Medicinal plants used during Pregnancy and Childbirth in Baramulla District of Jammu and Kashmir, India

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Research

Abstract

Background: Although medicinal plants have long been beneficial to women's health, understanding regarding their usage during pregnancy and childbirth is scarce. This is the first research of its kind in the study area, with the aim of documenting and preserving traditional knowledge of medicinal plants used during pregnancy and childbirth.

Materials and methods: Field surveys were carried out from August 2018 to December 2020 in Baramulla district of Jammu and Kashmir. Information was gathered through group discussions, field tours and personal interviews using standard questionnaire with the tribal people, traditional healers, midwives and pregnant women. The data collected was analyzed through Use value (UV) and Informant Consensus factor (ICF).

Results: A total of 60 medicinal plant species belonging to 56 genera and 30 families were reported to be commonly utilized by women for treating various health issues during pregnancy and childbirth. The Lamiaceae was found to be the most prevalent plant family, with leaves being the most regularly used plant part. Of all other methods of remedy preparation decoction was reported to be the most preferred. Childbirth had the highest ICF value and the most widely accepted medicinal plants were *Cydonia oblonga*, *Malva neglecta*, *Thymus linearis*, *Geranium wallichianum*, *Achyranthes aspera*, *Taraxacum officinale* and *Ajuga bracteosa* as per the Use Value.

Conclusion: The current findings highlight the need for more in-depth research into the phytochemical, pharmacological, and toxicological aspects of commonly used medicinal plants for pregnancy and childbirth related health issues in order to provide reliable information to primary users and to develop novel drugs.

Keywords: Medicinal plants, Pregnancy, Childbirth, Baramulla, J&K

Background

Herbal remedies are an important part of healing and are among the oldest forms of healthcare known to mankind (Dangwal and Sharma 2011). Despite significant developments in biology and medicine, the majority of people in developing countries lack access to sufficient health care. As a result, they continue to depend on plant services for their primary health care (Mokoso et al. 2014). According to the World Health Organization (WHO), 70-80 percent of the world's population uses alternative medicine, which is often extracted from plants (Fakeye et al. 2009). Herbal

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medicine is mostly used by women for both health maintenance and treatment of various ailments (Clarke et al. 2015). This widespread use extends to pregnancy, with plant-based medicinal drugs being used by around 10-74 percent of pregnant women in Africa, Australia, and Europe (Kennedy et al. 2013). Pregnancy is associated with significant physiological changes that result in a variety of health issues, such as persistent vomiting, heartburn, nausea, and constipation. To treat these illnesses, pregnant women also resort to self-medication, which includes the use of herbal medicine (Wells 2009). As a result, herbal medicine is becoming increasingly popular around the world, with women being the primary users, especially during pregnancy (Peprah et al. 2019).

Using plants to ensure a healthy pregnancy and encourage labor is a well-known practice all over the world (Van Der Kooi et al. 2006). Women in remote areas depend entirely on plants to treat a variety of diseases, including abortion, infertility, and other menstrual issues. They rely on herbal therapies recommended by traditional herbal healers and elderly women with extensive knowledge of plant use (Qureshi et al. 2009). Owing to the shortage of modern healthcare facilities in their immediate vicinity, pregnant women depend on Birth Attendants to manage their problems and for smooth delivery of baby (Terangpi et al. 2014).

Instead of using pharmaceuticals, they normally give birth at home utilizing herbal remedies prescribed by a traditional midwife (Randrianarivony et al. 2016). Plants that are used during pregnancy can help with pregnancy-related health problems like for nausea and vomiting, candida vaginal infection, nutritional, and labor facilitation or for unrelated pregnancy health conditions like respiratory disorders or skin problems (Ali-Shtayeh et al. 2015). Despite the lack of convincing proof of their effectiveness, research in developing countries have shown that a substantial number of pregnant women use herbal remedies to induce labor (Jones and Lawson 1998). During the prenatal period, herbal remedies are used to prepare the uterus and cervix for childbirth, as well as to relieve pain during labor and increase stamina during delivery (Tournaire and Theau-Yonneau 2007). Plants are thought to be safer for the fetus than modern drugs, so herbal products are favored over prescription medicines. Despite the fact that evidence on the safety profile of herbal products is inadequate to substantiate their use in pregnancy, it is increasingly used by expectant mothers (John and Shantakumai 2015). The wellbeing of the mother and child in the puerperium is directly influenced by the health of the woman during pregnancy and lactation (WHO 1998). Ethnomedicinal plants are used as an alternative medicine during pregnancy and lactation all over the world; however, there is a critical need for documentation and clinical testing to ensure that these ethnomedicinal plants are used safely. Since most health-care providers are unaware of the use of herbal medicines during pregnancy, they face serious challenge (Adams 2011). If used improperly or in combination with prescription drugs, herbal use during pregnancy can have unknown side effects or cause serious problems in the fetus (Holst et al. 2008).

Numerous studies conducted in different parts of the world have documented and validated the medicinal plants being utilized during pregnancy and childbirth (Ali-Shtayeh et al. 2015; Lamxay et al. 2011) however, to the best of our knowledge, based on literature survey, Jammu and Kashmir in general and Baramulla district in particular has been overlooked in this regard. Furthermore, studies focusing on traditional knowledge about the use of plants for health issues may yield insights that can aid in improving female healthcare. The plants used by pregnant women need to be documented properly in order to make sure that pregnant women gets proper treatment and to preserve valuable information about medicinal plants important for women's reproductive health.

We hypothesized that due to the remoteness of the area, the ethnomedicinal knowledge of district Baramulla would considerably differ from other areas of J&K and the wider Himalayas. This study was planned with the objective to document the indigenous knowledge about medicinal plants used during pregnancy and childbirth. The data was further analyzed by using various numerical indices and compared with previous studies to determine the novelty of work.

Materials and Methods

Study area

The current research was carried out in the Baramulla district of the former state of Jammu and Kashmir. The district of Baramulla is located 45 kilometers from the capital city of Srinagar and encompasses an area of 3,535 square kilometers. The district of Baramulla is situated on the banks of the Jhelum River at its highest point. This region extends from 33° 58' to 34° 22' North latitudes and 73° 54' to 74° 42' East longitudes, and is bordered on three sides (North, East, and South) by India and one side (East) by Pakistan (Fig. 1). The area's flora is diverse and prolific, with ecosystems that are distinct from those found in other parts of Jammu and Kashmir. The area has a Mediterranean climate with four seasons: spring, summer, autumn, and winter. The research area receives the highest rainfall of 1493.48 mm, while the lowest rainfall was 702.11 mm. The highest rainfall distribution is found

in the southern portion of the region, decreasing towards the north, and ending with the least rainfall dispersion. The average temperature fluctuates between -0.3°C in January and 30.10°C in July (Ahmad and Qayoom 2019).). The study area was investigated in villages richly populated with ethnic communities. Gujjar and Bakerwal are the two prominent ethnic groups in the area. The Gojri and Pahari languages, which are considered their mother tongues, are spoken by these people. Forest regulations give such groups living near forest regions access to the forest and forest products, and they have a better understanding of forest flora and medical benefits.

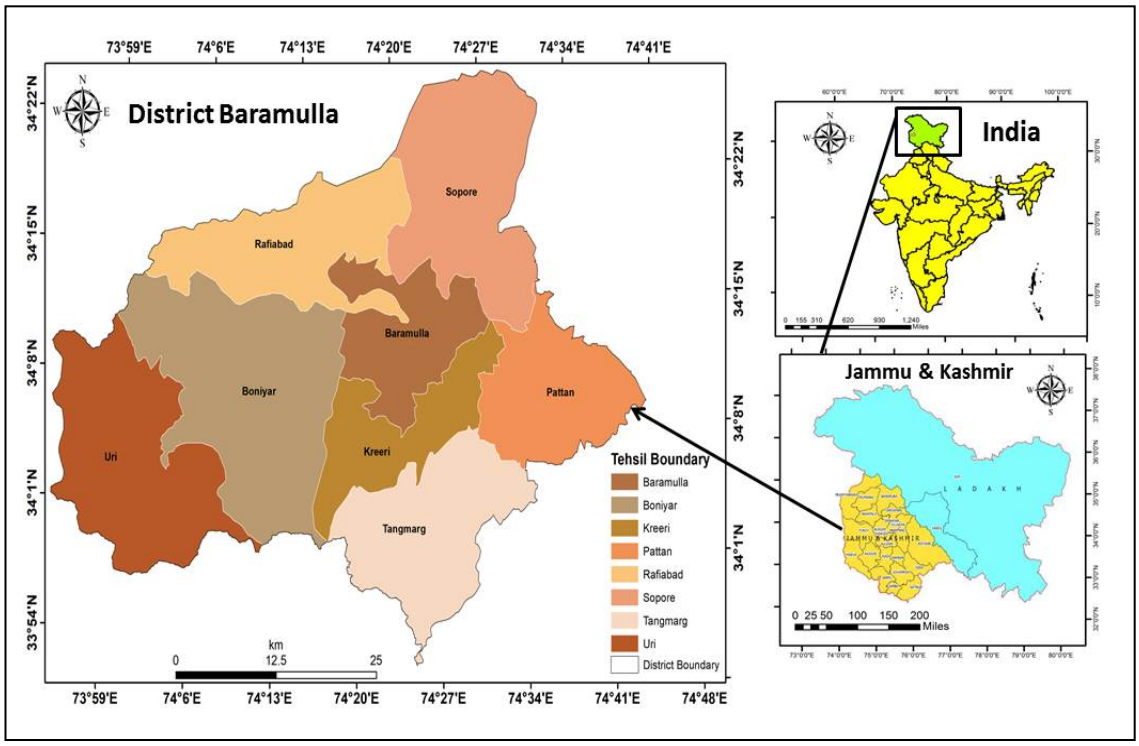

Figure 1. Map highlighting the study area, District Baramulla, Jammu and Kashmir.

Data Collection

Field surveys were conducted in the district of Baramulla, Jammu and Kashmir, from August 2018 to December 2020 to collect and record traditional information on the use of medicinal plants by the local population. A total of 31 visits were made to the research region, each lasting two days, to collect plants and information from a total of 14 sites/villages including Zehen Pora, Feroz Pora, Yamberzal Wari, Katian Wali, Malapora, Mirpur, Tetran, Gulnar, Fajapora, Gonipora, Hajibal, Khaipora, Ratnipora and Gulrez. These villages are mostly inhabited by the Gujjar, Bakerwal tribes, which are mainly dependent on the natural vegetation for their survival and health care needs. The ethnomedicinal data was collected through group discussions, field tours and personal interviews using standard questionnaire (Appendix I) (Martin 1995). Before interviewing the informants, we explained the intent of our study and obtained their consent to share their knowledge of plants they use to treat different diseases. A total of 43 people were interviewed during the course of the visit, with ages ranging from 35 to above 66 (Table 1). The informants included tribal people, traditional healers, midwives and pregnant women. The informants were chosen based on their knowledge of medicinal plants and how to use them. During the survey, the local name of the plant used, the plant part(s) used, the method of remedy preparation and administration, and the disease(s) treated were all recorded. Some field walks were also pursued with local knowledgeable informants during the field survey. A guided field walk through the forest helped us to gather as much information as possible about the identification and use of important medicinal plant species.

Preservation and Identification of collected plants

The medicinal plants that had been documented were collected for identification and herbarium specimen preparation. Standard methods were used for collecting, drying, mounting, preparing, and preserving plant specimens from the field (Jain and Rao 1977).

Table 1. Demographic features of informants.

Informants	Demographic information	Total	Percentage
Gender	Men	19	44
	Women	24	56
Categories	Traditional healers	6	14
	Midwives	4	9
	Pregnant women	12	28
	Indigenous people	21	49
Age groups	35-45	8	19
	46-55	13	30
	56-65	12	28
	66 and above	10	23
Educational qualification	Illiterate	18	42
	Primary	10	23
	Secondary	9	21
	Above secondary	6	14
Occupation	Housewives	22	51
	Farmers	10	23
	Hakeems	5	12
	Job holders	6	14
Religion	Muslim	43	100
Ethnic group	Gujjar	38	89
	Bakerwal	5	12

Local botanists assisted in the identification of voucher specimens, which were then compared to traditional floras like the Flora of Jammu and Kashmir (Singh et al. 2002), Flora of British India (Hooker 1879) and locally available literature (Navchoo and Kachroo 1995; Singh and Kachroo 1994). Plant species were named according to the recent format followed by The Plant List and IPNI (international Plant Names Index). All the preserved plant specimens were then submitted at KASH Herbarium of Department of Botany of University of Kashmir, Srinagar, India for future reference

Data Analysis

Informant Consensus Factor (ICF)

The informant consensus factor was used to determine whether the informants agreed on which plant species to use for each ailment category. The informant consensus factor shows which plants are often used, which may help with plant selection for potential phytochemical and pharmacological research (Giday et al. 2007). To check the informant consensus factor in this study, all of the diseases were grouped into different ailment categories. The ICF value varies from 0 to 1. A high value (1.0 or close to 1) indicates that a large proportion of the informants use a relatively small number of plant species. The low value, on the other hand, indicates that the informants disagree about the usage of plant species within a specific ailment group. ICF was calculated using the following formula (Heinrich et al. 1998).

$$\mathrm{ICF} = (Nur - Nt)/(Nur - 1)$$

Where *Nur* denotes the total number of usage reports for a given ailment category and *Nt* is the total number of species used by all informants for that particular ailment type.

Use Value

This index is used to calculate the relative value of each medicinal plant species used by the local population. In the current study use value was calculated using the following formula:

$$UV = \sum Ui/N$$

Where *Ui* is the total number of use reports by each informant and *N* shows the total number of informants taking part in the study (Phillips and Gentry 1993). Use value is high when there are many use reports for a given medicinal plant species and use value is low when there are very few reports associated with its use.

Results and Discussions

Demographic Features of Informants

During the fieldwork, 19 men including 6 traditional healers and 24 women including 4 midwives and 12 pregnant women ranging in age from 35 to above 66 years were interviewed about ethnomedicinal information (Table 1). Most of the informants were illiterate (44%) while 23% of the informants had primary education. About 21% of the informants had completed secondary education with just 12% having above secondary level education. All the informants were Muslims (100%) and Gujjar was the major ethnic group (89%) while Bakerwal were represented in small fraction (11%). The informants had different occupations such as Housewives (51%), Farmers (23%), Hakeems (12%) and Job holders (14%). Indigenous awareness and use of medicinal plants during pregnancy and childbirth

was found to be more prevalent in illiterate people than in the highly educated class of the region. Similar results were also reported by other researchers (Elkhoudri et al. 2016; Jan et al. 2020). The majority of the informants learned about indigenous medicinal plants through oral transmission from mostly close relatives. Some other studies also mentioned the tradition of orally acquiring medicinal plant knowledge (Appiah et al. 2019; Nadembega et al. 2011). Native healers were the sources of indigenous knowledge for a small percentage of the respondents. Whereas, none of the informants had received formal training for their indigenous skills. As per the data collected during our study it was reported that Indigenous knowledge and use of medicinal plants during pregnancy and childbirth was more prevalent in women. In the present study older people were also found to have a greater understanding of medicinal plants, which may be due to their vast experience which is in line with some other studies carried out in different parts of the world (Dlisani and Bhat 1999; Jan et al. 2017). During the present study the transmission of traditional knowledge, was found to be jeopardized because the younger generation had little interest in learning and therefore knew less about medicinal plants. According to the findings of our survey, the majority of respondents used medicinal plants because they were readily available, some of the respondents claimed that they use herbal medicines because of the unavailability of modern healthcare facilitates in their immediate vicinity, a few percent believed that their use of medicinal plants was part of their culture some, however, argued that western medicine was incapable of curing many diseases.

Diversity of medicinal flora

In the present study 60 medicinal plant species belonging to 30 families and 56 genera were documented to be used during pregnancy and childbirth in Baramulla district of Jammu and Kashmir. For each of the medicinal plants reported in this research, scientific name, voucher specimen number, local name, plant parts used, traditional medicinal use(s), mode of preparation and use values are given in Table 2.

Plants described in this study have been claimed to treat a variety of pregnancy and childbirth related health issues including, labor preparation, easier delivery, reduce labor pain, swelling of the feet and ankles, prevent miscarriage and unrelated pregnant health issues like constipation, skin allergies, and breathlessness. The most species were found in the Lamiaceae plant family (7 species; 11 %), followed by the Amaranthaceae (5 species; 8%), Brassicaceae, Rosaceae, Asteraceae (each 4 species; 6%). The families of Papaveraceae and Apiaceae (each 3 species; 5%) together with Fabaceae, Lythraceae, Solanaceae, Berberidaceae, Plantaginaceae, Polygonaceae and Malvaceae (each 2 species; 3%) were also represented. Other families in this study were represented by only one species (Fig. 2). Ali-Shtayeh et al. (2015) in the study carried out in Palestine also reported Lamiaceae as the dominant family for pregnancy, childbirth and postpartum healthcare. Idm'hnd et al. (2019) also reported Lamiaceae as the dominant plant family in their ethnobotanical study. Malik et al. (2011) in their study on ethnomedicinal practices in Kashmir Himalaya also reported Lamiaceae as the dominant plant family. The Lamiaceae family includes a large number of aromatic plants and is therefore considered economically important (Nunez and Castro 1992). Lamiaceae species are known for their therapeutic properties due to their high concentration of volatile compounds. The ethnobotanical and ethnopharmacological evaluation of Lamiaceae species found that their therapeutic potential is well recognized among herbalists and rural people, and that this plant family is still frequently used in traditional medicine to treat a variety of ailments, including microbial infections (Khoury et al. 2016).

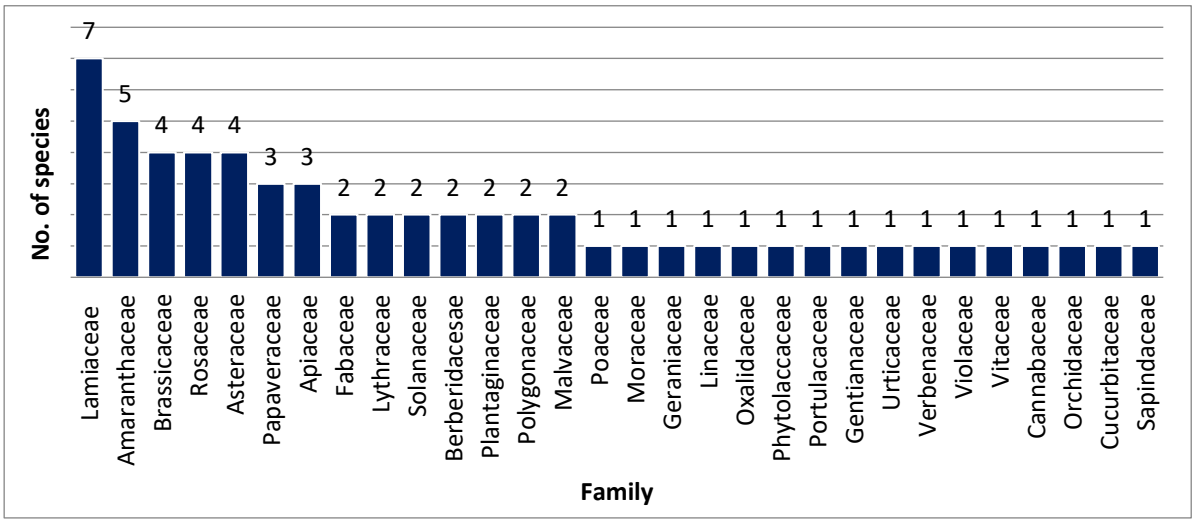

Figure 2. Contribution of different families to ethnomedicinal flora in the study area.

Table 2. Medicinal plants used by indigenous people in District Baramulla, Jammu and Kashmir for pregnancy and childbirth related issues.

Family/Scientific name	Voucher number	Local name	Habit	Part(s) used	Preparation	Disease treated	Total citations	Use Value	Similarity/ Dissimilarity
Amaranthaceae									
Achyranthes aspera L.	3353-KASH	Phutkanda	Herb	Root	Powder	Facilitate easy delivery	23	0.53	1(S), 2(S), 3(D), 4(D)
Amaranthus caudatus L.	3474-KASH	Liss	Herb	Seeds	Cooked	Curb labor pain	9	0.20	2(D)
Amaranthus viridis L.	3476-KASH	Liss	Herb	Seeds	Cooked	Relieves labor pain	13	0.30	3(D), 5(D), 6(S)
Chenopodium album L.	3486-KASH	Konh	Herb	Leaf	Decoction	Weakness	9	0.20	
Chenopodium botrys L.	3487-KASH	Kukli-haakh	Herb	Whole plant	Decoction	Relieve labor pain	20	0.46	7(S)
Apiaceae									
Coriandrum sativum L.	3490-KASH	Dainwal	Herb	Fruit	Decoction	Swelling of feet and ankle	8	0.18	8(D), 9(D)
Daucus carota L.	3499-KASH	Gaazir	Herb	Seeds	Paste	Induce abortion	10	0.23	5(S), 7(D), 3(D), 10(D)
Foeniculum vulgare Mill.	3509-KASH	Baidyan	Herb	Seeds	Decoction	Constipation	9	0.16	8(D), 11(D), 12(D), 10(D)
Asteraceae									
Artemisia absinthium L	3027-KASH	Tethwan	Herb	Whole plant	Infusion	Relieves labor pain	8	0.18	13(D), 14(D)
Bidens pilosa L.	3032-KASH	Kumber	Herb	Leaf	Decoction	Induce labor pain	4	0.09	15(S), 14(D)
Tagetes minuta L.	3453-KASH	Gutt-posh	Herb	Leaf	Juice	Induce labor	5	0.11	15(S)
Taraxacum officinale (L.) Weber ex F.H.Wigg	3051-KASH	Hand	Herb	Leaf	Cooked	Weakness	22	0.51	13(D), 16(D), 17(S)
Berberidaceae									
Berberis lycium Royle.	3479-KASH	Kawdach	Shrub	Bark	Decoction	Cure weakness	11	0.25	18(D), 14(S)
Podophyllum hexandrum Royle	3544-KASH	Wanwangun	Herb	Whole plant	Decoction	Expulsion of placenta	10	0.23	
Brassicaceae									
Lepidium sativum Wall.	3522-KASH	Halyun	Herb	Seeds	Decoction	Relieves labor pain	21	0.48	8(D), 19(D), 6(S)
Nasturtium officinale R.BR.	3534-KASH	Kul-haakh	Herb	Leaf	Decoction	Relax uterus muscle during delivery	20	0.48	12(S), 20(S), 3(D), 2(D)
Raphanus sativa L.	3557-KASH	Mujj	Herb	Seeds	Decoction	Induce abortion	6	0.13	21(S)
Sisymbrium irio L.	3569-KASH	Chari-lachijj	Herb	Seed	Decoction	Induce labor	11	0.25	4(D)
Cannabaceae									
Cannabis sativa L.	3482-KASH	Bhang	Herb	Leaf	Infusion	Relieves labor pain	10	0.23	14(D)
Cucurbitaceae									
Cucurbita maxima L.	3491-KASH	Pathir-al	Creeper	Seeds	Juice	Overactive bladder	12	0.27	13(D), 1(S)

Fabaceae									
Glycyrrhiza glabra L.	3465-KASH	Shangir	Herb	Seeds	Paste	Relieves labor pain	13	0.30	8(D), 18(D)
Trigonella foenum-graecum L.	3576-KASH	Meth	Herb	Seeds	Decoction	Gestational hypertension	13	0.30	8(S), 12(D), 20(D)
Gentianaceae									
Swertia petiolata D.Don	3365-KASH	Chirayetta	Herb	Leaf	Juice	Vomiting	17	0.39	6(D), 14(S)
Geraniaceae									
Geranium wallichianum D. Don. Ex Sweet	3511-KASH	Ratanjog	Herb	Roots	Decoction	Relieves labor pain	24	0.55	2(D), 3(D), 22(S), 6(S)
Lamiaceae									
Ajuga bracteosa Wall. ex Benth.	3469-KASH	Jaane-adam	Herb	Whole plant	Infusion	Prevents vomiting	22	0.51	5(S), 7(D), 3(D), 5(S)
Clinopodium umbrosum (M.Bieb.) Kuntze	3481-KASH	Batak-panjal	Herb	Aerial part	Infusion	Provide relief to the birthing women	16	0.38	23(S)
Mentha arvensis L.	3529-KASH	Pudni	Herb	Leaf	Infusion	Prevent unusual vomiting	12	0.27	21(D)
Mentha piperita L.	3529-KASH	Pudni	Herb	Leaf	Infusion	Induce labor pain	9	0.20	7(D), 12(D), 20(D), 14(S)
Nepeta cataria L.	3535-KASH	Brair-gass	Herb	Leaf	Cooked	Vomiting during pregnancy	17	0.39	2(D)
Ocimum basilicum L.	3677-KASH	Babir	Herb	Leaf	Infusion	Relieve labor pain	5	0.11	13(D), 2(D), 5(D)
Thymus linearis Benth.	3692-KASH	Jangli-javind	Herb	Whole plant	Juice	Urinary tract infection	25	0.58	24(S)
Linaceae									
Linum usitatissimum L.	3437-KASH	Alshi	Herb	Seed	Powder	Smooth delivery	21	0.48	8(D), 25(D), 26(D)
Lythraceae									
Punica granatum L.	3553-KASH	Deen	Tree	Fruit	Juice	Cure Weakness	18	0.41	8(D), 20(D), 10(D)
Trapa natans L.	3575-KASH	Gaer	Herb	Fruit	Cooked	Induce labor	11	0.25	9(D)
Malvaceae									
Lavetera cashmeriana Cambess.	3524-KASH	Sazposh	Herb	Flowers	Decoction	Skin irritation	10	0.23	16(S)
Malva neglecta L.	3524-KASH	Soxal	Herb	Leaf	Decoction	Weakness	25	0.58	27(D), 28(S)
Moraceae									
Ficus carica L.	3507-KASH	Anjeer	Tree	Fruit	Eaten Raw/Dried	Constipation	8	0.18	8(S), 16(D), 18(S)
Orchidaceae									
Dactylorhiza hatagirea (D. Don) Soo	3461-KASH	Salam-panjj	Herb	Tuber	Powder	Induce labor//Uterine tonic	12	0.27	6(D), 9(S)

Oxalidaceae									
Oxalis corniculata L.	3538-KASH	Chuk-chin	Herb	Leaf	Chewed	Vomiting	10	0.23	2(S), 3(S)
Papaveraceae									
Meconopsis aculeata Royle	-	Gul-e-neelam	Herb	Whole plant	Powder	Boosts immunity	20	0.46	
Papaver sommineferum L.	3539-KASH	Khash-khaash	Herb	Seed	Powder	Weakness during pregnancy	6	0.13	4(D), 3(D), 8(D), 14(S)
Fumaria indica (Hausskn.) Pugsley	3512-KASH	Shahtar	Herb	Leaf	Decoction	Prevent vomiting	8	0.18	
Phytolaccaceae									
Phytolacca acinosa Roxb.	3540-KASH	Brand-haakh	Herb	Root	Oil	Swelling of nipples	16	0.37	16(S)
Plantaginaceae									
Plantago lanceolata L.	3542-KASH	Gul	Herb	Leaf	Cooked	Easy delivery	17	0.39	29(D), 18(D)
Plantago major L.	3543-KASH	Boed-gul	Herb	Fruit	Decoction	Swelling of feet and ankles during late pregnancy	9	0.20	13(D), 8(D)
Poaceae									
Eleusine indica (L.) Gaertn.	3500-KASH	-	Herb	Leaf	Juice	Ease delivery	11	0.25	30(S), 31(D)
Polygonaceae									
Persicaria hydropiper (L.) Delabre	3546-KASH	Marxangan-ghass	Herb	Leaf	Decoction	Induce abortion	7	0.16	
Rumex nepalensis Spreng.	3563-KASH	Abij	Herb	Leaf	Cooked	Curb labor pain	12	0.27	
Portulacaceae									
Portulaca oleraceae L.	3548-KASH	Nuner	Herb	Whole plant	Cooked	Urine infection	15	0.34	3(D), 8(S), 18(D)
Rosaceae									
Cydonia oblonga Mill.	3494-KASH	Bomxunth	Tree	Seed	Infusion	Induce labor	27	0.62	32(S)
Malus domestica Borkh.	3523-KASH	Trail	Tree	Fruit	Eaten fresh	Facilitate easy delivery	9	0.20	11(S)
Prunus persica (L.) Batsch	3465-KASH	Chenun	Tree	Leaf	Infusion	Vomiting	7	0.16	8(D)
Rubus niveus Thunb.	3461-KASH	Chaanch	Shrub	Leaf	Infusion	Prevent miscarriage	8	0.18	16(D), 33(D)
Sapindaceae									
Aesculus indica (Wall. Ex Cambess.) Hook.	3468-KASH	Haan-doon	Tree	Fruit	Cooked	Weakness during pregnancy	7	0.16	33(S)
Solanaceae									
Datura Stramonium L.	3498-KASH	Datur	Herb	Leaf	Poultice	Soreness of breasts	7	0.16	2(S), 3(S), 19(D)
Physalis alkekengi L.	3547-KASH	Zool-poosh	Herb	Seed	Powder	Promote early labor	15	0.34	

Urticaceae									
Urtica dioica L.	3578-KASH	Sooi	Herb	Leaf	Cooked	Induce labor	16	0.43	8(D)
Verbenaceae									
Verbena officinalis L.	3580-KASH	Hutmool	Herb	Whole plant	Decoction	Prevent miscarriage	12	0.27	7(S), 2(S), 3(S), 4(D)
Violaceae									
Viola odorata L.	3581-KASH	Nunposh	Herb	Flower	Decoction	Breathlessness	13	0.30	
Vitaceae									
Vitis vinifera L.	3582-KASH	Daech	Climber	Leaf	Decoction	Prevent miscarriage	18	0.41	10(D)

S-Similar, D-Dissimilar

[1-Balamurugan et al. (2017), 2-Shinwari et al. (2017), 3-Jan et al. (2020), 4-Adnan et al. (2015), 5-Ishtiyaq et al. (2006), 6-Gairola et al. (2014), 7-Akther et al. (2016), 8-Sadeghi and Mahmood (2014), 9-Goyal (2017), 10-Jadhav and Bhutani (2005), 11-Ali-Shtayeh et al. (2015), 12-Illamola et al. (2020), 13-Bussmann and Glen (2020), 14. Tariq et al. (2018), 15. Kamatenesi-Mugisha (2007), 16-Jan et al. (2021), 17-Mir et al. (2021), 18-Bibi et al. (2017), 19-Bhatia et al. (2014), 20-Elkhoudri et al. (2016), 21-Patel and Patel (2012), 22-Jeelani et al. 2017, 23-Wagay 2014, 24-Pant and Samant (2010), 25-Adolphe et al. (2010), 26-Dodin et al. (2005), 27-Ozturk et al. (2016), 28-Al-Snafi (2019), 29-Mir et al. (2014), 30-Malan and Neuba (2011), 31-Mabeku et al. (2011), 32-Rajoriya et al. (2016), 33-Uniyal et al. (2006)]

Life form, plant part(s) used and remedy preparation

Herbs were reported to be the most widely used life form (50 species, 83%), followed by trees (6 species, 10%) shrubs (2 species, 3%); climber and creeper (1 species each) (Fig. 3). Similar results were reported in other studies carried out in different parts of the world (Jan et al. 2020, Balamurugan et al. 2017) showing herbs to be the most widely used life form to treat various gynecological disorders. Herbs have more bioactive compounds than shrubs and trees, making their medicinal activity more powerful. Furthermore, herbs are more commonly found along roadsides and in private gardens, making them more easily available in nature (Giday et al. 2009).

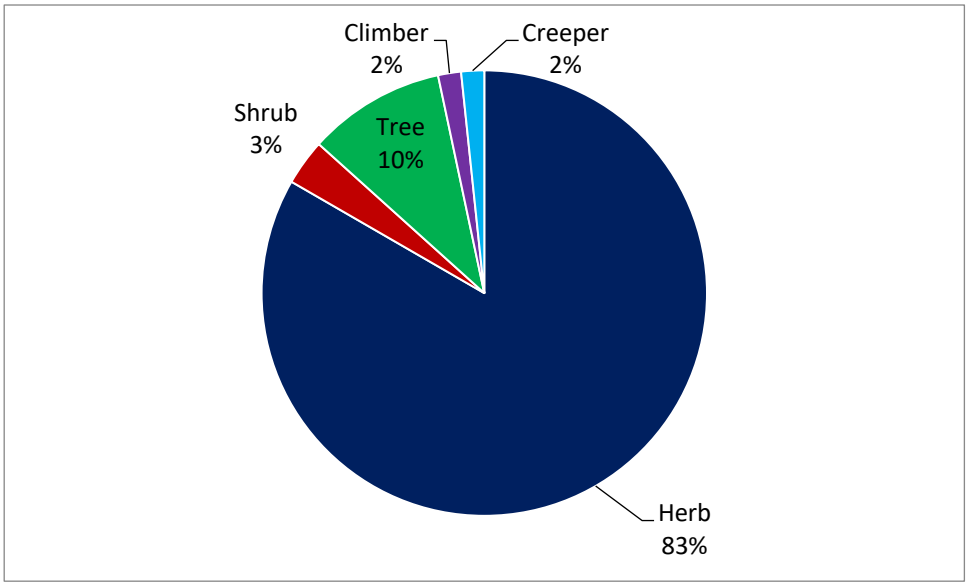

Figure 3. Distribution of species according to their life form.

In the research region, native people used diverse medicinal plant parts in their herbal remedy preparations. The leaves were reported to be the most used plant part, accounting for 38% percent followed by seeds (23%); whole plant (13); fruits (11%); root (5%); flower (3%); bark, aerial part and tuber (1% each) (Fig. 4). A similar practice has been found in other regions of India and the rest of the world (Balamurugan et al. 2017; Bussmann and Glenn 2010) showing leaf to be the most commonly employed plant part in the treatment of various female reproductive health conditions. This difference in plant part consumption could be due to differences in culture, species variety, and bioactive compounds found in different area's plant parts (Appiah et al. 2019). However, the plant part(s) harvested for herbal medicine preparations, as well as the frequency and amount gathered may have an effect on the harvested plant (Cunningham 1996). When the frequency of harvesting and the amount of leaves gathered are regulated, the usage of leaves may be less damaging to plants. Tribal people all around the world use leaves to make herbal treatments because they are easier to harvest than other plant parts (Giday et al. 2009) and majority of photosynthetic activities occur in the leaves, resulting in the generation of most bioactive compounds that may result in medicinal species' curative properties (Ghorbani 2005).

The current study documented various methods of preparation and administration of herbal recipes by local people of the study area. Decoction (21 species, 34%) was reported to be the most common method of crude drug preparation, followed by cooked (11 species, 18%); infusion (10 species, 16%); powder, juice (6 species, 10% each); paste, eaten fresh (2 species, 3% each) and oil, poultice (1 species, 2% each) (Fig. 5).Our findings are in consistence with other studies (Nergard et al. 2015; Ali-Shtayeh et al. 2015) showing decoction to be the most frequent herbal preparation.

Use Value (UV)

Phillips and Gentry (1993) devised a formula called use value to assess the local importance of any plant species. A higher use value indicates that a given plant species is more important, and vice versa. The use value, on the other hand, cannot identify or distinguish whether a plant species is employed for a single or several uses (Musa et al. 2011). The use value in this study ranged from 0.11 to 0.62 (Table 2), with the highest value reported for *Cydonia oblonga* (0.62) followed by *Malva neglecta* (0.60), *Thymus linearis* (0.58), *Geranium wallichianum* (0.55), *Achyranthes aspera* (0.53), *Taraxacum officinale* and *Ajuga bracteosa* (0.51 each). This illustrates the fact that these botanicals are frequently utilized in local traditional pharmacopoeia for women's healthcare during pregnancy and

childbirth. On the other hand, the least use value was observed for *Tagetes minuta* (0.11). As we can't ignore the medicinal plants with high use value, therefore, the medicinal plants with low use values should not be ignored as failing to provide this information to future generation could raise the threat of vanishing of this valuable knowledge (Ahmad et al. 2015).

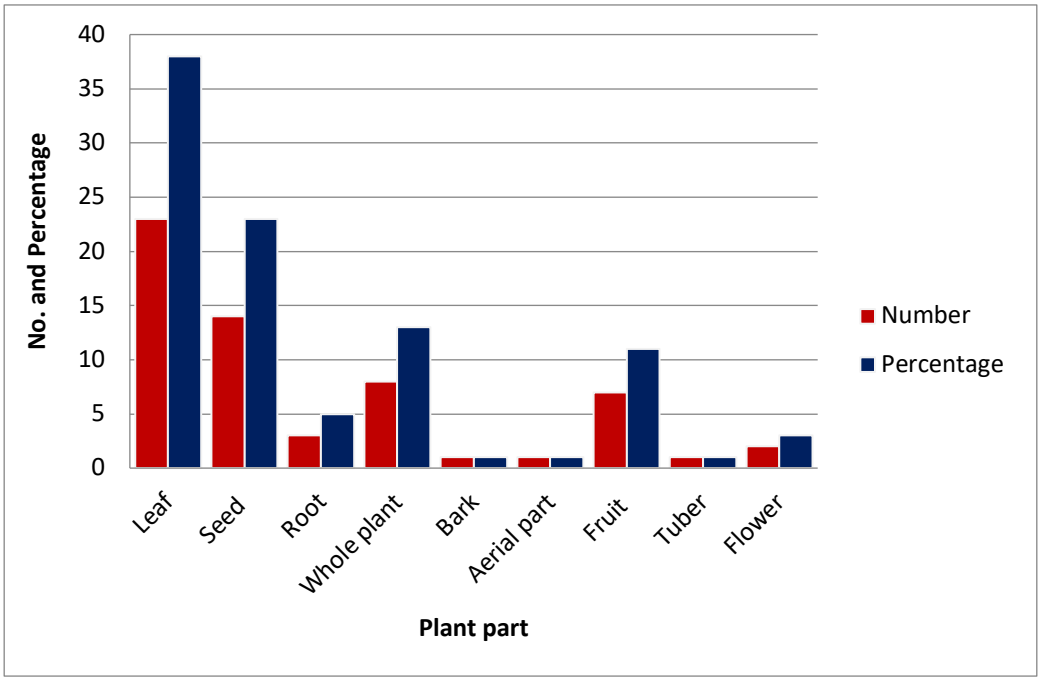

Figure 4. Contribution of plant parts used.

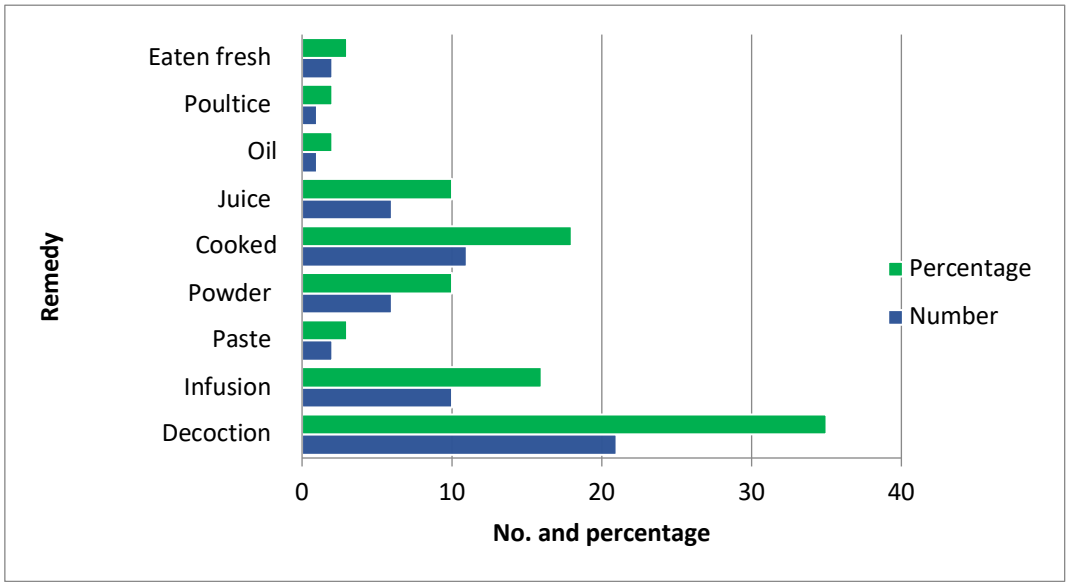

Figure 5. Contribution of herbal recipes.

In the current study it was reported that juice of *Thymus linearis* is given to pregnant women against urinary tract infections. Pant and Samant (2010) reported that whole plant of *Thymus linearis* is given to women during labor and postnatal period. The plant is reported to possess some important secondary metabolites including terpenoids, flavonoids, tannins, alkaloids and glycosides (Naz et al. 2015) and has anti-inflammatory, antipyretic, hepatoprotective, and antibacterial activities (Ahmad et al. 2014; Naz et al. 2015). In the current study root decoction of *Geranium wallichianum* is used to relieve labor pain. *Geranium wallichianum* is used in more or less similar ways as evidenced by previous literature. Example, paste of roots is used in case of premature delivery (Ishtiyak and Hussain 2017) similarly root of the plant is given in case of delivery pain (Jeelani et al. 2017). *Geranium*

wallichianum is recognised to have a wide range of biological properties, including antibacterial, antifungal, cytotoxic, phytotoxic, insecticidal, and enzyme inhibition, which supports the plant's usage in a variety of ailments and human illnesses.

Leaves of *Taraxacum officinale* are cooked and given to pregnant women during pregnancy for the treatment of weakness in the study area. Various other studies carried out in different parts of Jammu and Kashmir also reported the use of *Taraxacum officinale* for pre and post-partum healthcare (Mir et al. 2021a, b; Bhatia et al. 2014). Antioxidant, anti-inflammatory, antidiabetic, antibacterial, and anticancer activities have also been reported for *Taraxacum officinale* (Gonzalez-Castejon et al. 2012; Schutz et al. 2006). During the present study seed infusion of *Cydonia oblonga* was reported to induce labor in the pregnant women. Rajoriya et al. (2016) reported the usage of *Cydonia oblonga* to aid in the normal delivery of women, which is similar to our findings. Antioxidant, antibacterial, antifungal, anti-inflammatory, renoprotective, hepatoprotective, antidepressant, hypolipidemic, anti-colitis, immunomodulatory, anti-allergic, anticancer, anti-Helicobacter pylori, and anti-reflux actions have all been observed in this plant (Ashraf *et al.* 2016; Al-Snafi 2016). Leaf decoction of *Malva neglecta* is used to cure weakness in pregnant women. Ozturk et al. (2016) reported this plant to be used to conceive pregnancy. *Malva neglecta* has been shown to be high in minerals such as protein, vitamin C, iron, and zinc, all of which have an impact on human nutrition and health (Ozer and Aksoy 2019) and are being used by women during pregnancy and after childbirth as a source of iron, zinc, and vitamins (Al-Snafi 2019). In the current study, *Ajuga bracteosa* was found to be given to pregnant women to avoid vomiting. Ishtiaq et al. (2006) reported that plant extract is taken at intervals to prevent unusual vomiting in the early days of pregnancy, which is similar to our findings. *Ajuga bracteosa* has been used in medicine since ancient times for its anti-inflammatory, antifungal, antibacterial, and anthelmintic properties (Israili and Lyoussi 2009).

Informant Consensus Factor (ICF)

To calculate the value of ICF, all the ailments were divided into nine groups based on the ailments and complications reported. Highest ICF value of 0.95 was reported for the childbirth (121 use reports, 11 species) (Table 3). Current study reported the use of *Nasturtium officinale*, *Plantago lanceolata*, *Malus domestica*, *Linum usitatissimum*, *Achyranthes aspera* and *Eleusine indica* to facilitate easy delivery during childbirth. The second highest ICF value of 0.94 was reported for weakness (118 use reports, 8 species). The third highest ICF value of 0.93 was reported each for delivery pain (149 use reports, 11 species), vomiting (93 use reports, 7 species). Lowest ICF value of 0.90 was reported for abortion (23 use reports, 3 species). A higher ICF value means that local residents can effectively treat a particular disease. It has been suggested that high ICF values are related to high plant use values for one disease category (Madikizela et al. 2012).

Table 3. Value of informant consensus factor (ICF) for each disease category.

Disease categories	Use reports (Nur)	Taxa used (Nt)	ICF
General disorders	38	4	0.38
Induce abortion	23	3	0.90
Induce labor	110	9	0.92
Prevent miscarriage	29	3	0.92
Other pregnancy related disorders	115	9	0.92
Labor pain	149	11	0.93
Vomiting	93	7	0.93
Weakness	119	8	0.94
Childbirth	101	6	0.95

Leaf decoction of *Nasturtium officinale* is used to relax uterus muscles at the time of delivery. Illamola et al. (2020) reported this plant for pregnancy and Elkhoudri et al. (2016) reported that macerated seeds are used to get into shape and to initiate childbirth in Marrakech, Morocco which is in line with our study. *Linum usitatissimum* seed powder is used by women for smooth delivery in the current study. Adolphe et al. (2010) reported that seed consumption during pregnancy helps to reduce depression and has a neuroprotective effect and as per Dodin et al. (2005) seeds of *Linum usitatissimum* contain oestrogen, which can help women suffering from menopausal symptoms. Root powder of *Achyranthes aspera* is used by the local women to facilitate easy delivery. Some studies carried out in different parts of the world also confirmed its use for treatment of various pregnancy related health issues e.g., Qureshi and Bhatti (2009) reported that the root of *Achyranthes aspera* is used to make childbirth easier, prevent post-abortion bleeding and alleviate labour pain. Apart from these *Achyranthes aspera* has been extensively studied for its medicinal properties, including antioxidant, hemolytic activity (Kumar et al. 2009),

antibacterial (Alam et al. 2009) and antifungal (Elumalai et al. 2009) properties. On the other hand, anti-fertility activity has also been identified in the leaf extract of *Achyranthes aspera,* which could be used to prevent unintended pregnancy and monitor the ever-increasing population explosion (Shibeshi et al. 2006). *Eleusine indica* was another medicinal plant species identified as being used by the pregnant women at the time of childbirth for smooth delivery. *Eleusine indica* find mention in various literatures globally for the treatment of women's reproductive health. Similar to our findings Malan and Neuba (2011) reported the use of *Eleusine indica* for pregnancy by Anyi-Ndenye women. Mabeku et al. (2011) also reported the use of *Eleusine indica* by pregnant women in Cameroon to expel placenta after childbirth. *Eleusine indica* is being used as a diuretic, anti-helminthic, anti-cancer, febrifuge and against hypertension, kidney disorders, influenza and cough in conventional medicine (Ettebong et al. 2012). During the study it was also found that cooked leaves of *Plantago lanceolata* are given to women at the time of childbirth to facilitate easy delivery. Mir et al. (2014) reported that the leaves of *Plantago lanceolata* are used for bathing by the pregnant women. Minor secondary metabolites present in *Plantago lanceolata* include flavonoids, coumarins, volatile compounds, and saponins. The seeds have been found to have external applications for treating skin inflammation and wound healing in studies all over the world (Alsaraf et al. 2019). In the present study it was reported that pregnant women eat fresh fruits of *Malus domestica* to facilitate easy delivery. Ali-Shtayeh et al. (2015) reported its use to increase fetus movement in the womb. *Malus domestica* is one of the most important sources of antioxidants. In epidemiological research, consuming *Malus domestica* has been linked to a lower risk of cancer, cardiovascular disease, asthma, diabetes, coronary atherosclerosis, and obesity (Duda-Chodak et al. 2010).

Novelty and future impact of the study

To the best of our knowledge, it is the first independent study of its kind in the area and the region as a whole. The current research focuses on the safe and effective use of medicinal plants during pregnancy and childbirth. Our results coincide with other ethnobotanical studies in the region and around the world to some extent; however this study revealed a total of 60 medicinal plants used during pregnancy and child birth. The data revealed that the type of plant used, the method by which indigenous people prepare crude drugs, and how they are administered vary significantly across the region and globally, offering new ethnomedicinal information. The ethnomedicinal data of the present study was compared with previously published national and international papers. During the comparison, it was discovered that certain plant species had comparable or distinct medicinal significance, while others were reported for the first time. The usage of the following species to cure pregnancy related disorders has been recorded for the first time: *Chenopodium album, Meconopsis aculeata, Persicaria hydropiper, Fumaria indica, Rumex nepalensis, Podophyllum hexandrum, Physalis alkekengi* and *Viola odorta.*

Our study also adds some novel ethnomedicinal uses of different medicinal plants used in the study area, which may serve for pharmacological and phytochemical analysis for the discovery of new drugs and would provide insights that could help to raise and improve local pregnancy and childbirth care. Furthermore, it might provide a source of income for communities and have a positive impact on socioeconomic conditions, all with the purpose of preserving these natural treasures.

Conclusion

Our findings indicate that the traditional use of medicinal plants during pregnancy and childbirth is still a well-established practice in Baramulla district of Jammu and Kashmir. Local women, according to the research, have a great belief in indigenous medicine. They seem to rely on the plants to cure a variety of pregnancy-related ailments such as nausea, swelling of the feet and ankles, and weakness, as well as to prevent miscarriage, induce labor, and make delivery easier. The common benefits of using herbal medicine during pregnancy and childbirth include managing vomiting and nausea, relieve labor pain, prevent miscarriage, facilitate easy delivery, overcome weakness, induce labor etc. Medical plants, on the other hand, were widely used without concern, based on the notion that these remedies are natural and many women were ignorant that medicinal herbs could harm their pregnancy. However, using herbs during pregnancy can have negative implications because some traditional plants are poisonous, posing a risk to both mothers and newborns (Veale *et al.* 1992). There is currently insufficient evidence to advocate the safe use of medicinal plants during pregnancy, as most of the plants are not validated by scientific investigations, and many of the recorded medicinal plants lack toxicological information. As a result, we urge that more study be conducted on these medicinal plants, with a focus on their efficacy, toxicity, and pharmacological mechanisms of action, which could lead to information that might be used to help increase and improve local maternity and delivery care. Scientific investigations are needed, particularly to discover any harmful effects of herbal medication use during pregnancy. Moreover women of the tribal areas should receive health education regarding the effects of herbs during pregnancy.

Declarations

List of abbreviations: S-Similar, D-Dissimilar.

Ethics approval and consent to participate: This ethnomedicinal study was approved by the ethical committees of the Department of Botany, Government Model Science College, Jiwaji University, Gwalior, India. Before conducting interviews, individual prior informed consent was obtained from all participants. No further ethics approval was required. All work conducted was carried out under the stipulations of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity. The right to use and authorship of any traditional knowledge of all participants is maintained, and any use of this information, other than for scientific publication, does require the additional prior consent of the traditional owners, as well as a consensus on access to benefits resulting from subsequent use.

Consent for publication: Not applicable.

Availability of data and materials: The data used to support the findings of this study are available from the corresponding author upon request.

Competing interests: The authors declare no competing interests.

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Author's contributions: **Muatasim Jan:** Visualization, Supervision, Methodology, Formal analysis, Writing–original draft. **Rakesh Kumar Khare:** Visualization, Supervision, Writing–review and editing. **Tawseef Ahmad Mir:** Methodology, Formal analysis, Writing–original draft, Proof-reading.

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