

Therapeutic potentials of medicinal plants traditionally used during postpartum period and their molecular targets

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Abstract

Childbirth is a critical period of life and behavior towards childbirth varies from culture to culture. In many Southeast Asian cultures, postpartum period is considered important from point of view of recovery by offering a period of confinement. This study aimed to describe the plants used in diet therapy after childbirth in postpartum period, their importance and tried to assess the potential effects of the practices on the health of new mother and baby. The study shows that medicinal plants play a significant role in the recovery of new mother as they possess many biological properties and their molecular targets cover vast area. Therefore, the above mentioned plant species should be further explored for their other pharmacological characteristics for human welfare. Formulations can be prepared using these plants for the better healthcare of women.

Keywords: Childbirth . Postpartum period . Diet therapy. Medicinal plants

INTRODUCTION

Childbirth is one of the most important events in the life of a woman. It is a time of transition and social celebration in many societies, signaling an adjustment of cultural responsibilities (Steinberg, 1996). In any society, childbirth is a critical period of life and behavior towards childbirth varies from culture to culture (Marshall, 1985). In Indian and Chinese societies, herbal medicines are available for small maladies like cuts and burns to major ailments like tumors and wounds. Therefore, it is but natural that herbal preparations are developed for an important event like child birth in the society. Traditionally, people have a rich knowledge of herbs which are related to childbirth and affect fertility, pregnancy, parturition and postnatal period (Newman, 1985). In many Southeast Asian cultures, postpartum period is considered important from point of view of recovery by offering a period of confinement ranging from 10 to 45 days. The postpartum period (recovering women's health after delivery) is broadly defined as beginning 1 hour after delivery of the placenta and lasting 6 weeks (Blenning and Paladine, 2005). The World Health Organization, 2006 recognizes that this is in keeping with traditional practices of many cultures where a 40 day period of extra support is provided for the new mother and her baby. Although little evidences are present to support the timing and content of the postpartum visit (Gunn *et al.*, 1998), yet there is evidence that this is a time of increased health needs for both mother and baby. According to humoral medicine, pregnancy is seen as a hot state; with parturition heat is lost and the woman comes into a state of excess cold, and during the postpartum period, care should be taken

to restore the mother to equilibrium (Roasting 2003). Accordingly, postpartum care is aimed at keeping the new mother warm; it is believed that this will restore her humoral balance.

The common health problems to new mother during first 6–7 months postpartum are tiredness/exhaustion, backache, pain in perineum or lower uterine caesarean section (LUCS), wound, sexual problems, hemorrhoids, relationship with partner, bowel problems, urinary incontinence, contraception, more upper respiratory tract infections (URTI) than usual and mastitis (Piejko, 2006).

Confinement is to protect the new mother and her infant from exposure to illness, because both are considered to be in a vulnerable state after birth (Kim-Godwin, 2003). It, as a treatment involves, staying inside the home, avoiding housework, proper hygiene, proper nutrition, eating hot food, avoiding cold food, abstaining from sexual activity etc. Indian traditions offer a detailed therapeutic course line for postpartum care of the mother so that her physiology can be completely rejuvenated by following simple house hold nutrition to strengthen the mind and body. These diet therapies are traditionally known to prevent disorders such as depression, insomnia and indigestion etc. Indian system of medicine also mentioned special life style and food habits for puerperal women up to 45 days after delivery.

Medicinal plants have a significant role during pregnancy, birth and postpartum care in many parts of the world. Graphical representation of importance of medicinal plants during postpartum period is presented in Figure 1. Erosion and deterioration of traditional medical knowledge can be observed in many cultures and lead not only to a loss in biocultural diversity, but also diversity in alternatives for primary healthcare (Maffi 2005). This paper describes the plants used in diet therapy after childbirth, their importance and tries to assess the potential effects of the practices on the health of new mother and baby from a western health perspective.

Received: Oct 12, 2011; Revised: Nov 05, 2011; Accepted: Nov 23, 2011.

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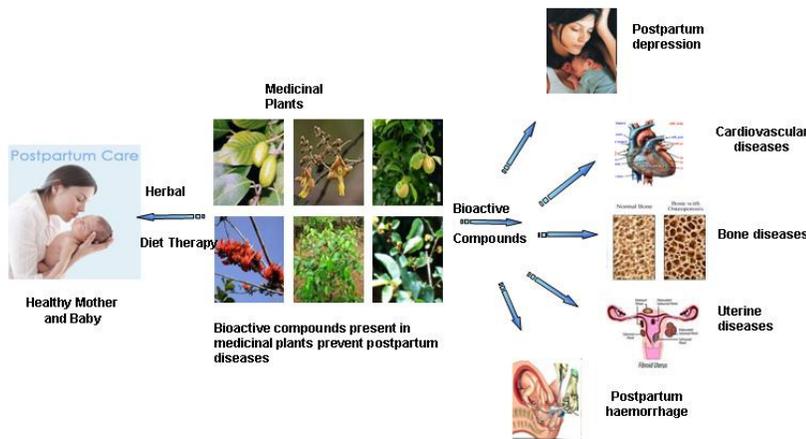


Fig 1. Graphical representation of therapeutic potential of postpartum medicinal plants

Key messages

- Postpartum diet therapy have shown positive effects on maternal health as well as on the health of newborn as bioactive principles pass from mother to baby through lactation.
- Our study on these medicinal plants (Jain *et al.*,2011) has found that most of the plants possess potent antioxidant activity, thus exert many beneficial effects on the health of mother and baby.
- Further investigation is needed to explore other important pharmacological properties of these medicinal plants.

METHOD

This study was carried out at urban and rural sites in Rajasthan which is the largest state in India and is located in the northwestern part of the country. The Aravalli hills divide the state of Rajasthan into two geographically and culturally different parts: north- western desert, and south- eastern hilly semi-arid forest.

Information was collected by interviewing several informants and midwives who had a detailed knowledge of plant use. There are specialized shops who sell such herbal products were also consulted. For botanical confirmation, all plant specimens were directly collected in the field and identification was done at Department of Botany, Mohanlal Sukhadia University, Udaipur.

Life style and dietary pattern during postpartum Behavioral restrictions

In India, the 42 day restrictions after childbirth is considered as resting period, which may sometimes lasts up to 60 days. During this period, family members (especially female relatives) provide strong social support; help new mothers at home during that period strictly limiting her activities, and her needs are taken care of by female relatives and midwives as in other non-western cultures (Kim-Godwin, 2003). Postpartum women are traditionally advised to follow a special dietary and lifestyle pattern, which is quite different from the dietary and lifestyle patterns they maintain before and after postpartum period as in China (Liu *et al.*,2006). According to

Ayurveda, after birth, the vata dosha (one of the three balancing aspects) is likely to increase. This may increase levels of anxiety or confusion, disturbance in sleep (even when not woken by baby), lack of energy, feeling the cold more than usual, aching joints, lack of routine including for mealtimes, restlessness, skin and hair dryness, brittle nails, digestive disturbance especially more gas and/or constipation. Ayurveda recommends regular massage (or self-massage) for raised levels of vata, to improve mood and to reduce skin dryness. Therefore, daily massages with warm oil are also given to both mother and baby.

The women wear long clothes or woollen clothes, socks and scarf and completely cover their body to keep it warm. They are prohibited to take bathe or wash hair in this period. Cold baths or showers are avoided. It is believed that as the postpartum woman is weak, water can harm skin by causing body swelling, body ache and cold which can be passed to the baby. Similarly, hair washing will cause a headache. It is believed that if a woman does not follow these restrictions, she may suffer a poor health at her later life.

Diet therapy

The emphasis is given on proper nutrition during postpartum time. Avoidance of foods classified as cold, such as fresh fruits and vegetables, cold foods, and plain water, is almost universal (Boer and Lamxay, 2009). Special preparations of herbs and spices, a good amount (15-20 L) of ghee (cleared butter) and dry fruits are given to the new mother during this period. The consumption of milk, butter and cleared butter is encouraged due to the belief that these foods will increase the quantity and quality of breast milk along with help to overcome weakness and regain body strength. A tea spoonful powder of long pepper (*Piper longum*) is given daily to the mother for stimulating both digestive and respiratory system. It also adds thermogenic response.

A sweet preparation made of caraway or carom seeds (*Trachyspermum ammi*) is given for initial 5 to 7 days to the new mother for cleaning of uterus and to avoid stomach problems. The powdered seeds are cooked with cleared butter and sugar and taken regularly after delivery for 5-7 days in early morning.

After that, a sweet preparation or dessert made of dried rhizome of ginger (*Zingiber officinale*) in cleared butter and sugar is given for next 3 to 5 days to avoid gastrointestinal disorders. Ginger enhances absorption and prevents gastrointestinal side effects.

Then, a preparation named "Battissa" (meaning 32) made by mixing about 32 herbs namely *Embelia ribes*, *Rubia cordifolia*, *Mesua ferrea*, *Elettaria cardamomum*, *Areca catechu*, *Curcuma amada*, *Piper cubeba*, *Piper nigrum*, *Piper longum*, *Asparagus racemosus*, *Quercus infectoria*, *Tribulus terrestris*, *Terminalia chebula*, *Mucuna pruriens*, *Cocos nucifera*, *Cinnamomum zeylanicum*, *Butea monosperma*, *Anethum graveolens*, *Curculigo orchoides*, *Curcuma longa*, *Desmodium gangeticum*, *Gmelina arborea*, *Litsea glutinosa*, *Oscimum basilicum*, *Smilax chinensis*, *Solanum suratense*, *Solanum indicum*, *Syzigium aromaticum*, *Vitex negundo* etc. is given for about 7 days to cure various common disorders of this period such as body pain, swelling, abdominal and

uterine pain, excessive bleeding, weakness etc. and as tonic.

After that, a preparation made of Box myrtle (*Myrica esculenta*) in cleared butter is given to the new mother in order to relieve her from any sort of depression and headache. The plant possesses anxiolytic and antidepressant activity.

Up to these period, hot herbal preparations in nature (all the above mentioned preparations) along with meal is given to the mother to recover from the cold state and for cleaning of the uterus. Now, food which exerts cold effect is given for balancing.

A food preparation made of *Symplocos racemosa* is given for 3 to 5 days to cure hormonal imbalance, excessive bleeding, leucorrhoea etc. Then, *Anogeissus latifolia* preparation including cleared butter, dry fruits and jaggery, in the form of dessert is given to the mother for wound healing, to cure body ache especially back pain. The complete diet chart of the postpartum period is given in Table 1.

Table 1. Diet chart during postpartum period

Days of administration	Food preparation	Possible health benefits
First 3-5 days	"Ajwain" sweet preparation made of seeds of <i>Trachyspermum ammi</i> with cleared butter, sugar and dry fruits	To cure stomachache, gas trouble and for cleaning of uterus
3-5 days	Zinger sweet preparation made of <i>Zingiber officinale</i> with cleared butter, sugar and dry fruits	To improve digestion, alleviate gastrointestinal problems and uterine cleaning
About 7 days	A preparation named "Battissa" containing about 30 herbs	For strength and rejuvenation and to cure body and back pain
3 days	"Kaiphala" preparation made by the bark of <i>Myrica esculenta</i>	Cure headache, depression and exerts soothing effect
5-7 days	"Lodh" made by <i>Symplocos racemosa</i> in cleared butter and sugar	To cure hormonal imbalance and check excessive bleeding
3 days	Almonds (<i>Prunus amygdalus</i>)	For strength
7 days	Gum obtained from <i>Anogeissus latifolia</i> with cleared butter and jaggery	To cure backache and provide strength

Biological properties of plants used during postpartum period

The plants used during postpartum period possess diverse pharmacological properties which help the new mother to recover and to strengthen health of new born also. These medicinal plants are used in combination and thus some plants act as bioenhancer as well as immunomodulator. Bioenhancer are drug facilitators, they are the molecules which themselves do not show typical drug activity but when used in combination enhance the activity of drug molecules. In Indian system of medicine, combination of plants is used rather than using single plant; hence preparations having combination of plants play an important role in modulating drug effect, e.g., piperine from *Piper* species acts as bioenhancer (Atal et al., 1981).

Aegle marmelos contains diverse molecules such as essential oils, coumarins, furoquinoline, alkaloids, triterpenoids, tannins and sterols etc. This is one of the ingredients of Dasmoolarisht (ten roots, a standard Ayurvedic medicine for loss of appetite and inflammations of uterus). Seeds of *Anethum graveolens* are used as household remedy to relieve digestive problems such as stomachache, indigestion and flatulence. Dill water is believed to have a soothing effect and is given to babies to treat gripe, relieve hiccups and colic. It is also a galactagogue. Seeds are chewed by women after delivery to digest food and to increase secretion of milk (Jain et al., 2005). Some of these properties of the plant have been validated scientifically. Similarly, gum of *Anogeissus latifolia* is given to the

lady after delivery to get rid of back pain and to repair damaged tissue (Jain et al., 2005). Gum of this plant is also used as tonic and galactagogue. Gum of *Butea monosperma* accelerates wound healing (Sumitraa et al., 2005), imparts bone biomechanical strength (Bhargavan et al., 2009) and possesses osteogenic activity (Maurya et al., 2009). As per the need of the period, female rejuvenators are also fed to the new mother to supply female hormones and to maintain urinary tract and strengthen the immune system. *Asparagus racemosus* perform these actions and it is also a galactagogue.

Cinnamomum zeylanicum is used in uterine hemorrhage, stomachache, as an antiseptic and an astringent (Jayaprakasha et al., 2003). The scientific trials have confirmed its immunomodulatory activity. *Elettaria cardamomum* is used in Ayurvedic and Unani system of medicine against gastrointestinal disorders, cardiac disorders, renal and vesicular calculi, dyspepsia, debility, anorexia, asthma, bronchitis and halitosis (The wealth of India, 2005). The formulation made by cardamom is given along with other ingredients to the mother after 15 days of delivery in early morning as it is very effective against urinary problems, strengthening mother's body after delivery, remove stomach pain, avoid excess bleeding, etc. (Rajith et al., 2010).

Embelin is the main bioactive molecule of the plant *Embelia ribes*. It is a powerful antihyperlipidemic agent and lower blood glucose levels and blood pressure (Bhandari et al., 2008). *Piper longum* is highly valued in Ayurveda for treating several disorders

mostly related to indigestion, fever, asthma and cough (Dev, 2006). Piperine, the main bioactive molecule of this plant enhances the thermo genesis of lipid and accelerates energy metabolism in the body (Malini *et al.*,1999) and also increases the serotonin and beta-endorphin production in brain. It also acts as immunomodulator, bioenhancer and digestive stimulant. *Symplocos racemosa* is used in Ayurveda for various female disorders. It is astringent, cold and used

in menorrhagea, metrorrhagea, leucorrhoea, blood disorders, for wound healing and to stop hemorrhage. Figure 2 shows bioactive principles of the medicinal plants used in postpartum period and Figure 3 contains pictures of medicinal plants.

Many of the plants used in postpartum period possess high total phenolic content and are potent antioxidants (Jain *et al.*,2011) which may have many indirect beneficial pharmacological actions.

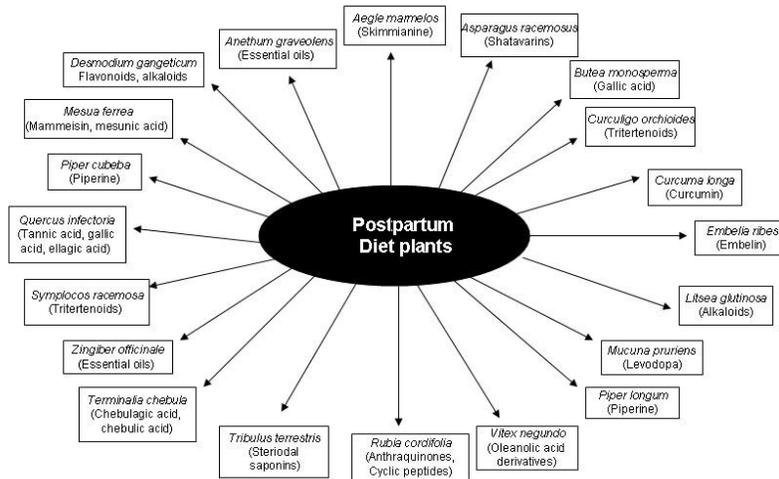


Fig 2.. Bioactive principles of Medicinal plants used in postpartum period



Fig 3. Sources of Ayurvedic drugs

Molecular targets

Nuclear factor-κB (NF-κB) pathway activation is common to

both inflammation and cell proliferation (cancer). It regulates several genes associated with inflammation, proliferation, carcinogenesis and apoptosis.

Curcumin from *Curcuma* species possesses anti-inflammatory and anticancer properties. Curcumin suppresses prostaglandin synthesis by effecting cyclooxygenase (COX), a key enzyme responsible for the conversion of arachidonic acid to prostaglandins. It has also been shown to suppress the production of cytokines such as interferon- γ (IFN- γ), interleukins and tumor necrosis factor (TNF), inhibit the inducible nitric oxide synthase (iNOS); and to suppress the activation of NF- κ B. These pathways affected by curcumin, not only play an important role in inflammation; they have also been associated with the development and progression of cancer (Aggarwal *et al.*,2006) and references therein.

Piperine from *Piper* species has been shown to be a bioenhancing principle for many bioactive molecules. It inhibits the major drug-metabolizing enzyme CYP3A4 and the drug transporter P-glycoprotein (Bhardwaj *et al.*,2002). Embelin is a potent inhibitor of transcription factors NF- κ B activation, which makes it a potentially effective suppressor of tumor cell survival, proliferation, invasion, angiogenesis, and inflammation (Ahn *et al.*,2007). *A. raceomsus* contains several glycosides, and one of these, shatavaran-I has

been shown to block oxytocin-induced contractions in rat, guinea pig, and rabbit uteri *in vivo* and *in situ* (Gaitunde and Jetmalani 1969). In postpartum and estrogen primed rate, intramuscular injection of the alcoholic extract of the roots was shown to exert lactogenic effect, increasing milk yield and breast lobular-alveolar tissue which has been attributed to an increase of prolactin levels or to a release of corticosteroids (Sabnis *et al.*,1968).

Scoparone and scopolatin is the chemical constituent of *Aegle marmelos* responsible for various anti-inflammatory purposes. Apigenin, luteolin and hentriacontanol from *Gmeliana arborea* show anti-inflammatory activity. *Terminalia chebula* and *Litsea glutinosa* are potent angiotensin-converting enzyme (ACE) inhibitors; hence they possess antihypertensive action (Dev, 2006). ACE inhibitors are also used as therapeutic agents in many other diseases, especially originating from hypertension, such as heart failure, stroke etc. Molecular targets of postpartum diet plants are presented in Table 2.

Table 3 presents the information about the plants used in postpartum healthcare in India such as common name, part used and scientific validations of the medicinal properties.

Table 2. Molecular targets of postpartum diet plants

Plant name	Bioactive molecules	Molecular target
<i>Aegle marmelos</i>	Scoparone, scopolatin	↓ NO
<i>Tribulus terrestris</i>	Steroidal saponins	↓ COX-2, ↓ iNOS
<i>Curcuma longa</i>	Curcumin	↓ NF- κ B, ↓ cyclin D1, ↓ COX-2, ↓ iNOS, ↓ TNF, ↓ IL-6, ↓ IL-8, ↓ IL-12
<i>Piper longum</i>	Piperine	Drug-metabolizing enzyme CYP3A4
<i>Embelia ribes</i>	Embelin	↓ NF- κ B
<i>Gmeliana arborea</i>	Apigenin, luteolin, Hentriacontanol	↓ COX-2, ↓ cyclin D1, ↓ IL-4, ↓ IL-13, ↓ NF- κ B
<i>Terminalia chebula</i>	Ellagic acid, chebulin	↓ Angiotensin-converting enzyme (ACE)
<i>Litsea glutinosa</i>	Boldine	↓ Angiotensin-converting enzyme (ACE)
<i>Asparagus racemosus</i>	Glycosides	↑ Prolactin, ↑ corticosteroids

Table 3. Information about the plants used in postpartum healthcare in India

Plant name	Local name	Part used	Scientifically validated pharmacological properties
<i>Aegle marmelos</i> (Rutaceae)	Bael, Bilva	Fruits	Antioxidant and hepatoprotective, antihyperlipidemic
<i>Anethum graveolens</i> (Apiaceae)	Dill, Sowa	Fruits	Galactagogue, antihyperlipidaemic, antihypercholesterolaemic, antioxidant, antispasmodic, regulatory agent of the menstrual cycle
<i>Anogeissus latifolia</i> (Combretaceae)	Dhawra, Bakli	Gum	Cure backpain and to repair damaged tissue, hepatoprotective, wound healing potential, antioxidant
<i>Areca catechu</i> (Arecaceae)	Supari	Seeds, nut	Treatment of medication-induced movement disorders
<i>Asparagus racemosus</i> (Asparagaceae)	Shatavari, Satavar	Roots	Female rejuvenative, Blood purifier, immunostimulant, immunoadjuvant, tonic, antidepressant, adaptogen, galactagogue, treatment of gastric ulcers and dyspepsia,
<i>Butea monosperma</i> (Fabaceae)	Kamarkas, Palas, Tesu, Khakara	Gum	Impart bone biomechanical strength, osteogenic activity
<i>Cinnamomum Zeylanicum</i> (Lauraceae)	Dalchini, Twak	Bark	Immunomodulatory activity
<i>Cocos nucifera</i> (Arecaceae)	Khopra, Nariyal	Endosperm	Antinociceptive and antioxidant
<i>Curculigo orchoides</i> (Hyoxidaceae)	Kali musli	Tubers	Metabolic enhancer, tonic, galactagogue, possesses estrogenic activity
<i>Curcuma amada</i> (Zingiberaceae)	Amba-haldi	Rhizome	Treatment of dysentery and body ache, antioxidant, anti-hypercholesterolemic
<i>Curcuma longa</i> (Zingiberaceae)	Haldi	Rhizome	Antioxidant, atherosclerotic, for wound healing and gastrointestinal disorders
<i>Desmodium gangeticum</i>	Shala parni	Roots	Antioxidant, anti-inflammatory and antidiabetic

(Fabaceae)			
<i>Elettaria cardamomum</i> (Zingiberaceae)	Elaichi	Seeds	Antihypertensive , antioxidant, gut modulatory, diuretic sedative and gastroprotective
<i>Embelia ribes</i> (Myrsinaceae)	Vai vidang	Fruits (Berries)	Analgesic, anticancer, antihyperlipidemic, lower blood glucose levels and blood pressure
<i>Gmelina arborea</i> (Lamiaceae)	Gambhari, Sewan	Roots	Antioxidant, treatment of vaginal discharge
<i>Litsea glutinosa</i> (Lauraceae)	Maida lakdi	Bark	Antispasmodic, antioxidant and antiinflammatory.
<i>Mesua ferrea</i> (Clusiaceae)	Nagkesar, Nagesar	Flowers	Anti-inflammatory and C.N.S. depressant activities
<i>Mucuna pruriens</i> (Fabaceae)	Kaunch, Kevach	Seeds	Neuroprotective
<i>Myrica esculenta</i> (Moringaceae)	Kaiphal	Bark	Anxiolytic and antidepressant
<i>Myristica fragrans</i> (Myristicaceae)	Jaiphal, Nutmeg	Seeds	Analgesic and haemodynamic
<i>Oscimum basilicum</i> (Lamiaceae)	Ram tulsi		Antioxidant, Vasorelaxant and anti-platelet aggregation property
<i>Piper cubeba</i> (Piperaceae)	Sheetal Mirch	Fruits (Berries)	Anti-inflammatory activity and analgesic activity
<i>Piper longum</i> (Piperaceae)	Piparamul	Roots	Improves blood circulation by inhibiting platelet aggregation, digestive stimulant and immunomodulatory
<i>Piper nigrum</i> (Piperaceae)	Kali Mirch	Dried unripe fruits (Berries)	Analgesic
<i>Quercus infectoria</i> (Fagaceae)	Majuphal	Galls	wound healing potential, anti-inflammatory, antioxidant
<i>Rubia cordifolia</i> (Rubiaceae)	Manjistha	Roots	Anti-inflammatory, hepatoprotective, antioxidant, blood purifier, immunomodulant, anti-peroxidative
<i>Smillex chinensis</i>	Chopchini	Roots	Antipyretic
<i>Solanum indicum</i> (Solanaceae)	Badi kateri	Roots	hypertension
<i>Symplocos racemosa</i> (Symplocaceae)	Lodh	Bark	Increase female hormones (FSH, LH)
<i>Syzygium aromaticum</i> (Myrtaceae)	Laung	Dried flower buds	Treatment of gastrointestinal disorders, antiulcer and purgative agent
<i>Terminalia chebula</i> (Combretaceae)	Harad	Fruits	Antioxidant, and wound healing property
<i>Trachyspermum ammi</i> (Apiaceae)	Ajwain	Seeds	Antihyperlipidaemic
<i>Tribulus terrestris</i> (Zygophyllaceae)	Gokhru	Fruits	Treatment of female disorders(Renal disorders and leucorrhoea), vasodialator
<i>Vitex negundo</i> (Verbenaceae)	Nirgundi, Negad	Seeds	Treatment of raised uterus, analgesic, anti-inflammatory, anxiolytic
<i>Zingiber officinale</i> (Zingiberaceae)	Adrak, Saunth	Rhizome	Analgesic, anti-inflammatory and hypoglycaemic

DISCUSSION

The postpartum period is a time of tremendous changes, increased health problems, and emotional upheaval for new parents. Both mother and child are considered to be in a vulnerable state after birth. Confinement is practiced to protect mother and infant from exposure to diseases. Plants use during postpartum recovery is more common but no specific plant or plant extracts are used during pregnancy or to facilitate childbirth. The plants are not used for the purpose of bath in India as in other societies such as the use of Bakera in Indonesia (Zumstag and Weckerle 2007), the Temazcal in parts of Mexico (Castaneda Camey *et al.*, 1996) and herbal bath in Guatemala (Michel *et al.*, 2006). The concept of Steam bath and mother roasting with a mixture of medicinal plants is not present here. The plants and their preparations are included in diet therapy according to the need and health status which is not present in any other culture.

Plant extracts used for postpartum recovery are cited as helping to expel the lochia, lessen mild postpartum hemorrhage, contract the uterus, aid in physical recovery, augment lactation, give the mother strength and treat illness in infants (Boer and Lamxay

2009). Feeding new mother with so many herbs has beneficial consequences for both mother and child. It has been shown in daily life that cattle milk contains plant specific odour if fed with odorous plants like neem or onion, it has been demonstrated in several studies that bioactive molecule or active metabolite ingredients pass without degradation. Therefore, such herbal feeding to mother results in passing these molecules (after a biological processing) to young child which has a beneficial consequence as evident by modern scientific validation of herbal properties.

This study showed the significant role of food and medicinal plants playing part in postnatal recovery. The above mentioned plant species should be explored for their pharmacological characteristics for human welfare. Formulations can be prepared using these plants.

ACKNOWLEDGEMENTS

This work was supported by financial assistance from UGC-DRS under special assistance programme for medicinal plant research to K.G.R. N.J. and V.S. thanks UGC for financial assistance in the form of fellowship.

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