 'Folk medicines' or 'Infertility' or 'sterility' or 'fertility enhancement' or 'menstrual disorders' or 'menstruation' or 'menses' or 'conception' or 'conception enhancement' or 'abdominal pain' or 'abnormal bleeding' or 'abnormal menses' or 'menstrual problems' or 'irregular menses' or 'menstrual cramps' or 'excessive menstruation' or 'menorrhagia' or 'polymenorrhagia' or 'amenorrhoea' or 'dysmenorrhoea' or 'hypermenorrhoea' or 'hypomenorrhoea' + 'rural/indigenous/ethnic/tribal/people/community + 'Tanzania,' were used to gather the required literature. All reports with information on gynaecological disorders, particularly infertility and menstrual disorders, or MPs in Tanzania, were selected

and carefully screened as per the recommendations described in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Figure 1) (Liberati *et al.* 2009). Only original articles published in peer-reviewed journals, books, theses, dissertations, patents, and reports on infertility and menstrual disorders in Tanzania written in English were considered. Studies on ethnoveterinary, review articles, and pharmacological studies, and those with no scientific plant names and parts used were excluded from the review. All studies with ethnobotanical information on the family name, scientific name, local name (if shown), method of preparation, and route of administration (if shown) were included in this review. The scientific names and life forms of MPs were verified using online botanical databases such as the Plants of the World Online (https://powo.science.kew.org/) and JSTOR Global Plants (https:plants.jstor.org/), and where a given MP was considered as distinct species in different reports, the nomenclature as per the above-mentioned botanical databases took precedence.

After thoroughly eliminating duplicates and an advanced systematic screening of the collected literature, 68 research records on MPs from Tanzania were found. After screening for infertility and menstrual disorders, only 29 records remained and merited this review (Figure 1). The information gathered from the selected records was used to prepare a comprehensive list of species with scientific names, local name(s), plant part(s) used, cured ailment, mode of preparation, and application (Table 1). For many species, different synonyms were used in various records, but only valid botanical names were retained in those cases, and synonyms were merged with the right botanical name.

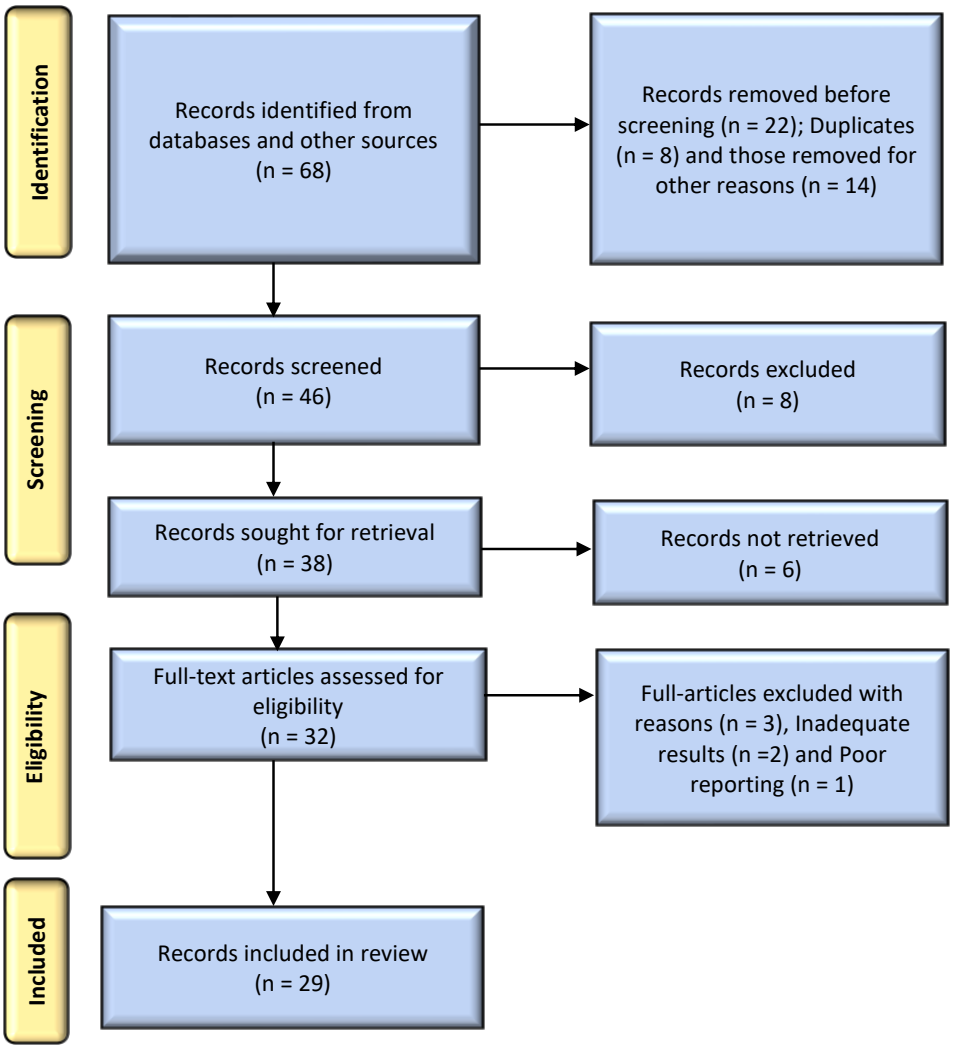

Figure 1. Flow chart of the study

Data analysis

All collected ethnobotanical data were entered into Microsoft Excel, and descriptive statistics such as frequency distribution and percentages were used to analyse the collected ethnobotanical data (plant parts, life forms, preparation methods, and routes of administration).

Results and Discussion

Medicinal plants diversity

A total of 172 MPs representing 53 botanical families and 140 genera were used to treat infertility and menstrual disorders in Tanzania (Table 1). The dominant families were Fabaceae (24 species, 14.0%), followed by Rubiaceae (12 species, 7.0%), Phyllanthaceae and Malvaceae (9 species each, 5.2%), Lamiaceae (8 species, 4.7%), Celastraceae and Combretaceae (with 7 species each, 4.1%), Anacardiaceae and Annonaceae (with 6 species each, 3.5%), and Sapindaceae and Rutaceae (with 5 species each, 2.9%) (Figure 2). Some families mentioned in the present have been reported elsewhere as predominant in managing gynaecological disorders. For instance, Fabaceae was represented with more species in the study conducted in South Africa (Steenkamp 2003) and India (Balamurugan *et al.* 2018, Prabhu *et al.* 2014). Moreover, studies conducted in Cameroon (Tsobou *et al.* 2016) and Nigeria (Ogunlakina & Sonibare 2020) reported Rubiaceae and Euphorbiaceae as dominant in herbal remedy formulations against reproductive disorders. The MPs' dominance and higher exploitation in these botanical families indicate they are extensively distributed in various ecological settings.

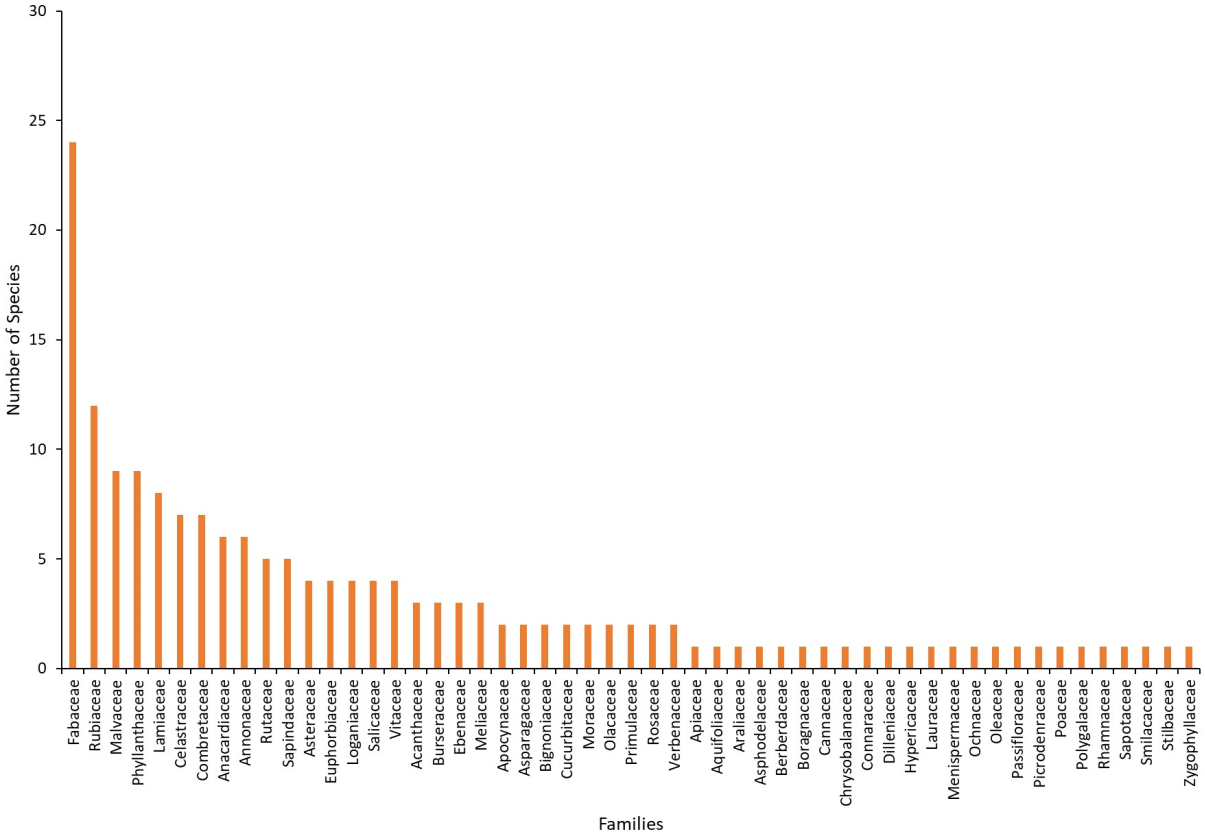

Figure 2. Recorded families with species used to manage infertility and menstrual disorders

Disorders treated by medicinal plants

The review revealed five gynaecological disorders, namely infertility, menorrhoea, dysmenorrhoea, amenorrhoea, and polymenorrhoea (Figure 3), which are treated with the traditional knowledge of ethnopharmacology by the indigenous community in the country. Among the disorders, infertility is managed by the highest number of MPs (109 species belonging to 42 families), followed by menorrhagia (49 species, 28 families), dysmenorrhoea (26 species, 22 families), amenorrhoea (21 species, 16 families), and polymenorrhoea (3 species, 3 families).

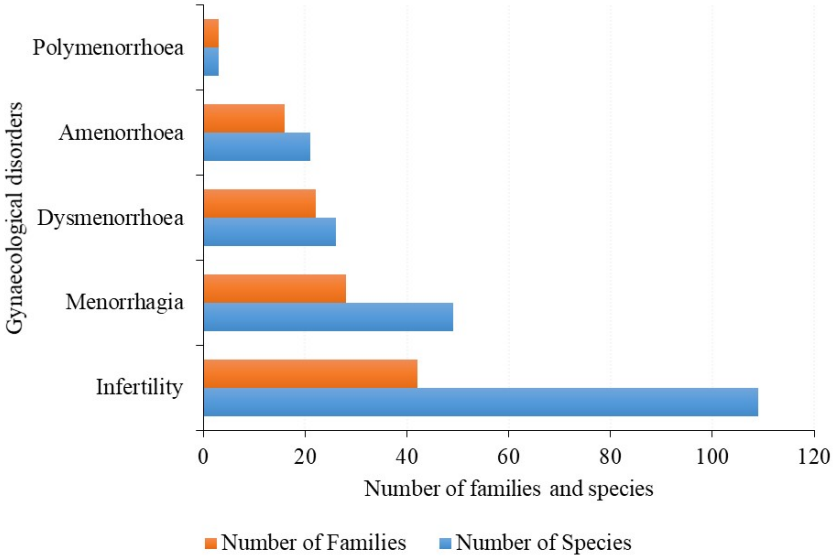

Figure 3. Number of families and species corresponding to each gynaecological disorder

Similar uses from other countries

Among the reported MPs in this review have also been reported elsewhere to have similar applications in treating female infertility and menstrual disorders. For instance, in Nigeria, *Annona senegalensis* Pers (Annonaceae), *Cocos nucifera* L. (Annonaceae), *Combretum apiculatum* Sond. (Combretaceae), *Xylopia aethiopica* (Dunal.) A. Rich. (Anacrdiaceae), *Kigelia africana* (Lam.) Benth. (Bignoniaceae), and *Mangifera indica* L. (Anacardiaceae) are used to treat female infertility (Ajao *et al.* 2022, Idu *et al.* 2016). Likewise, *Ricinus communis* L. (Euphorbiaceae) in Jordan (Akour *et al.* 2016) and Nigeria (Ajao *et al.* 2022), *Justicia salvioides* Milne-Redh. (Acanthaceae) in Cameroon (Telefo *et al.* 2012), *Thunbergia alata* Boj. ex Sims (Acanthaceae) in Uganda (Namukobe *et al.* 2011), *Vangueria infausta* Burchell (Rubiaceae), and *Ximenia caffra* Sond (Olacaceae), *Bridelia cathartica* G. Bertol (Phyllanthaceae) (Mashile *et al.* 2019, Steenkamp 2003) and *Euclea natalensis* A. DC (Ebenaceae) (de Wet and Ngubane 2014), *Flueggea virosa* (Roxb. ex Willd.) Royle (Phyllanthaceae) in South Africa (Abdillahi and Van Staden 2013) and Somalia (Samuelsson *et al.* 1992), *Hoslundia opposita* Vahl (Lamiaceae), and *Plectranthus kilimandschari* Gurke (Lamiaceae) in Kenya (Kaingu *et al.* 2013), *Searsia longipes* (Engl.) Moffett (Anacardiaceae), *B. cathartica* and *Pterocarpus angolensis* DC. (Fabaceae) in Zimbabwe (Maroyi 2013) are used to treat female infertility.

Other ethnobotanical studies reported *E. natalensis*, *F. virosa*, *P. angolensis* (Steenkamp 2003), and *B. cathartica* (de Wet & Ngubane 2014) in South Africa, *Cassia occidentalis* L. (Fabaceae) and *Cyphostemma paucidetatum* (Klotzsch) Desc. ex Wild & R.B. Drumm (Vitaceae) in Uganda (Kamatenesi-Mugisha & Oryem-Origa 2007) as well as *F. virosa*, *X. caffra*, and *Securidaca longepedunculata* Fresen (Polygalaceae) in Mali (Sanogo 2011) to be used for the treatment of dysmenorrhoea. Moreover, *B. cathartica* has been reported to treat dysmenorrhoea and menorrhagia in South Africa (Abdillahi & Van Staden 2013, de Wet & Ngubane 2014), while *P. kilimandschari* and *Uvaria acuminata* Oliv. (Annonaceae) are used by Kenyan communities to treat menorrhagia, amenorrhoea, and dysmenorrhoea (Kaingu *et al.* 2013).

Table 1. List of medicinal plants used for the management of infertility and menstrual disorders among women in rural communities in Tanzania

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
Acanthaceae	*Hygrophila auriculata* (Schumach.) Heine	Kasindano	Herb	Wild	Whole plant	Dysmenorrhoea	Not specified	(Otieno et al. 2007)
	Justicia salvioides Milne-Redh.	Muluguti	Shrub	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Thunbergia alata Bojer ex Sims	Nakagwinda	Herb	Wild, Cultivated	Leaves	Menorrhagia	Cooked with *Cucurbita pepo* L. leaves and eaten	(Chhabra et al. 1987, Augustino & Gillah 2005)
Anacardiaceae	*Lannea schweinfurthii* (Engl.) Engl.	Mugumbu	Tree	Wild, Cultivated	Root	Menorrhagia	Decoction; oral	(Abdallah et al. 2007)
	Mangifera indica L.	Mwembe	Tree	Cultivated	Bark	Infertility	Not specified	(Augustino & Gillah 2005, Kacholi 2013, 2014)
	Ozoroa mucronata (Bernh. ex C.Krauss) R. Fern. & A.Fern	Mkamachumu	Shrub	Wild	Root	infertility	Decoction; oral	(Abdallah et al. 2007)
	Searsia longipes (Engl.) Moffett	Olmesigei	Shrub	Wild	Root	Menorrhagia	Decoction; oral	(Abdallah et al. 2007)
	Searsia natalensis (Bernh ex. C.Krauss) F.A. Barkley	Mfunguzi	Shrub	Wild	Leaves Roots	Infertility; Dysmenorrhoea; Polymenorrhoea	Infusion of leaves taken orally for infertility. Roots cooked with Chicken meat and eaten for dysmenorrhoea; Decoction of roots taken orally against Polymenorrhoea.	(Chhabra et al. 1987, Kingo & Maregesi 2020)
	Sorindeia madagascariensis (Spreng.) DC.	Mkunguma	Tree	Wild	Root	Infertility	Decoction; oral	(Chhabra et al. 1993)
Annonaceae	*Annona senegalensis* Pers	Mtopetope	Tree	Wild	Roots	Infertility; Polymenorrhoea	Decoction; oral	(Chhabra et al. 1987, Abdallah et al. 2007)
	Cocos nucifera L.	Mnazi	Tree	Cultivated	Roots	Amenorrhoea	Decoction; oral	(Abdallah et al. 2007)
	Friesodielsia obovata (Benth.) Verdc.	Musalasi	Shrub	Wild	Roots	Infertility	MoP not specified; oral	(Augustino & Gillah 2005, Augustino et al. 2011)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
	Uvaria acuminata Oliv.	Mungwene, Mngwene	Shrub	Wild	Root	Dysmenorrhoea	Decoction; oral	(Chhabra et al. 1993)
	Xylopia aethiopica (Dunal) A.Rich.	Mlawilila	Tree	Wild	Fruits	Amenorrhoea	Decoction; oral	(Kacholi 2014)
	Xylopia tomentosa Excell	Mushenene	Tree	Wild	Roots, Leaves	Infertility	MoP not specified; oral	(Augustino et al. 2011)
Apiaceae	*Steganotaenia araliacea* Hochst.	Msumi	Tree	Wild, Cultivated	Root	Amenorrhoea	Decoction; oral	(Chhabra et al. 1993)
Apocynaceae	*Rauvolfia mannii* Stapf	Nyavihongo	Shrub	Wild	Roots	Infertility	Decoction; oral	(Shangali et al. 2008)
	Voacanga africana Stapf	Mberebere	Tree	Wild	Roots	Dysmenorrhoea	Decoction; oral	(Hedberg et al. 1983b)
Aquifoliaceae	*Ilex mitis (L.) Radlk.*	Mhangavya	Tree	Wild	Root	Infertility	Decoction; oral	(Shangali et al. 2008)
Araliaceae	*Cussonia arborea* Hochst. ex A.Rich.	Mgagigagi	Tree	Wild	Roots	Infertility, Menorrhagia	Decoction; oral	(Abdallah et al. 2007)
Asparagaceae	*Asparagus cochinchinensis* (Lour.) Merr.	Olopirolopapaa	Climber	Wild	Roots	Infertility	Not specified	(Hilonga et al. 2019)
	Dracaena steudneri Engl.	Mgologolo	Tree	Wild, Cultivated	Leaves	Infertility	Ashes of the burnt leaves are combined with soda ash, and the powder licked	(Moshi et al. 2012)
Asphodelaceae	*Aloe lateritia* Engl.	Kithapa	Shrub	Wild, Cultivated	Roots	Menorrhagia	Decoction; oral	(Chhabra et al. 1990b)
Asteraceae	*Ageratum conyzoides* L.	Omwigara	Herb	Wild, Cultivated	Root, Leaves	Infertility, Menorrhagia	Decoction; then taken orally as a tea	(Moshi et al. 2009, 2012)
	Berkheya bipinnatifida (Harv.) Roessler		Herb	Wild		Menorrhagia	Not specified	(Abdallah et al. 2007, Otieno et al. 2007)
	Blepharispermum zanguebaricum Oliv. & Hiern	Msekele	Shrub	Wild	Roots	Infertility	Decoction drunk	(Chhabra et al. 1993)
	Pluchea dioscoridis (L.) DC.	Mnywenywe	Shrub	Wild	Root	Infertility	Decoction; oral	(Hedberg et al. 1983b)
Berberidaceae	*Berberis holstii* Engl.	Kimakatsa	Shrub	Wild	Roots	Infertility	Decoction; oral	(Shangali et al. 2008)
Bignoniaceae	*Kigelia africana* (Lam.) Benth.	Myegea	Tree	Wild	Roots, Bark	Infertility, Menorrhagia	Not specified	(Augustino & Gillah 2005)
	Markhamia obtusifolia (Baker) Sprague	Mubapa	Tree	Wild	Roots	Infertility; Menorrhagia	Decoction; oral	(Hedberg et al. 1982, Augustino et al. 2011)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
Boraginaceae	*Ehretia amoena* Klotzsch	Mkirika	Tree	Wild	Bark, Leaves, Roots	Menorrhagia; Polymenorrhoea	Decoction; oral	(Chhabra et al. 1987, Abdallah et al. 2007)
Burseraceae	*Commiphora africana* (A.Rich.) Engl.	Muntonto	Tree	Wild	Roots	Infertility; Menorrhagia; Dysmenorrhoea	Decoction; oral	(Chhabra et al. 1987, Augustino et al. 2011)
	Commiphora madagascariensis Jacq.	Mtonto	Tree	Wild	Root	Dysmenorrhoea; Menorrhagia	Infusion in cold water; oral	(Hedberg et al. 1982)
	Commiphora mollis (Oliv.) Engl.	Mponda	Tree	Wild	Roots	Infertility	Not specified	(Hilonga et al. 2019)
Cannaceae	*Canna indica* L.	Amarango/ Embakyo	Herb	Wild, Cultivated	Leaves	Infertility	Powdering, then soak in a cup of water and taken orally	(Moshi et al. 2012)
Celastraceae	*Elaeodendron buchananii* (Loes.) Loes.	Mnenekanda	Tree	Wild	Roots	Infertility; Menorrhagia	Decoction; oral	(Chhabra et al. 1989)
	Elaeodendron schlechterianum (Loes.) Loes.	Chihusilo Ngakama	Tree	Wild	Root	Infertility, Dysmenorrhoea	Decoction; oral	(Maregesi et al. 2007)
	Elaeodendron schweinfurthianum (Loes.) Loes.	Mnenekanda	Tree	Wild	Bark	Menorrhagia	Powdered Bark mixed with water then taken orally	(Chhabra et al. 1989)
	Gymnosporia putterlickioides Loes.	Mtuvalavuha	Shrub	Wild	Roots	Dysmenorrhoea	Decoction; oral	(Hedberg et al. 1982)
	Gymnosporia senegalensis (Lam.) Loes.	Mwezya	Shrub	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Salacia bussei Loes.	Mbwiki	Shrub	Wild	Roots	Menorrhagia	Decoction of roots mixed with *Zea mays* L. seeds and consumed orally	(Augustino et al. 2011)
	Salacia madagascariensis (Lam.) DC.	Mshakii	Shrub	Wild	Roots	Menorrhagia	Boiling roots mixed with *Zea mays* L. seeds and consumed orally	(Chhabra et al. 1989)
Chrysobalanaceae	*Parinari curatellifolia* Planch ex. Benth.	Mumbula	Tree	Wild, Cultivated	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
Combretaceae	*Combretum apiculatum* Sond.	Mlamadori	Tree	Wild	Root	Menorrhagia	Decoction; oral	(Abdallah et al. 2007)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
	Combretum posoniiflorum (Klotzsch.) Engl.	Mlama	Tree	Wild	Leave, Roots	Infertility	MoP not specified; oral	(Augustino & Gillah 2005, Kacholi 2020)
	Combretum obovatum F.Hoffm	Vugoweko	Tree	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Combretum exalatum Engl.	Mwelekela	Tree	Wild	Root	Menorrhagia	Infusion; oral	(Hedberg et al. 1982)
	Combretum zeyheri Sond.	Musana	Tree	Wild	Roots, Leaves, Bark	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Terminalia myrtifolia (M.A.Lawson) Gere & Boatwr.	Mgonji	Tree	Wild	Root	Infertility; Menorrhagia	Decoction; oral	(Hedberg et al. 1983b, Chhabra et al. 1993)
	Terminalia sambesiaca Engl. & Diels.	Mpululu	Tree	Wild	Roots	Infertility	Not specified	(Augustino & Gillah 2005, Kacholi 2013, 2014)
Connaraceae	*Agelaea pentagyna* (Lam.) Baill.	Mlungamo	Climber	Wild	Roots	Infertility	Decoction; oral	(Shangali et al. 2008)
Cucurbitaceae	*Cucurbita maxima* Duchesne	Mwongu/boga	Herb	Cultivated	Fruit	Menorrhagia	The fruit is baked under ashes and squeezed into the vagina.	(Moshi et al. 2012)
	Momordica charantia L.	Zukini	Climber	Wild, Cultivated	Leaves	Menorrhagia	Decoction; oral	(Abdallah et al. 2007)
Dilleniaceae	*Tetracera boiviniana* Baill.	Mpinga	Shrub	Wild	Leaves	Menorrhagia	Infusion; oral	(Chhabra et al. 1989)
Ebenaceae	*Euclea divinorum* Hiern	Mdaa	Shrub	Wild	Roots, Leaves	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Euclea natalensis A.DC.	Mlamamwitu	Tree	Wild	Leaves	Dysmenorrhoea	Infusion; oral	(Chhabra et al. 1989)
	Euclea racemosa L.	Mdala	Tree	Wild	Roots	Dysmenorrhoea	Powdered roots mixed with porridge and taken orally	(Chhabra et al. 1989)
Euphorbiaceae	*Euphorbia candelabrum* Welw.	Ganga	Tree	Wild, Cultivated	Roots	Infertility	Roots boiled with chicken meat and then taken orally	(Hedberg et al. 1983b)
	Euphorbia hirta L.	Vakikulu	Herb	Wild	Leaves	Dysmenorrhea	MoP not specified; oral	(Augustino et al. 2011)
	Premna senensis Klotzsch	Mununhwanhala	Shrub	Wild	Roots, Leaves	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Ricinus communis L.	Mbono	Shrub	Wild, Cultivated	Seeds	Infertility	Crushing seeds to make oil, add oil to porridge,	(Chhabra et al. 1990a)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
							and consume the mixture orally	
Fabaceae	*Albizia anthelmintica* (A.Rich.) Brongn.	Mfuleta	Shrub	Wild	Roots	Infertility	Decoction; oral	(Chhabra et al. 1990b, Augustino & Gillah 2005)
	Albizia harveyi E. Fourn.	Mhonya	Shrub	Wild	Roots	Infertility	Infusion; oral	(Chhabra et al. 1990b)
	Brachystegia spiciformis Benth.	Myombo	Tree	Wild	Bark	Menorrhagia	Decoction; oral	(Augustino et al. 2011)
	Cajanus cajan (L.) Huth	Mbaazi	Shrub	Cultivated	Roots, Leaves, Seeds	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Cassia abbreviata Oliv.	Munzoka	Tree	Wild	Roots, Leaves, Bark	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Cassia burttii Baker f.	Mkwizingi	Shrub	Wild	Roots	Amenorrhoea	Powdered roots and decoction are added to porridge and consumed orally	(Chhabra et al. 1987)
	Senna occidentalis (L.) Link	Mkundekunde	Shrub	Wild, Cultivated	Roots	Menorrhagia	Decoction; oral	(Chhabra et al. 1990b)
	Dalbergia melanoxylon Guill. & Perr.	Mpingo	Tree	Wild	Roots	Infertility	Not specified	(Augustino et al. 2011)
	Alantsirodendron pilosum Villiers	Mutundulu	Shrub	Wild, Cultivated	Roots, Leaves, Bark	Infertility; Menorrhagia	Decoction; oral	(Chhabra et al. 1990b, Augustino & Gillah 2005, Augustino et al. 2011)
	Dolichos oliveri Schweinf.	Kafulofulo	Herb	Wild	Roots	Infertility	Decoction; oral	(Augustino et al. 2011)
	Entada abyssinica Steud. ex A.Rich.	Mufutwambula	Tree	Wild	Roots, Leaves, Bark	Infertility, Menorrhagia	Decoction; oral	(Chhabra et al. 1990b, Augustino et al. 2011)
	Feidherbia albida (Delile) A.Chev.	Mpogolo	Tree	Wild, Cultivated	Roots	Infertility	Not specified	(Augustino & Gillah 2005)
	Julbernardia globiflora (Benth.) Troupin	Kilepori	Tree	Wild, Cultivated	Roots	Infertility	Not specified	(Hilonga et al. 2019)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
	Philenoptera bussei (Harms) Schrire	Muwale	Tree	Wild	Root	Infertility, Menorrhagia	Decoction; oral	(Hedberg et al. 1983a, Chhabra et al. 1990b)
	Piliostigma thonningii (Schumach.) Milne-Redh.	Msegese	Tree	Wild	Roots	Infertility; Menorrhagia	Decoction; oral	(Chhabra et al. 1987, Abdallah et al. 2007)
	Pterocarpus angolensis DC.	Mninga	Tree	Wild	Root	Infertility	Not specified	(Augustino & Gillah 2005)
	Senegalia brevispica (Harms) Siegler & Ebinger	Mdunga	Tree	Wild	Root	Menorrhagia	Decoction; oral	(Abdallah et al. 2007)
	Senegalia mellifera (Vahl) Siegler & Ebinger	Mulugala	Tree	Wild	Roots, Leaves, Bark	Amenorrhoea; Infertility	Decoction; oral	(Hedberg et al. 1983a, Chhabra et al. 1990b, Augustino et al. 2011)
	Senegalia nigrescens (Oliv.) P.J.H. Hurter	Kagowole	Tree	Wild	Roots	Infertility	MoP not Specified; oral	(Augustino et al. 2011)
	Senegalia pentagona (Schumach.) Hook. f.	Magowela	Tree	Wild	Roots	Amenorrhoea	Decoction; oral	(Chhabra et al. 1990b)
	Senegalia polyacantha (Schumach.) Kayl. & Boatwr.	Muwindi	Shrub	Wild	Roots	Infertility	Not specified	(Augustino & Gillah 2005)
	Tamarindus indica L.	Mkwaju	Tree	Wild, Cultivated	Roots	Infertility	Decoction; oral	(Hedberg et al. 1982, Abdallah et al. 2007)
	Vachelia tortilis (Forssk.) Galasso & Banfi	Mgunga	Tree	Wild	Roots	Infertility	Not specified	(Augustino & Gillah 2005)
	Vachellia robusta (Burch.) Kayl. & Boatwr.	Mkongowe	Shrub	Wild, Cultivated	Roots	Dysmenorrhoea	Decoction; oral	(Chhabra et al. 1990b)
Hypericaceae	*Harungana madagascariensis* Lam. ex Poir.	Mvavata	Shrub	Wild	Roots	Infertility	Decoction; oral	(Shangali et al. 2008)
Lamiaceae	*Coleus barbatus* (Andrews) Benth. ex G.Don	Mzungh'va	Shrub	Wild	Roots	Infertility	Decoction; oral	(Hedberg et al. 1983a)
	Hoslundia opposita Vahl	Mvulavula	Shrub	Wild, Cultivated	Roots	Dysmenorrhoea ; Menorrhagia	Decoction; oral	(Chhabra et al. 1990a, Moshi et al. 2010)
	Mesosphaerum pectinatum (L.) Kuntze	Hozandongole	Herb	Wild	Leaves	Menorrhagia	Decoction; oral	(Chhabra et al. 1990a)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
	Leonotis ocymifolia (Burm.f.) Iwarsson	Iriro	Shrub	Wild	Roots	Infertility	Decoction; oral	(Hedberg et al. 1983a)
	Ocimum suave Willd.	Mlwenyi	Herb	Wild	Roots	Dysmenorrhea	Decoction; oral	(Kitula 2007)
	Orthosiphon thymiflorus (Roth) Sleesen	Olemorani	Herb	Wild	Leaves	Infertility	Not specified	(Hilonga et al. 2019)
	Plectranthus kilimandschari (Gurke) H.I.Maass	Makoroma	Herb	Wild	Leaves	Dysmenorrhea	Infusion; oral	(Maregesi et al. 2007)
	Vitex mombassae Vatke	Sungwi	Tree	Wild, Cultivated	Roots	Infertility	MoP not specified; oral	(Augustino & Gillah 2005, Augustino et al. 2011)
Lauraceae	*Kuloa usambarensis* (Engl.) Trofimov & Rohwer	Mseri	Tree	Wild, Cultivated	Bark	Infertility	Not specified	(Augustino & Gillah 2005, Kacholi 2013, 2014)
Loganiaceae	*Strychnos innocua* Delile	Mumundu	Tree	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Strychnos usambarensis Gilg ex Engl.	Mwage	Tree	Wild	Roots	Infertility	Decoction; oral	(Chhabra et al. 1990a)
	Strychnos potatorum L.f.	Mugwegwe	Tree	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Strychnos spinosa Lam.	Mtogo	Tree	Wild	Roots, Leaves, Bark	Infertility	MoP not specified; oral	(Augustino et al. 2011)
Malvaceae	*Adansonia digitata* L.	Mbuyu	Tree	Wild, Cultivated	Fruits, Roots	Menorrhagia; Amenorrhoea	Not specified Decoction of roots taken orally	(Augustino & Gillah 2005)
	Dombeya shupangae K.Schum.	Mhati	Tree	Wild	Roots	Amenorrhoea	Decoction; oral	(Hedberg et al. 1983b)
	Dombeya acutangula Cav.	Mnwati, Msosowawana	Tree	Wild	Roots	Infertility; Dysmenorrhoea	Decoction; oral	(Hedberg et al. 1983b, Chhabra et al. 1993)
	Grewia bicolor Juss.	Olesiteti	Tree	Wild	Roots	Infertility, Amenorrhoea	MoP not specified; oral	(Augustino & Gillah 2005, Augustino et al. 2011)
	Grewia similis K.Schum.	Mkole	Shrub	Wild	Roots	Dysmenorrhoea	Decoction; oral	(Abdallah et al. 2007)
	Microcos conocarpoides (Burret) Burret	Mudati	Tree	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
	Sterculia africana (Lour.) Fiori	Muhozya	Tree	Wild	Roots, Bark	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Thespesia danis Oliv.	Mmoyomoyo	Tree	Wild, Cultivated	Roots	Infertility; Menorrhagia	Decoction; oral	(Abdallah et al. 2007)
	Triumfetta rhomboidea Jacq.	Mfungang'ombe	Herb	Wild, Cultivated	Root	Amenorrhoea	Decoction; oral	(Chhabra et al. 1993)
Meliaceae	*Cedrela odorata* L.	Mwerezi	Tree	Wild, Cultivated	Leaves, Bark	Amenorrhoea; Infertility	Infusion; oral	(Amri & Kisangau 2012)
	Turraea fischeri Gürke	Muningiwe	Tree	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Turraea nilotica Kotschy et Peyr.	Mdyampofu	Tree	Wild	Roots	Infertility	Decoction; oral	(Chhabra et al. 1990a)
Menispermaceae	*Cissampelos pareira* L.	Chihoko-chandezi	Climber	Wild, Cultivated	Leaves	Menorrhagia	Crushing to make juice, then taken orally	(Chhabra et al. 1990a)
Moraceae	*Ficus sur* Forssk.	Msombe, Ng'aboli	Tree	Wild	Roots	Infertility	Not specified	(Augustino & Gillah 2005, Hilonga et al. 2019)
	Ficus sycomorus L.	Mkuyu	Tree	Wild	Bark	Infertility	Infusion; oral	(Amri & Kisangau 2012)
Ochnaceae	*Brackenridgea zanguebarica* Oliv.	Mkatakwa	Tree	Wild	Roots	Amenorrhoea; Dysmenorrhoea	Decoction; oral	(Chhabra et al. 1990b)
Olacaceae	*Strombosia Scheffleri* Engl.	Mkongotsa	Tree	Wild	Roots	Infertility	Decoction; oral	(Shangali et al. 2008)
	Ximenia caffra Sond.	Mpingi	Tree	Wild	Roots	Infertility; Dysmenorrhoea	Decoction; oral	(Hedberg et al. 1983a, Chhabra et al. 1990b, Augustino & Gillah 2005)
Oleaceae	*Jasminum fluminense* Vell.	Binyafwira, Chingula	Climber	Wild	Leaves, Roots	Infertility	Infusion; oral	(Maregesi et al. 2007, Shangali et al. 2008, Hilonga et al. 2019)
Passifloraceae	*Adenia racemosa* W.J.de Wilde	Mgole	Climber	Wild	Bark	Menorrhagia	Decoction; oral	(Chhabra et al. 1991)
Phyllanthaceae	*Antidesma venosum* Tul.	Mjembajemba	Shrub	Wild	Root	Dysmenorrhoea	Decoction; oral	(Hedberg et al. 1983a, Chhabra et al. 1993)
	Bridelia brideliifolia (Pax) Fedde	Kihambawali	Shrub	Wild	Roots	Infertility	Roots cooked with chicken mean and soup taken orally	(Chhabra et al. 1990a)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
	Bridelia cathartica Bertol	Mkarati	Shrub	Wild	Roots, Bark	Infertility, Menorrhagia	Not specified	(Augustino & Gillah 2005)
	Bridelia micrantha (Hochst.) Baill.	Mshamako	Tree	Wild	Root	Amenorrhoea; Dysmenorrhea	Decoction; oral	(Moshi et al. 2012)
	Flueggea virosa (Roxb. ex Willd.) Royle	Mkwambe	Tree	Wild, Cultivated	Roots	Infertility; Dysmenorrhoea	Decoction; oral	(Chhabra et al. 1990a)
	Hymenocardia acida Tul.	Mupala	Shrub	Wild	Roots, Leaves	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Margaritaria discoidea (Baill.) G.L.Webster	Kasenga	Tree	Wild, Cultivated	Roots, Bark	Infertility	Decoction of roots taken orally. The bark ash mixed with indigenous salt and palm oil is swallowed to relieve amenorrhoea.	(Hedberg et al. 1983a, Augustino et al. 2011)
	Phyllanthus reticulatus Poir.	Mzizima	Shrub	Wild	Roots	Dysmenorrhoea ; Menorrhagia	Decoction; oral	(Hedberg et al. 1983a, Chhabra et al. 1990a)
	Pseudolachnostylis maprouneifolia Pax	Mutungulu	Tree	Wild	Roots	Infertility; Menorrhagia	Decoction; oral	(Chhabra et al. 1990a, Abdallah et al. 2007)
Picrodendraceae	*Oldfieldia dactylophylla* (Welw. ex Oliv.) J.Léonard	Muliwanfwengi	Tree	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
Poaceae	*Cenchrus purpureus* (Schumach.) Morrone	Ibingobingo	Grasses	Wild, Cultivated	Whole plant	Infertility	MoP not specified; oral	(Augustino et al. 2011)
Polygalaceae	*Securidaca longepedunculata* Fresen.	Mnengonengo	Tree	Wild, Cultivated	Roots	Infertility; Dysmenorrhoea	Decoction; oral	(Hedberg et al. 1983a, Augustino & Gillah 2005, Augustino et al. 2011)
Primulaceae	*Embelia schimperi* Vatke	Mnyainyai	Tree	Wild	Leaves, Roots	Dysmenorrhoea	Chewing leaves and decoction of roots taken orally	(Kitula 2007)
	Maesa lanceolate Forssk.	Mguti	Shrub	Wild	Roots	Infertility	Not specified	(Augustino & Gillah 2005, Shangali et al. 2008)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
Rhamnaceae	*Frangula mucronata* (Schltdl.) Grubov.	Kihanga	Tree	Wild	Root	Infertility	Decoction; oral	(Kitula 2007)
Rosaceae	*Rubus pinnatus* Willd.	Lufifi	Climber	Wild	Leaves	Amenorrhoea	Infusion; oral	(Amri & Kisangau 2012)
	Hagenia abyssinica (Bruce) J.F.Gmel.	Mluziluzi	Tree	Wild, Cultivated	Root	Infertility	Not specified	(Augustino et al. 2011)
Rubiaceae	*Catunaregam spinosa* (Thunb.) Tirveng	Mupogole	Shrub	Wild	Roots, Bark	Infertility Menorrhagia	Infusion; oral Decoction; oral	(Chhabra et al. 1991, Augustino et al. 2011)
	Crossopteryx febrifuga (Afzel. ex G.Don) Benth.	Kumbwambizo, Mhotaponzi	Tree	Wild, Cultivated	Roots	Infertility	Decoction; oral	(Augustino & Gillah 2005, Maregesi et al. 2007)
	Fadogia cienkowskii Schweinf.	Kambolambola	Shrub	Wild, Cultivated	Roots	Infertility	MoP not specified; oral	(Ruffo 1991)
	Hymenodictyon parvifolium Oliv.	Muginya, Mujunguluji	Tree	Wild	Roots	Dysmenorrhoea	Decoction; oral	(Ruffo 1991)
	Multidentia crassa (Hiern) Bridson & Verdc.	Muyogoyogo	Tree	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Oxyanthus goetzei K.Schum.	Mpwaga	Shrub	Wild	Roots	Infertility	Decoction; oral	(Shangali et al. 2008)
	Rubia cordifolia L.	Karamata	Herb	Wild	Whole plant	Amenorrhoea	Decoction; oral	(Moshi et al. 2010)
	Rothmannia engleriana (K.Schum.) Keay	Mukondokondo	Tree	Wild	Roots, Leaves, Bark	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Rytigynia decussata (K.Schum.) Robyns	Matapulo	Shrub	Wild	Root	Menorrhagia	Decoction; oral	(Chhabra et al. 1991)
	Vangueria cinerascens (Welw. ex Hiern) Lantz	Kambolambola	Herb	Wild	Roots	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Tarenna littoralis Merr.	Mchokowejini	Shrub	Wild	Roots	Amenorrhoea	Decoction; oral	(Chhabra et al. 1991)
	Vangueria infausta Burch.	Mzambarau	Tree	Wild, Cultivated	Root, Bark, Seeds	Infertility, Amenorrhoea, Menorrhagia	Infusion: oral	(Augustino & Gillah 2005, Amri & Kisangau 2012)
Rutaceae	*Clausena anisata* (Willd.) Hook.f. ex Benth.	Mjavikali	Tree	Wild	Roots	Menorrhagia	Decoction; oral	(Chhabra et al. 1991)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
	Harrisonia abyssinica Oliv.	Mkusu, Mkunzu	Shrub	Wild	Roots	Menorrhagia; Dysmenorrhoea	Decoction; oral	(Hedberg et al. 1983b, Chhabra et al. 1993)
	Toddalia asiatica (L.) Lam.	Mtanula	Shrub	Wild	Roots	Infertility	Decoction; oral	(Shangali et al. 2008)
	Vepris glomerata (F. Hoffm.) Engl.	Mulungusigiti	Tree	Wild	Roots, Leaves	Infertility	MoP not specified; oral	(Augustino et al. 2011)
	Zanthoxylum chalybeum Engl.	Oloisuki, Mkunungu	Tree	Wild	Roots, Bark	Dysmenorrhoea	Decoction; oral	(Chhabra et al. 1991, Augustino et al. 2011, Mbinile et al. 2020)
Salicaceae	*Casearia gladiiformis* Mast.	Mlelulelu	Tree	Wild	Root	Infertility	Decoction; oral	(Kitula 2007)
	Flacourtia indica (Burm.f.) Merr.	Mupugusura	Shrub	Wild, Cultivated	Roots	Infertility	MoP not specified; oral	(Augustino & Gillah 2005)
	Scolopia stolzii Gilg	Mgogola	Tree	Wild	Root	Infertility	Decoction; oral	(Kitula 2007)
	Trimeria grandifolia (Hochst.) Warb.	Mdagha	Shrub	Wild	Roots	Dysmenorrhoea	Decoction; oral	(Hedberg et al. 1983a)
Sapindaceae	*Allophylus rubifolius* (Hochst. ex A. Rich.) Engl.	Mwanga	Shrub	Wild	Roots	Menorrhagia	Decoction; oral	(Chhabra et al. 1991)
	Blighia unijugata Baker	Kindamo	Tree	Wild, Cultivated	Roots, Leaves	Amenorrhoea	Decoction; oral	(Chhabra et al. 1991)
	Deinbollia borbonica Scheff.	Mmoyomoyo	Tree	Wild	Roots	Infertility	Decoction; oral	(Kideghesho & Msuya 2010)
	Zanha africana (Radlk.) Exell	Mkalya	Tree	Wild, Cultivated	Roots	Dysmenorrhoea	Decoction; oral	(Augustino & Gillah 2005, Kitula 2007)
	Zanha golungensis Hiern	Mhomavikali	Tree	Wild	Roots	Amenorrhoea	Decoction; oral	(Chhabra et al. 1991)
Sapotaceae	*Manilkara sansibarensis* (Engl.) Dubard	Mwongala	Tree	Wild, Cultivated	Roots	Infertility	Decoction; oral	(Chhabra et al. 1993)
Smilacaceae	*Smilax anceps* Willd.	Rumatwa	Shrub	Wild	Root	Infertility	Decoction; oral	(Chhabra et al. 1993)
Stilbaceae	*Nuxia floribunda* Benth.	Mngogo	Tree	Wild, Cultivated	Root	Amenorrhoea	Decoction; oral	(Kitula 2007)
Verbenaceae	*Baccharoides lasiopus* (O.Hoffm.) H.Rob.	Mhasha	Shrub	Wild	Roots	Infertility; Menorrhagia	Decoction of roots mixed with roots of other plants such as *Securinega uirosu* (Roxb. ex Willd.) Pax & K.	(Hedberg et al. 1983b)

Family Name	Species Name	Local Name	Life form	Source	Parts used	Disorder type	MoP & RoA	References
							Hoffm. and/or *Trimera grandiflora* (Hochst.) Warb. taken orally	
	Lantana camara L.	Mkinda	Shrub	Cultivated	Root	Menorrhagia,	Decoction; oral	(Chhabra et al. 1993)
Vitaceae	*Ampelocissus africana* (Lour.) Merr.	Tongotongo	Climber	Wild, Cultivated	Roots	Menorrhagia.	Decoction of roots mixed with those of *Maytenus senegalensis* roots (Lam.) then taken orally	(Chhabra et al. 1993)
	Cissus rotundifolia Lam.	Mkilua	Tree	Wild	Roots	Infertility; Menorrhagia	Decoction; oral	(Abdallah et al. 2007)
	Cyphostemma paucidentatum (Klotzsch) Desc. ex Wild & R.B.Drumm.	Mwengele	Herb	Wild	Roots	Infertility; Menorrhagia	Decoction; oral. Infusion; oral	(Abdallah et al. 2007)
	Rhoicissus revoilii Planch.	Ilyungulyungu	Tree	Wild	Roots	Infertility	Decoction; oral	(Abdallah et al. 2007)
Zygophyllaceae	*Balanites aegyptiaca* (L.) Delile	Olng'oswai	Tree	Wild, Cultivated	Roots	Amenorrhoea	MoP not specified; oral	(Augustino et al. 2011)

Note: MoP - Modes of Preparation, RoA - Routes of Administration

Life forms and sources of medicinal plants

Medicinal plants documented in this review were mainly trees (55.8%), followed by shrubs (29.7%). Other life forms include herbs (9.3%), climbers (4.7%), and grasses (0.6%), which constitute a small proportion (Figure 4). However, this finding is unsurprising as trees and shrubs are predominant components of local flora distributed nationwide. Also, they have parts readily available throughout the year, as opposed to herbs, which are unavailable throughout the year. According to (Balamurugan *et al.* 2018, Semenya & Maroyi 2018, Shankar *et al.* 2012), the more familiar the life form is, the greater the likelihood of its use. Thus, the local community, especially the traditional healers, prefer the life forms mentioned earlier due to their natural availability, accessibility, and familiarity within their localities (Semenya & Maroyi 2018, Shukla *et al.* 2018). Moreover, cultural influence plays a significant role in choosing medicinal plants (de Wet & Ngubane 2014). Most recorded MPs (81%) in this review are collected from wild environments, while the remaining 19% are obtained from cultivated ecosystems.

The Most reviewed studies revealed that information sources on MPs' use emanate from traditional healers, herbalists, family members, ancestral inheritance, doctor-patient communication, and self-survey. However, traditional healers are reported to play an essential role in the spread and utility of MPs in managing gynaecological disorders among young rural women. They can categorise MPs and recall their functions, benefits, and methods of disorders management. Moreover, traditional healers are vital in transferring knowledge from generation to generation.

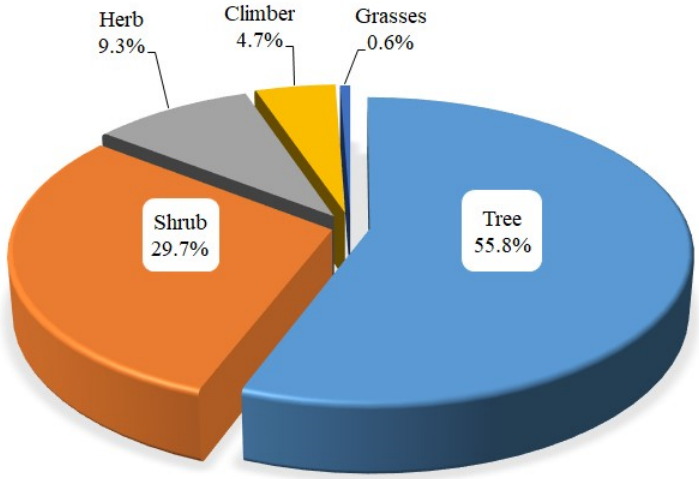

Figure 4. Life forms of medicinal plants used for herbal remedies formulation

Plant parts used

The majority of the herbal formulations used to manage infertility and menstrual disorders are prepared from roots (70%), followed by leaves (15%) and bark (11%), whereas fruits (2%), seeds (1%) and whole plant (1%) are rarely used (Figure 5). Similarly, roots have been reported to be the dominant plant part used for treating gynaecological disorders in South Africa (Steenkamp 2003), and India (Shukla *et al.* 2018, Surendran *et al.* 2023). Also, the study on the comparative use of herbal medicines for treating various women's menstrual disorders in different areas of the globe reported roots and leaves as the most utilised plant organs (Jiao *et al.* 2022). Besides, it has been scientifically proven that plant roots are rich in potent bioactive ingredients (Balakrishnan *et al.* 2020, He *et al.* 2010, Wei *et al.* 2016). However, the extensive exploitation of roots should be done cautiously as it can jeopardize the medicinal plant's survival, particularly rare species, and slowly reproducing MPs (Lulekal *et al.* 2013, Siddique *et al.* 2021). For instance, *Zanthoxylum chalybeum* Engl. (Rutaceae) has been reported to be threatened due to improper harvesting techniques (Shukla *et al.* 2018). Thus, appropriate harvesting strategies and conservation measures are inexorable if sustainable exploitation of medicinal plants is to be realized. The use of leaves can be promoted as a good strategy and a more sustainable technique since, in most cases, at least some leaves are left over on the parent plant, allowing them to carry on plant life functions.

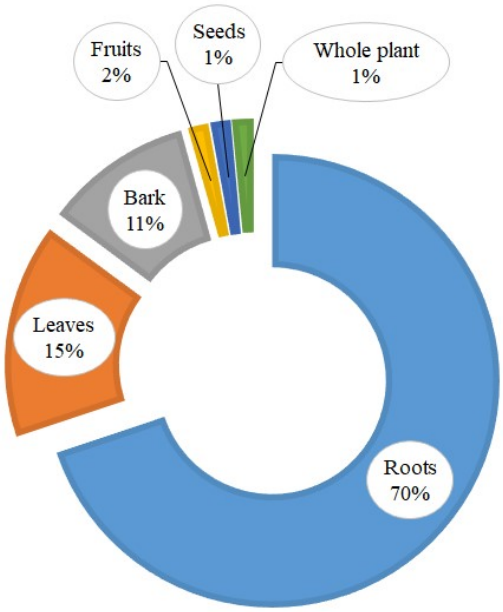

Figure 5. The percentage share of plant parts used for the formulation of remedies

Methods of preparation and route of administration

Most studies show that herbal remedies for managing female infertility and menstrual disorders are prepared through decoction (76%) and infusion (11%). Other preparation methods were rarely reported (Figure 6). Similar to this study finding, the decoction method is regularly reported in various ethnomedicinal studies conducted in Africa (Balamurugan *et al.* 2018, Mashile *et al.* 2019, de Wet Ngubane 2014) and other parts of the globe (Chen *et al.* 2014, Coe 2008, Jiao *et al.* 2022), focusing on gynaecological disorders. The high usage of the decoction method could be due to the simplicity of preparations. Moreover, the decoctions are absorbed quickly and have the most substantial actions of all traditional types of practice (Yang & Ross 2010).

Also, it is worth noting that most MPs (89.2%) are singly used to treat the disorders, while the rest are either mixed with porridge, cooked with chicken meat, or combined with other MPs. For instance, the leaves of *T. alata* are cooked mixed with the leaves of *Curcubita maxima* L. (Curcubitaceae) and eaten to treat menorrhagia. The roots of *Salacia bussei* Loes. (Celastraceae) and *Salacia madagascariensis* (Lam.) DC. (Celastraceae) are mixed with *Zea mays* L. (Poaceae) seeds, then boiled, and decoction is orally taken to manage menorrhagia. Also, the roots of *Searsia natalensis* (Bernh ex. C.Krauss) F.A.Barkley (Anacardiaceae), *Bridelia brideliifolia* (Pax) Fedde (Phyllanthaceae), and *Euphorbia candelabrum* Tremaux (Euphorbiaceae) are usually boiled with chicken meat and consumed orally to treat infertility, while seeds of *R. communis* and roots of *Cassia burttii* Baker f. (Fabaceae) are usually powdered and added to porridge to treat infertility and amenorrhoea, respectively.

The oral route administration (98%) appears to be the dominant pathway of administering remedies for gynaecological disorders. A similar finding on the mode of administration of herbal remedies for gynaecological disorders has been reported in India (Shukla *et al.* 2018, Surendran *et al.* 2023), Jordan (Akour *et al.* 2016), and Nigeria (Ogunlakina & Sonibare 2020).

Pharmacological evidence against infertility and menstrual disorders

The phytochemical analysis of some MPs used for managing female reproductive health disorders from various studies documented numerous bioactive compounds that provide pharmacological evidence against the complaint. For example, *Bridelia* species possess quercetin, myricetin glycosides, bridelonine, and isoflavone, which justify their use against abdominal pain and gynaecological problems (Ngueyem *et al.* 2009). Also, Anthocyanins, flavonoids, and tannins present in *B. cathartica* have been reported to influence fertility and sexual development (Ly *et al.* 2015, Sieniawska 2015). Moreover, dopaminergic compounds possessed by *Vitex* species from the family Lamiaceae are reported to treat premenstrual syndrome symptoms (Kamal *et al.* 2022). Extracts from *Euphorbia hirta* L. (Euphorbiaceae), *X. caffra,* and *Ampelocissus africana* (Lour.) Merr. (Vitaceae) were also reported to possess tannins, flavonoids, and phenols, which are helpful in the management of infertility and menorrhagia (Maroyi 2016, Promprom & Chatan 2018).

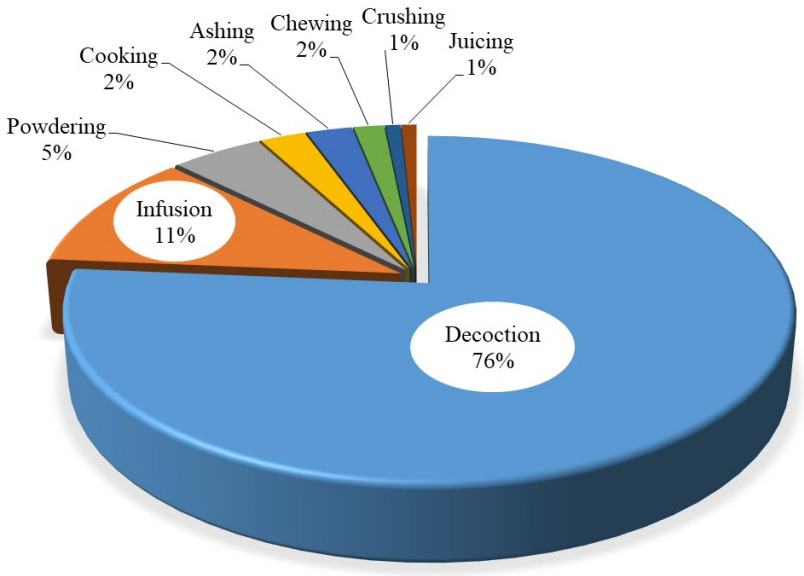

Figure 6. Methods of preparing herbal remedies

Moreover, high phenols and flavonoid levels have been isolated from *Balanities aegyptiaca* (L.) Del. (Zygophyllaceae) (Faten *et al.* 2015). Other species reported in this review, such as *Cissampelos pareira* L. (Menispermaceae), possess quercetin-3-O-sophoroside bioactive compound, which has been described to increase the expression of follicle-stimulating hormone (FSH) that enhances the maturation of oocyte and ovulation (Cao *et al.* 2020, da Silva Mendes *et al.* 2020). In other studies, some phytochemical compounds such as phenolic acids, flavonoids, and quercetin, which demonstrated phytochemical activities against infertility and menstrual disorders symptoms, have been reported to be present in *M. indica, T. alata,* and *Hygrophila auriculata* (Schum.) Heine (Acanthaceae) (Jhaumeer Laulloo *et al.* 2018, Rao & Kumar 2017). Generally, several plants reported in this review possess different phytochemicals, such as tannins and flavonoids, which demonstrated potent effects on female reproductive disorders. However, most reported MPs have limited or no information on phytochemical compounds and pharmacological activities against female fertility and menstrual disorders. Hence, further investigation of bioactive ingredients and their pharmacological activities is paramount for the potential development of modern drugs.

Need for conservation of ethnomedicinal knowledge

Globally, the consumption of MPs is increasing at an alarming rate, posing an extinction risk to their existence (Ssenku *et al.* 2022). About 15,000 MPs worldwide are estimated to be at risk of extinction due to high demand and other factors such as climate change (Phondani *et al.* 2016). Hence, conserving the MPs is paramount. Additionally, it is high time to consider preserving the indigenous culture and their ethnomedicinal knowledge of MPs. This is because the tradition of using plant-based medicine is orally transferred from generation to generation, and thus, it may get lost if not well documented and conserved (Chen *et al.* 2014, Kibonde 2020). In recent years, the younger generation has shown disinterest in their traditional culture, customs, and values as they leave their origin places for higher education studies and employment. In this way, they are now ignoring and moving away from conventional herbal health systems and are focusing more on modern lifestyles (Jima & Megersa 2018, Kacholi & Amir 2022, Tahir *et al.* 2021). The inhabitants' changing lifestyles and socio-economic scenarios make them hesitant to live with their traditional ancestry, leading to knowledge fading (Siddique *et al.* 2021, Vineeta *et al.* 2022). Younger generations in urban areas rely more on modern medications than herbal remedies, as they are easy to get and use. Also, agricultural expansion in most rural areas has become a significant threat to MPs as most wild environments, particularly forests, have been encroached on and cleared to establish farms (Jima & Megersa 2018, Kacholi & Amir 2022). Thus, proper documentation is indispensable for conserving indigenous knowledge of traditional medicines. Therefore, as part of protecting and preserving traditional knowledge, this review provides baseline data to enable pharmacological studies to ascertain contemporary drugs for treating gynaecological disorders.

Conclusion

For the first time, this review provides a compiled list of MPs used for treating infertility and menstrual disorders across Tanzania communities. The work presents rich Tanzanians' traditional knowledge of using MPs for gynaecological disorders. Interestingly, some of the conventional remedies highlighted in this review have been used elsewhere for treating the same gynaecological disorders, and few have been scientifically confirmed to have pharmacological activities against the disorders.

At the same time, many await verification, though there is very little information on the bioactivities of several of them. Thus, there is a need to carry out the biological activities of many of these MPs to search for bioactive compounds and conduct toxicity studies to understand the adverse side effects of these remedies. Generally, this review offers baseline information necessary for conserving the traditional knowledge that has not been adequately explored and documented in the communities and conserving the MPs. Similarly, the data inform people working in these areas on gynaecological medication and provide insight for developing modern drugs.

Declarations

List of abbreviations: MPs - Medicinal plants
Ethical approval and consent to participate*:* None because this is a review article.
Consent for publication*:* Not applicable
Availability of data and materials: Not applicable
Disclosure statement: The authors declare that there are no conflicts of interest.
Funding: No funds were received for this review.
Author's contributions: DSK, OJK, HMA, and NGM conceptualized, designed the review strategy, and wrote and approved the final version of the manuscript.

Acknowledgements

The authors acknowledge positive criticisms from various reviewers who made this article a reality.

Literature cited

Abdallah RK, Hamza KFS, Mwamakimbullah RJL. 2007. Use of medicinal plants for maternal care in villages around Zaraninge forest reserve in Bagamoyo, Tanzania. Journal of Tanzania Association of Foresters 11:180-191.

Abdillahi H, Van Staden J. 2013. Application of medicinal plants in maternal healthcare and infertility: a South African perspective. Planta Medica 79:591-599.

Abrao MS, Muzii L, Marana R. 2013. Anatomical causes of female infertility and their management. International Journal of Gynecology and Obstetrics 123:S18-S24.

Afrin S, AlAshqar A, El Sabeh M, Miyashita-Ishiwata M, Reschke L, Brennan JT, Fader A, Borahay MA. 2021. Diet and nutrition in gynecological disorders: a focus on clinical studies. Nutrients 13:1747.

Ajao AA, Mukaila YO, Sabiu S. 2022. Wandering through southwestern Nigeria: an inventory of Yoruba useful angiosperm plants. Heliyon 8:e08668.

Akbaribazm M, Goodarzi N, Rahimi M. 2021. Female infertility and herbal medicine: an overview of the new findings. Food Science and Nutrition 9:5869-5882.

Akour A, Kasabri V, Afifi FU, Bulatova N. 2016. The use of medicinal herbs in gynecological and pregnancy-related disorders by Jordanian women: a review of folkloric practice vs evidence-based pharmacology. Pharmaceutical Biology 54:1901-1918.

Amri E, Kisangau DP. 2012. Ethnomedicinal study of plants used in villages around Kimboza forest reserve in Morogoro, Tanzania. Journal of Ethnobiology Ethnomedicine 8:1.

Augustino S, Gillah PR. 2005. Medicinal plants in urban districts of Tanzania: plants, gender roles and sustainable use. International Forestry Review 7:44-58.

Augustino S, Hall JB, Makonda FBS, Ishengoma RC. 2011. Medicinal resources of the miombo woodlands of Urumwa, Tanzania: plants and its uses. Journal of Medicinal Plants Research 5:6352-6372.

Balamurugan S, Vijayakumar S, Prabhu S, Morvin Yabesh JE. 2018. Traditional plants used for the treatment of gynaecological disorders in Vedaranyam taluk, South India: an ethnomedicinal survey. Journal of Traditional and Complementary Medicine 8:308-323.

Cao Y, Zhao H, Wang Z, Zhang C, Bian Y, Liu X, Zhang C, Zhang X, Zhao Y. 2020. Quercetin promotes in vitro maturation of oocytes from humans and aged mice. Cell Death and Disease 11:965.

Chen H-Y, Huang B-S, Lin Y-H, Su IH, Yang S-H, Chen J-L, Huang J-W, Chen Y-C. 2014. Identifying Chinese herbal medicine for premenstrual syndrome: implications from a nationwide database. BMC Complementary and Alternative Medicine 14:206.

Chhabra SC, Mahunnah BLA, Mshiu EN. 1987. Plants used in traditional medicine in eastern Tanzania. I. Pteridophytes and angiosperms (Acanthaceae to Canellaceae). Journal of Ethnopharmacology 21:253-277.

Chhabra SC, Mahunnah RLA, Mshiu EN. 1989. Plants used in traditional medicine in Eastern Tanzania. II. Angiosperms (Capparidaceae to Ebenaceae). Journal of Ethnopharmacology 25:339-359.

Chhabra SC, Mahunnah RLA, Mshiu EN. 1990a. Plants used in traditional medicine in Eastern Tanzania. IV. Angiosperms (Mimosaceae to Papilionaceae). Journal of Ethnopharmacology 29:295-323.

Chhabra SC, Mahunnah RLA, Mshiu EN. 1990b. Plants used in traditional medicine in Eastern Tanzania. III. Angiosperms (Euphorbiaceae to Menispermaceae). Journal of Ethnopharmacology 28:255-283.

Chhabra SC, Mahunnah RLA, Mshiu EN. 1991. Plants used in traditional medicine in eastern Tanzania. V. Angiosperms (Passifloraceae to Sapindaceae). Journal of Ethnopharmacology 33:143-157.

Chhabra SC, Mahunnah RLA, Mshiu EN. 1993. Plants used in traditional medicine in Eastern Tanzania. VI. Angiosperms (Sapotaceae to Zingiberaceae). Journal of Ethnopharmacology 39:83-103.

Ciebiera M, Esfandyari S, Siblini H, Prince L, Elkafas H, Wojtyła C, Al-Hendy A, Ali M. 2021. Nutrition in gynecological diseases: current perspectives. Nutrients 13:1178.

Coe FG. 2008. Ethnomedicine of the Rama of Southeastern Nicaragua. Journal of Ethnobiology 28:1-38.

Esimai O, Esan Goo. 2010. Awareness of menstrual abnormality amongst college students in urban area of Ile-Ife, Osun State, Nigeria. Indian Journal of Community Medicine 35:63

Faten ZM, Abdelgawad AF, Amr S, Fathy MM, Esraa A. 2015. Biochemical and phytochemical studies on *Balanities aegyptiaca* fruits. Biochemistry Letters 10:13-26.

He C, Wei J, Jin Y, Chen S. 2010. Bioactive components of the roots of *Salvia miltiorrhizae*: changes related to harvest time and germplasm line. Industrial Crops and Products 32:313-317.

Hedberg I, Hedberg O, Madati PJ, Mshigeni KE, Mshiu EN, Samuelsson G. 1982. Inventory of plants used in traditional medicine in Tanzania. Part I. Plants of the families Acanthaceae - Cucurbitaceae. Journal of Ethnopharmacology 6:29-60.

Hedberg I, Hedberg O, Madat PJ, Mshigeni KE, Mshiu EN, Samuelsson G. 1983a. Inventory of plants used in traditional medicine in Tanzania. Part II. Plants of the families Dilleniaceae - Opiliaceae. Journal of Ethnopharmacology 9:105-127.

Hedberg I, Hedberg O, Madati PJ, Mshigeni KE, Mshiu EN, Samuelsson G. 1983b. Inventory of plants used in traditional medicine in Tanzania. Part III. Plants of the families Papilionaceaevitaceae. Journal of Ethnopharmacology 9:237-260.

Hilonga S, Otieno JN, Ghorbani A, Pereus D, Kocyan A, de Boer H. 2019. Trade of wild-harvested medicinal plant species in local markets of Tanzania and its implications for conservation. South African Journal of Botany 122:214-224.

Idu M, Oghale O-U, Hauwa GJ. 2016. Ethnomedicinal survey of plants used in the treatment of female ınfertility in Chanchaga local government area in Minna, Niger State, Nigeria. Marmara Pharmaceutical Journal 20:269.

Izetbegovic S, Alajbegovic J, Mutevelic A, Pasagic A, Masic I. 2013. Prevention of diseases in gynecology. International Journal of Preventive Medicine 4:1347-1358.

Jhaumeer Laulloo S, Bhowon MG, Soyfoo S, Chua LS. 2018. Nutritional and Biological Evaluation of Leaves of *Mangifera indica* from Mauritius. Journal of Chemistry 2018:1-9.

Jiao M, Liu X, Ren Y, Wang Y, Cheng L, Liang Y, Li Y, Zhang T, Wang W, Mei Z. 2022. Comparison of herbal medicines used for women's menstruation diseases in different areas of the world. Frontiers in Pharmacology 12:751207.

Jima TT, Megersa M. 2018. Ethnobotanical study of medicinal plants used to treat human diseases in Berbere district, Bale zone of Oromia Regional State, South East Ethiopia. Evidence-Based Complementary and Alternative Medicine 2018:1-16.

Kacholi DS. 2013. Effects of habitat fragmentation on biodiversity of Uluguru Mountain forests in Morogoro region, Tanzania. PhD Dissertation, Georg-August University Goettingen, Goettingen, Germany.

Kacholi DS. 2014. Indigenous tree uses, use-values and impact of human population on forest size, structure, and species richness in Uluguru, Morogoro, Tanzania. Tanzania Journal of Science 40:34-50.

Kacholi DS. 2020. Density and aboriginal uses of wild tree species in Milawilila forest reserve in Morogoro Region, Tanzania. Tanzania Journal of Science 46:85-100.

Kacholi DS, Amir HM. 2022. Ethnobotanical survey of medicinal plants used by traditional healers in managing gonorrhoea and syphilis in Urambo district, Tabora region, Tanzania. Journal of Herbs, Spices and Medicinal Plants 28:179-192.

Kacholi DS, Mvungi HA. 2022. Ethnomedicinal survey of antidiarrheal plants of the Nyamwezi people of Nsenda ward in Urambo District, central western Tanzania. Ethnobotany Research and Applications 24:1-14.

Kaingu CK, Oduma JA, Mbaria JM, Kiama SG. 2013. Medicinal plants traditionally used for the management of female reproductive health dysfunction in Tana River County, Kenya. TANG Humanitas Medicine 3:17.1-17.10.

Kamal N, Mio Asni NS, Rozlan INA, Mohd Azmi MAH, Mazlan NW, Mediani A, Baharum SN, Latip J, Assaw S, Edrada-Ebel RA. 2022. Traditional medicinal uses, phytochemistry, biological properties, and health applications of Vitex sp. Plants 11:1944.

Kamatenesi-Mugisha M, Oryem-Origa H. 2007. Medicinal plants used in some gynaecological morbidity ailments in western Uganda. African Journal of Ecology 45:34-40.

Kibonde SF. 2020. Indigenous knowledge and conservation of medicinal plants in Rungwe district, Tanzania. OALib 07:1-10.

Kideghesho JR, Msuya TS. 2010. Gender and socio-economic factors influencing domestication of indigenous medicinal plants in the West Usambara Mountains, northern Tanzania. International Journal of Biodiversity Science, Ecosystem Services and Management 6:3-12.

Kingo RM, Maregesi SM. 2020. Ethnopharmacological study on some medicinal plants used in Ujiji, Kigoma, Tanzania. The Journal of Phytopharmacology 9:102-109.

Kitula RA. 2007. Use of medicinal plants for human health in Udzungwa mountains forests: a case study of New Dabaga Ulongambi forest reserve, Tanzania. Journal of Ethnobiology and Ethnomedicine 3:7.

Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JPA, Clarke M, Devereaux PJ, Kleijnen J, Moher D. 2009. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ 339:b2700.

Lulekal E, Asfaw Z, Kelbessa E, Van Damme P. 2013. Ethnomedicinal study of plants used for human ailments in Ankober district, north Shewa zone, Amhara region, Ethiopia. Journal of Ethnobiology and Ethnomedicine 9:63.

Ly C, Yockell-Lelièvre J, Ferraro ZM, Arnason JT, Ferrier J, Gruslin A. 2015. The effects of dietary polyphenols on reproductive health and early development. Human Reproduction Update 21:228-248.

Majeed J, Sharma P, Ajmera P, Dalal K. 2022. Menstrual hygiene practices and associated factors among Indian adolescent girls: a meta-analysis. Reproductive Health 19:148.

Maregesi SM, Ngassapa OD, Pieters L, Vlietinck AJ. 2007a. Ethnopharmacological survey of the Bunda district, Tanzania: Plants used to treat infectious diseases. Journal of Ethnopharmacology 113:457-470.

Maregesi SM, Ngassapa OD, Pieters L, Vlietinck AJ. 2007b. Ethnopharmacological survey of the Bunda district, Tanzania: Plants used to treat infectious diseases. Journal of Ethnopharmacology 113:457-470.

Maroyi A. 2013. Traditional use of medicinal plants in south-central Zimbabwe: review and perspectives. Journal of Ethnobiology and Ethnomedicine 9:31.

Maroyi A. 2016. *Ximenia caffra* Sond. (Ximeniaceae) in sub-Saharan Africa: a synthesis and review of its medicinal potential. Journal of Ethnopharmacology 184:81-100.

Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA. 2012. National, regional, and global trends in infertility prevalence since 1990: a systematic analysis of 277 health surveys. PLoS Medicine 9:e1001356.

Mashile SP, Tshisikhawe MP, Masevhe NA. 2019. Medicinal plants used in the treatment of maternal health-related problems by the Mapulana of Ehlanzeni district, Mpumalanga province, South Africa. Journal of Applied Pharmaceutical Science 9:21-29.

Mbinile SD, Munishi LK, Ngondya IB, Ndakidemi PA. 2020. Spatial distribution and anthropogenic threats facing medicinal plant *Zanthoxylum chalybeum* in Simanjiro area, Northern Tanzania. Scientific African 10:e00562.

Mogha NG, Kalokora OJ, Amir HM, Kacholi DS. 2022. Ethnomedicinal plants used for treatment of snakebites in Tanzania: a systematic review. Pharmaceutical Biology 60:1925-1934.

Moshi MJ, Otieno DF, Mbabazi PK, Weisheit A. 2009. The ethnomedicine of the Haya people of Bugabo ward, Kagera region, north western Tanzania. Journal of Ethnobiology and Ethnomedicine 5:24.

Moshi MJ, Otieno DF, Mbabazi PK, Weisheit A. 2010. Ethnomedicine of the Kagera region, north western Tanzania. Part 2: The medicinal plants used in Katoro Ward, Bukoba district. Journal of Ethnobiology and Ethnomedicine 6:19.

Moshi MJ, Otieno DF, Weisheit A. 2012. Ethnomedicine of the Kagera region, north western Tanzania. Part 3: plants used in traditional medicine in Kikuku village, Muleba district. Journal of Ethnobiology and Ethnomedicine 8:14.

Namukobe J, Kasenene JohnM, Kiremire BT, Byamukama R, Kamatenesi-Mugisha M, Krief S, Dumontet V, Kabasa JD. 2011. Traditional plants used for medicinal purposes by local communities around the Northern sector of Kibale National Park, Uganda. Journal of Ethnopharmacology 136:236-245.

Ngueyem TA, Brusotti G, Caccialanza G, Finzi PV. 2009. The genus Bridelia: a phytochemical and ethnopharmacological review. Journal of Ethnopharmacology 124:339-349.

Ogunlakina AD, Sonibare MA. 2020. Ethnobotanical survey of medicinal plants used as remedy for female infertility and menstrual disorder in southwestern Nigeria. Nigerian Journal of Pharmaceutical Research 15:205-217.

Omara T. 2020. Antimalarial plants used across Kenyan communities. Evidence-Based Complementary and Alternative Medicine 2020:1-31.

Otieno JN, Lyaruu HVM, Hosea KMM. 2007. Diversity and multiple uses of medicinal plants in Lake Victoria basin, Tarime district, Tanzania. Journal of Tanzania Association of Foresters 11:31-39.

Pala NA, Sarkar BC, Shukla G, Chettri N, Deb S, Bhat JA, Chakravarty S. 2019. Floristic composition and utilization of ethnomedicinal plant species in home gardens of the Eastern Himalaya. Journal of Ethnobiology and Ethnomedicine 15:14.

Patel PK, Patel MK. 2012. Ethnogynaecological uses of plants from Gujarat, India. Bangladesh Journal of Plant Taxonomy 19:93-94.

Phondani PC, Bhatt ID, Negi VS, Kothyari BP, Bhatt A, Maikhuri RK. 2016. Promoting medicinal plants cultivation as a tool for biodiversity conservation and livelihood enhancement in Indian Himalaya. Journal of Asia-Pacific Biodiversity 9:39-46.

Prabhu S, Vijayakumar S, Yabesh JEM, Ravichandran K, Sakthivel B. 2014. Documentation and quantitative analysis of the local knowledge on medicinal plants in Kalrayan hills of Villupuram district, Tamil Nadu, India. Journal of Ethnopharmacology 157:7-20.

Promprom W, Chatan W. 2018. Estrogenic effects of *Euphorbia hirta* L. Extract in Ovariectomized Rats. PJ 10:435-438.

Raj AJ, Biswakarma S, Pala NA, Shukla G, Vineeta, Kumar M, Chakravarty S, Bussmann RW. 2018. Indigenous uses of ethnomedicinal plants among forest-dependent communities of Northern Bengal, India. Journal of Ethnobiology and Ethnomedicine 14:8.

Rao MRK, Kumar SS. 2017. Preliminary phytochemical analysis of herbal plant *Hygrophila Auriculata*. Indo American Journal of Pharmaceutical Sciences 4:4580-4583.

Ruffo C. 1991. A survey of medicinal plants in Tabora region, Tanzania. In Traditional medicinal plants. KE Mshigeni, MHH Nkunya, V Fupi, RLA Mahunnah, and EN Mshiu (eds.), p. 391. Dar es Salaam University Press-Ministry of Health, Tanzania, Dar es Salaam.

Samuelsson G, Farah MH, Claeson P, Hagos M, Thulin M, Hedberg O, Warfa AM, Hassan AO, Elmi AH, Abdurahman AD, et al. 1992. Inventory of plants used in traditional medicine in Somalia. II. Plants of the families Combretaceae to Labiatae. Journal of Ethnopharmacology 37:47-70.

Sanogo R. 2011. Medicinal plants traditionally used in Mali for dysmenorrhea. African Journal of Traditional, Complementary and Alternative Medicines 8:90-96.

Semenya SS, Maroyi A. 2018. Plants used by Bapedi traditional healers to treat asthma and related symptoms in Limpopo Province, South Africa. Evidence-Based Complementary and Alternative Medicine 2018:1-33.

Shangali CF, Zilihona IJE, Mwang'ingo PLP, Nummelin M. 2008. Use of medicinal plants in the Eastern Arc Mountains with special reference to the Hehe ethnic group in the Udzungwa Mountains, Tanzania. Journal of East African Natural History 97:225-254.

Shankar R, Lavekar G, Deb S, Sharma B. 2012. Traditional healing practice and folk medicines used by Mishing community of North East India. Journal of Ayurveda and Integrative Medicine 3:124.

Shukla G, Bhatt JA, Chakravarty S. 2018. Folk therapeutic uses of ethnomedicinal plants to cure gynecological disorders: a meta-analysis of West Bengal State in India. Ethnobotany Research and Applications 24:1-19.

Siddique Z, Shad N, Shah GM, Naeem A, Yali L, Hasnain M, Mahmood A, Sajid M, Idrees M, Khan I. 2021. Exploration of ethnomedicinal plants and their practices in human and livestock healthcare in Haripur district, Khyber Pakhtunkhwa, Pakistan. Journal of Ethnobiology and Ethnomedicine 17:55.

Sieniawska E. 2015. Activities of tannins - from *in vitro* studies to clinical trials. Natural Product Communications 10:1934578X1501001.

da Silva Mendes JW, Cunha WEM, Rodrigues FFG, Silveira ER, de Lima RDP, da Costa JGM. 2020. Cissampelos genus: biological activities, ethnobotanical and phytochemical aspects. Phytochemistry Reviews 19:955-982.

Ssenku JE, Okurut SA, Namuli A, Kudamba A, Tugume P, Matovu P, Wasige G, Kafeero HM, Walusansa A. 2022. Medicinal plant use, conservation, and the associated traditional knowledge in rural communities in Eastern Uganda. Tropical Medicine and Health 50:39.

Steenkamp V. 2003. Traditional herbal remedies used by South African women for gynaecological complaints. Journal of Ethnopharmacology 86:97-108.

Surendran S, Prasannan P, Jeyaram Y, Palanivel V, Pandian A, Ramasubbu R. 2023. Knowledge on ethnogynaecology of Indian Tribes - a comprehensive review. Journal of Ethnopharmacology 303:115880.

Tahir M, Gebremichael L, Beyene T, Van Damme P. 2021. Ethnobotanical study of medicinal plants in Adwa district, Central Zone of Tigray Regional State, Northern Ethiopia. Journal of Ethnobiology and Ethnomedicine 17:71.

Telefo P, Tagne S, Koona O, Yemele D, Tchouanguep F. 2012. Effect of the aqueous extract of *Justicia insularis* T. Anders (Acanthaceae) on ovarian folliculogenesis and fertility of female rats. African Journal of Traditional, Complementary and Alternative Medicines 9:197-203.

Vander Borght M, Wyns C. 2018. Fertility and infertility: definition and epidemiology. Clinical Biochemistry 62:2-10.

Vineeta, Shukla G, Bhat JA, Chakravarty S. 2022. Species richness and folk therapeutic uses of ethnomedicinal plants in West Bengal, India: a meta-analysis. Phytomedicine Plus 2:100158.

Walker MH, Tobler KJ. 2022. Female infertility. *In* StatPearls. StatPearls publishing, Treasure Island (FL).

Wei H, Zhu J-J, Liu X-Q, Feng W-H, Wang Z-M, Yan L-H. 2016. Review of bioactive compounds from root barks of Morus plants (Sang-Bai-Pi) and their pharmacological effects. Cogent Chemistry 2:1212320.

de Wet H, Ngubane SC. 2014. Traditional herbal remedies used by women in a rural community in northern Maputaland (South Africa) for the treatment of gynaecology and obstetrics complaints. South African Journal of Botany 94:129-139.

Wood SN, Pigott A, Thomas HL, Wood C, Zimmerman LA. 2022. A scoping review on women's sexual health in the postpartum period: opportunities for research and practice within low-and middle-income countries. Reproductive Health 19:112.

Yang Y, Ross J. 2010. Theories and concepts in the composition of Chinese herbal formulas. *In* Chinese Herbal Formulas. pp. 1-34. Elsevier, China.