Use of lipid-lowering medicinal herbs during pregnancy: A systematic review on safety and dosage

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Review Article

Abstract

BACKGROUND: Hyperlipidemia is one of the important diseases in pregnancy that causes fetal abnormalities during pregnancy and after the birth. Unfortunately, the usual anti-fat drugs are associated with high morbidity in fetus and due to people's inclination towards taking herbs, it is required to identify side effects of medicinal herbs in pregnancy. The aim of this study was to present hypolipidemic herbs that would not any complications for mother and fetus.

METHODS: In this review article, the major electronic databases such as EBSCO, Central Register of Controlled Trials (CENTRAL), China Network Knowledge Infrastructure (CNKI), Cochrane, Google scholar, MEDLINE, SciVerse, Scopus, and Web of Science were searched using the key words "herbal" and "hyperlipidemia", "herbal" and "pregnancy" matched by MeSH from their respective inceptions till September, 2016. Total of 1723 publications (145 review articles, 855 original research articles, and 723 abstracts) about the effect of herbals on hyperlipidemia and 682 publications (200 abstracts, 423 original research articles, and 59 review articles) about the effect of herbals in pregnancy were retrieved. At the end, a list of medicinal plants effective on hyperlipidemia alongside their effects on pregnancy was developed. Finally, the plants effective on hyperlipidemia and safe during pregnancy were determined and their dosage, complications, mechanism of action, and side effects were reported.

RESULTS: A total of 110 effective herbs on hyperlipidemia were identified and complications of 95 plants in pregnancy were studied. At last, among the 55 selected plants effective on hyperlipidemia and examined for pregnancy, we reported 12 herbs with their dosage and special considerations that can be used to treat hyperlipidemia during pregnancy.

CONCLUSION: Some medicinal plants can be used to treat hyperlipidemia during pregnancy without any significant side effects both on mother or fetus.

Keywords: Hyperlipidemias, Pregnancy Outcome, Fertility, Dyslipidemia, Herbals, Medicinal Plants, Oxidative Stress

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Introduction

Exposure to elevated levels of cholesterol and oxidative stress due to products of cholesterol metabolism during fetal period has been shown to result in programmed death of fetal arterial cells with a predisposition to atherosclerosis later in life.[1] Commonly, during reproductive years (about 2 decades), risk of cardiovascular diseases reduces. Besides, lipid and lipoproteins is not been measured routinely during pregnancy as gestational dyslipidemia is considered physiologic with little clinical significance.[2] However, recent discoveries of fatty streaks in the aorta of 6-month-old fetuses and also evidences of aortic atherosclerosis in autopsy of deceased infants with normal levels of cholesterol born to mothers with

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hypercholesterolemia, has highlighted the importance of correcting or preventing maternal dyslipidemia for the benefit of the mother and the child.[3] Currently, no reference standards exist for lipid parameters during pregnancy, although it is well-known that pregnancy is a state of insulin resistance, which is reflected by lipoprotein lipid profiles. Pregnancy-related hypertriglyceridemia is rare, but it can be life threatening in some patients with genetic susceptibility. Complications can include acute pancreatitis, hyperviscosity syndrome, and potentially preeclampsia. Overweight and obese women are significantly more likely to exceed the pregnancy-related weight gain recommendations. Women with gestational diabetes and/or preeclampsia are also at increased risk for elevated triglyceride levels, development of chronic hypertension, recurrent gestational diabetes and/or overt diabetes, recurrent preeclampsia, and development of albuminuria later in life.[4]

Two registered clinical trials are currently evaluating the effects of lipophilic statins to prevent preeclampsia in pregnancy. The true risk of congenital anomalies caused by statins in pregnancy has not been well confirmed in humans yet. However, because statins are category X, they should only be used in a research setting during pregnancy until more information is available. Fenofibrate has been assigned to pregnancy category C by the Food and Drug Administration (FDA). Fenofibrate should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. The side effects of statins and other antihyperlipidemic drugs in animal models of pregnancy showed delayed delivery, increased postimplantation loss, decreased litter size and pup birth weight, 40% pup survival rate, 4% neonate survival, no pup survival to weaning, and increased incidence of spina bifida, abortion, and fetal skeletal abnormalities (domed head, hunched shoulders, rounded body, abnormal chest, kyphosis, stunted fetuses, altered skeletal formation of ribs, sternebrae, vertebrae, and palatine). Delayed delivery, decreased live births, and death of 17% of fetuses occurred at doses 18 times higher than the maximum human dosage. In addition, studies on animal reproductive system with doses 7 to 10 times higher than the recommended human dosage based on body surface area (BSA) have demonstrated to have embryocidal and teratogenic effects.[5,6]

Lifestyle changes and glycemic control should be instituted if necessary. During pregnancy, a bile acid sequestrant can safely treat elevated cholesterol levels. Women must be educated about dietetic measures and body mass reduction even in preconception period. In addition, during pregnancy, mothers must be monitored and due to risk of pancreatitis in case of triglyceride above 11.5 mmol/l, other therapy options must be taken into account. In the last trimester of pregnancy, severe hypertriglyceridemia associated with pancreatitis can be treated with omega-3 fatty acids, parenteral nutrition, plasmapheresis, and other lipid-lowering agents.[7]

The use of herbal medicines has been increasing in many developing and industrialized countries. More and more pregnant women are using herbal remedies to treat pregnancy-related problems due to cost-effectiveness of therapy and easy access to these products.[8]

To date, over 200 plants have been recommended for treatment of hyperlipidemia. As with chemical drugs, medicinal plants can cause permanent damage to fetus. Therefore, despite people's willingness to use medicinal plants, certain precautions with these plants should be taken into account. In addition, couples are likely to use these plants on the verge of fertility to treat hyperlipidemia or other disorders.[9,10] Therefore, it is highly necessary for both physicians and patients to know which plants have optimal effects on hyperlipidemia during and before pregnancy without having side effects.[11] The aim of this review article was to investigate the effect of plants on hyperlipidemia and plant-based side effects in pregnancy and fertility as well as to introduce the plants that are effective on hyperlipidemia during pregnancy.

Materials and Methods

In this study, 2405 publications (204 review articles, 1278 original full text articles, and 923 abstracts) were retrieved. The major electronic databases including Web of Science, Scopus, PubMed, Google scholar, MEDLINE, EBSCO, China Network Knowledge Infrastructure (CNKI), and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from their respective inceptions till September 2016. To identify herbs used to treat hyperlipidemia the following keywords were used and matched by the MeSH: “herbal in hyperlipidemia”, “botany in hyperlipidemia”, “herbal therapy in hypertriglyceridemia”, “systematic review of herbal in hypercholesterolemia”, “herbal medicine for hypercholesterolemia”, “herbal with anti-lipid effect”, “natural remedies for hyperlipidemia”, “herbal therapy for atherosclerosis and “hypolipidemic diet”.

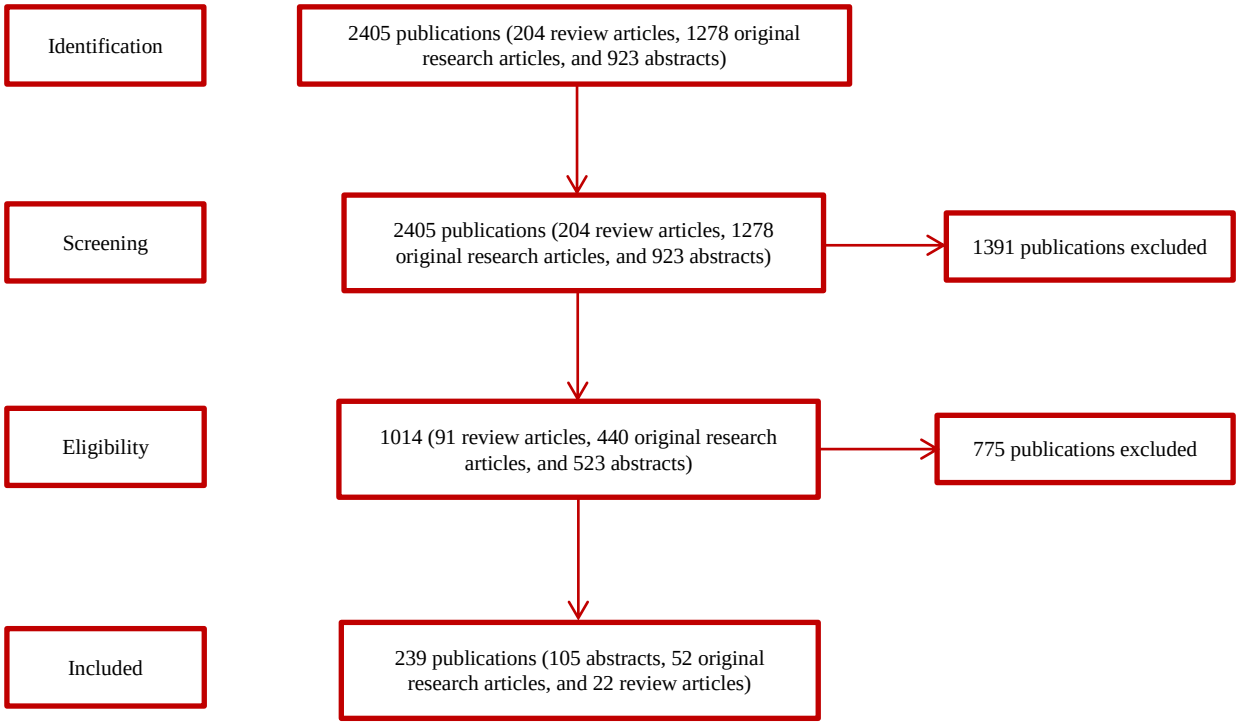

Figure 1. Searching and data extraction was based on the Cochrane protocol and checklist for review

Total of 1723 publications (145 review articles, 855 original research articles, and 723 abstracts) were analyzed and their findings are registered in checklist 1.

We selected herbal drugs based on safety in pregnancy. All steps for searching and data extraction was based on the Cochrane protocol and checklist for systematic review (Figure 1).

In addition, to find evidence on the efficacy of herbals in pregnancy, fertility and infertility, 692 publications (200 abstracts, 423 original research articles, and 59 review articles) were analyzed. The headings that were used included "herbal in pregnancy", "phytomedicine in pregnancy", "side effects of herbal in pregnancy", "herbals in pregnancy and lactation", "herbal therapy in fertility", "herbal therapy in infertility", "herbal in fertility", "herbal in infertility", "phytomedicine in infertility", "botany in pregnancy", "medicinal plants in fertility", "Chinese herbal in pregnancy", "review of herbal in pregnancy", and "Ayurvedic herbal in pregnancy". The results of this investigation were registered in checklist 2. A plant was included in the analysis if its name appeared in at least two publications. Then, the plants effective on hyperlipidemia, fertility, and pregnancy were determined after the two checklists were integrated (Table 1). Finally, the plants effectiveness on hyperlipidemia and safety during pregnancy were determined and after analysis of 110 publications, their dosage, complications, mechanisms of action, and side effects were reported (Table 2).

Results

A total of 110 plants have been reported to be effective on hyperlipidemia and 95 plants were reported to be effective on fertility and pregnancy. Overall, 12 and 55 plants have been reported to be effective on lipid and safe during pregnancy, respectively. The potential side effects, dosage, and special considerations regarding these plants are shown in table 2. Moreover, 21 plants could be used in normal diet during pregnancy but were not recommended as medicinal plants.

Discussion

Hyperlipidemia can affect maternal and fetal health. Many side effects of chemical drugs on mother and fetus have led to prevention of their use during pregnancy. In this study, we found that the effective medicinal plants on hyperlipidemia contributed greatly to reducing oxidative stress via their antioxidant properties in addition to directly exerting hypolipidemic effects.

Reactive oxygen species cause damage to the structure of different cells and tissues including heart and vessels. Napoli et al. demonstrated that low levels of superoxide dismutase (SOD) in pregnant rabbits that had hyperlipidemia for over six months led to formation of fatty streaks in the aortic arch in their fetus.[11]

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Achillea millefolium [12-14]	Yarrow	Asteraceae	Leaf	May interfere with spermatogenesis	-	-	Abortifacient, emmenagogue	Reduces fetal weight, increases placental weight, neurotoxic component, Potential harmful.	Prohibited in pregnancy, even with nutritional values
Allium cepa [15,16]	Onion	Liliaceae	Leaf, bulb	-	-	-	-	-	Lower risk of spontaneous preterm delivery
Allium sativum [17-20]	Garlic	Liliaceae	Leaf, bulb	-	Minimal risk – third trimester, crosses into the amniotic fluid	-	-	Potential abortifacient, emmenagogue, uterine stimulant	In clinical and animal studies, at doses lower than 1 g, no complications were seen This plant was used to lower preeclampsia and hyperlipidemia during pregnancy Lower risk of spontaneous preterm delivery
Aloe vera [21-25]	Cap aloe	Liliaceae	Leaf	Antifertility effect in male	-	Potentially nephrotoxic, potential hepatic dysfunction	Potentially genotoxic, mutagenic, carcinogenic	Potential abortifacient, emmenagogue Aloe vera gel – minimal risk	Prohibited in pregnancy, even with nutritional values
Anethum graveolens [26-30]	Dill	Apiaceae	Leaf, seed	Induces infertility without any effect on oocyte structure, decreases sexual potency and spermatogenesis in males	Uterine muscles of rat contracted in the presence of dill	-	-	-	Induction of labor
Apium graveolens [31]	Celery	Umbellifera	Leaf	-	Uterine stimulant, abortifacient and emmenagogue	-	-	-	-

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Artemisia vulgaris[32,33]	Mugwort	Compositae	Leaf	-	Emmenagogue and abortifacient effects	-	-	-	Prohibited in pregnancy, even with nutritional values
Arctium loppa[8]	Burdock	Compositae	Root	-	Oxytocic and uterine stimulant action	-	-	-	Prohibited in pregnancy, even with nutritional values
Avena sativa[34-36]	Oats	Germinaceae	Fruit	-	-	-	-	-	No data available
Berberris vulgaria[37]	Barberry	Berberidaceae	Root and fruit	-	-	-	May cause newborn jaundice (kernicterus)	Uterine stimulant	-
Boswellia carterii[38-40]	Indian tree	Burceraceae	Resin	An aphrodisiac and a fertility promoting agent, increases sperm motility and sperm density	-	-	-	-	There is lack of evidence on safe use of boswellia during pregnancy and lactation
Calendula officinalis[4,5, 25,41]	Marigold-calendula	Compositae	Flower	Spermicide, anti-blastocyst	-	-	Uterotonic effect	Emmenagogue, potential abortifacient, estrogenic	Topical-unknown
Chicorium intybus[42]	Chicory	Compositae	Root	-	Reduces body weight, weight gain, body length and serum free fatty acids, uterine contractions	-	-	-	Prohibited in pregnancy, even with nutritional values
Citrus limon[43-45]	Lemon	Rutaceae	Fruit	Anti-fertility effect in men	-	-	-	-	Lemon inhalation can be effective in reducing nausea and vomiting of pregnancy

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Cinnamomum verum[46-53]	Cinnamon	Lauraceae	Bark	Significant increase in reproductive organ weights, sperm motility, sperm count	-	-	-	Emmenagogue effects	Unsafe for therapeutic use during pregnancy It is not recommended to be used in food during pregnancy A uterine stimulant in high doses, but quite safe as a culinary herb; avoid the essential oil completely
Citrus paradise[54,55]	Grapefruit	Rutaceae	Fruit	-	Safe	-	-	-	At edible amounts during pregnancy, it is used as an effective antioxidant and fibrous food, over once daily is not recommended and interactions with other drugs and supplements should be taken into account
Coffea Arabica[56-63]	Arabica coffee	Rubiaceae	Seed	-	Spontaneous abortion, increased risk of stillbirth, low birth weight infants	-	Teratogenic compounds, impairs trace mineral absorption in fetus	Harmful to the fetus (crosses the placenta)	Three cups of coffee throughout the day possibly safe
Commiphora mukul[16,25,64]	Guggul	Burseraceae	Gum	-	-	-	-	Potential abortifacient, Emmenagogue, uterine stimulant	Prohibited in pregnancy, even with nutritional values
Cornus mas[65-67]	Cran berry	Cornaceae	Fruit	-	-	-	-	-	Herbal compendium reported that cranberry is of minimal risk when consumed safe in food quantities It is used to treat uterine tract infections during pregnancy

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Crataegus microphylla C. Koch[68-69]	Howthorn	Rosaceae	Leaf, fruit	-	-	-		Uterine activity	-
Dioscorea nipponica[70]	Wild yam	Dioscoreaceae	Rhizome	-	Contractile agonist for the uterus, abortion	-	-	-	-
Eleuthero coccus[71-74]	Ginseng	Araliaceae	Rhizome	-	-	-	-	-	Panax ginseng should be consumed with caution during pregnancy, especially during the first trimester
Equiestum arvense[74]	Horsetail	Equisetaceae	-	-	-	-	-	May cause autism	There are few studies about this plant and it is better not to be used in pregnancy
Eucalyptus globulus[75,76]	Eucalyptus	Myrtaceae	Leaf	Decreases fertility in male	-	-	-	-	There has been no adverse outcome in mice injected on days 6 and 15 of gestation There has been no evidence of adverse reproductive effects of eucalyptus oil in humans Topically, it is safe
Fisus carica[77]	Fig	Moraceae	Leaf and fruit	-	-	-	-	-	Fresh or dried fig fruit is likely safe in amounts found in food, but there is not enough information to know if it is safe in the larger amounts that are used as medicine Lower risk of spontaneous preterm delivery

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Ginco biloba[78-80]	Ginkgo	Ginkgoaceae	Leaf	-	Malformations including round shaped eye and orbits, syndactyly, malformed pinnae, nostrils, lips and jaws.	Unsafe when adulterated with colchicine, antiplatelet, emmenagogue, hormonal changes	Ginkgo leaf has antiplatelet activity, which may be of concern during labor as ginkgo use could prolong bleeding time	Emmenagogue, hormonal changes	Prohibited in pregnancy, even with nutritional values
Glycine soja[81,82]	Soy	Legomuminosae	Seed	-	-	-	-	-	Prohibited in pregnancy, even with nutritional values
Glycyrrhiza glabra[83,84]	Licorice	Leguminosae	Root	-	-	Likely to be born before 38 weeks of gestation, risk of pre-term pregnancy (before 37 weeks), does not affect birth weight, does not affect maternal blood pressure		Potential abortifacient, emmenagogue, uterine stimulant, causes high prolactin and estrogen levels, risk of pre-term pregnancy (before 37 weeks), does not affect birth weight	-
Hibiscus sabdariffa[85,86]	Hibiscus	Malvaceae	Flower	-	-	-	-	Decrease both pregnancy weight gain and postpartum weight loss, decrease maternal fluid and food intake with increased plasma sodium and corticosterone concentration	There is some evidence that hibiscus might start menstruation, and this could cause a miscarriage Aromatic ketones may present some hazard

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Lavandula stoechas[87-89]	Lavender	Labiatae	Leaf	-	-	-	-	Emmenagogue effects	Lavender oil had estrogenic and anti-androgenic activities Due to its purported properties as an emmenagogue, excessive internal use should be avoided during pregnancy; however, there is no definitive evidence in this area
Malus orientalis[9]	Apple	Rosaceae	Fruit	-	-	-	--		Safe in pregnancy
Medicago sativa[25,68,90,91]	Alfalfa	Leguminaceae	Leaf	Antifertility in man	Estrogenic activity			Emmenagogue, anti-gonadotrophic activity	Minimal risk in food
Nigella sativa[92,93]	Black cumin	Ranunculaceae	Seed	Nigella sativa oil L. (Ranunculaceae) and Cinnamon zeylanicum J. Presl (Lauraceae) were found to enhance fertility	Stimulation of uterine contractions, abortion	-	-	-	-
Oenothera bienni[94-96]	Evening primrose	Onagraceae	Seed	-	Teratogenic and induces labor15	May induce labor but effectiveness is unclean, increased risk of pregnancy complication (evidence level 1b), prolonged rupture of membranes, oxytocin augmentation, arrest of descent, vacuum extraction	-	-	Oral administration of evening primrose oil from the 37th gestational week until birth does not shorten gestation or decrease the overall length of labor Further, the use of orally administered evening primrose oil may be associated with an increase in the incidence of prolonged rupture of membranes, oxytocin augmentation, arrest of descent, and vacuum extraction

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Ocimum basilicom[97]	Basil	Labiatae	Leaf	-	-	-	-	Emmenagogue, abortifacient, mutagenic	-
Peganum harmala[98]	Harmala	Zygophyllaceae	Seed	-	-	-	-	-	Prohibited in pregnancy, even with nutritional values
Persea Americana[99]	Avocado	Lauraceae	Seed, fruit	-	-	-	-	-	There is not enough reliable information about the safety of taking avocado as medicine if you are pregnant or breast-feeding, stay on the safe side and stick to food amounts
Petroselinum crispu[100]	Parsley	Umbelliferae	Leaf	-	Abortifacient	-	-	Emmenagogue, estrogenic, uterine stimulant constituent	-
Plantago psyllium[101-104]	Plantain	Plantaginaceae	Leaf, seed	-	-	-	-	-	Psyllium powder could significantly decrease the number of surgeries resulting from anorectal complications, hemorrhoid diseases, anal fissure and constipation It is in concordance of several other studies which emphasized the effect of fiber in diet on preventing constipation in the course of pregnancy
Purtolaca oleraceae[105]	Purslane	Purtulaceae	Leaf	Antifertility effect in male rat	-	Abortifacient	-	-	If used in low amounts in diet, it causes no problem
Pronus avium[106]	Cherry	Rosaceae	Fruit, cherry tails	-	-	-	-	-	Sweet cherry is safe for pregnant and breast-feeding women in food amounts, but larger medicinal amounts should be avoided until more is known

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Punica granatum[107]	Pomegranate	Punicaceae	Fruit, leaf	-	-	-	-	-	Use cautiously in pregnant and breastfeeding women, due to a lack of safety data Although some animal studies show that pomegranate may induce abortion, consuming pomegranate as a food is likely safe during pregnancy There is little information available on the topical use (application to the skin) of pomegranate during pregnancy and breastfeeding
Rhus coriaria L.[108]	Sumac	Anacardiaceae	Fruit	-	-	-	-	-	Cautionary herb during pregnancy
Solanum lycopersicum[109]	Tomato	Solanaceae	Fruit	-	-	-	-	-	Safe in pregnancy
Tea sinensis[60,67,110-114]	Tea, green tea	Theaceae	Leaf	-	Spontaneous abortion, increased risk of stillbirth, low birth weight infants	-	-	Harmful to the fetus	Three cups or more of tea per day was associated with an increased risk of spina bifida
Tarraxacum officinale[68,115]	Dandelion	Compositae	Root, leaf	-	-	-	-	-	Minimal risk in food amounts No negative effects on humans have been reported during pregnancy or lactation, in children, or in combination with pharmaceutical drugs

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Terminalia chebul[116]	Haritaki	Combretaceae	Fruit	-	-	-	-	-	There is some evidence that Terminalia arjuna is possibly unsafe during pregnancy The safety of the other two species during pregnancy is unknown. It is best to avoid using any terminalia species
Thymus volgaris[117-119]	Thyme	Labiateae	Leaf	Decreases fertility in male	-	-	-	Emmenagogue, abortifacient	Topically, it is safe
Trigonella foenum[25,120, 121]	Fenugreek	Leguminosae	Seed	-	-	Pseudo-maple syrup urine disease	Potential abortifacient Uterine stimulant	Emmenagogue	Minimal risk in food
Urtica dioica[122-124]	Nettle	Urticaceae	Root, leaf	Increasing fertility in women and men, increase the quality of spermatozoa and inhibits nicotine-induced adverse effects on sperm parameters.	Induce uterine stimulation	-	-	-	Use of nettle should be avoided during pregnancy or lactation
Vitex doniana[125-128]	Black plum	Lamiaceae	Fruit	Due to treatment of hyperprolactinemia, premenstrual syndrome, abnormal menstrual cycle, amenorrhea, mastodynia, this herb can induce fertility in woman	Uterine muscle contractions and also potentiated the contractile effects of prostaglandins , ergometrine and oxytocin	-	-	-	Use of vitex agnus cactus (VAC) should be avoided during pregnancy or lactation

Table 1. Study of hypolipidemic plants and their effects on fertility and pregnancy (continue)

Scientific name	Common name	Family	Part of use	Pre pregnancy effects	Strong scientific evidence	Good scientific evidence	Fair scientific evidence	Weak scientific evidence	End result or explain certain points
Vitis vinifera[129, 130]	Grape	Vitaceae	Fruit, leaf, seed	-	-	-	-	-	Topically, it is safe The grape seed extract was non-mutagenic in mice There are no adverse outcomes in mice
Withania somnifera(L.) Dunal[131,132]	Winter cherry -	Solanaceae	Fruit	Increasing sperm motility and treatment of libido, sexual performance, sexual vigor, and penile erectile dysfunction	Abortion	-	-	-	Prohibited in pregnancy, even with nutritional values
Zingiber officinalis[133-141]	Ginger	Zingiberaceae	Root	-	Minimal risk (up to 1000 mg of dried ginger per day), unlikely cause of spontaneous abortion	Does not increase rates of major malformations	Non-mutagenic, non-teratogenic Mutagenic constituents Anti-mutagenic constituents Potential embryotoxicity	Non-teratogenic.	Ginger could be considered a harmless and possibly effective alternative option for women suffering from nausea and vomiting of pregnancy (NVP)
Zizyphus vulgaris[142,143]	Jujuba	Rhamnaceae	Fruit	Antifertility/contraception, antisteroidogenic activity and hence fertility in adult female mice It was found to arrest the normal estrus cycle of adult female mice at diestrus stage and reduced the wet weight of ovaries significantly Hematological profiles, biochemical estimations of whole blood and serum remained unaltered in extract-treated mice	Consumer safety in pregnancy has not been established	-	-	-	-

Table 2. Hypolipidemic herbs that seem safe in pregnancy

Common name	Dosage	Side effects	Special notification
Onion[144]	50 g of fresh onions or 5 g of dried drug	No health hazards or side effects are known in conjunction with the proper administration of designated therapeutic dosages The intake of large quantities can lead to stomach complaints	Popular: pressed juice and onion syrup, made of 500 g onions, 500 g water, 100 g honey and 350 g sugar
Garlic[145-147]	300 mg dry popwder or 2 g fresh garlic	Abdominal discomfort, nausea, vomiting, diarrhea and a feeling of fullness have occurred with garlic therapy	Fresh garlic is not recommended in pregnancy
Lemon[147,148]	1g dry powder infuse	No health hazards or side effects are known in conjunction with the proper administration of designated therapeutic dosages	Avoid the use of commercial liquid products because additional ingredients or fake lemon
Cranberry[147,149]	10 ripe fruit twice a day after meal, 10 ml cranberry juice twice daily after meal	Mild stomach upset and diarrhea	
Fig[147,150]	5 fruit twice daily	No health hazards or side effects are known in conjunction with the proper administration of designated therapeutic dosages	It is better to be soaked in water
Apple[147,151]	3 fruit/day	No health hazards or side effects are known in conjunction with the proper administration of designated therapeutic dosages	Apple seeds are highly toxic, avoid taking it
Psyllium[147,152]	1g in 100 ml water twice daily	Allergic reactions ranging from sneezing to chest congestion and wheezing were reported in three nurses after psyllium use	The dose should be taken 30 min to one hour after taking other medications
Cherry[147,153]	2-5 g dry powder, 10-15 fresh fruit		
Pomegranate[147,154]	10 ml of juice twice a day or 20 g pomegranate seeds twice a day or 1 tablet/day (90 mg ellagic acid)	No health hazards or side effects are known in conjunction with the proper administration of designated therapeutic dosages	Storage: pomegranate should be sealed in containers and protected from moisture
Tomato[147,155]	Three tomatoes a day, or 1 g dry powder three times/day	No health hazards or side effects are known in conjunction with the proper administration of designated therapeutic dosages	-
Grape[147, 156,157]	10 g fresh fruit, 1 g dry powder	No health hazards or side effects are known in conjunction with the proper administration of designated therapeutic dosages	
Ginger[132, 147,158]	1 g dry powder/day	Increases appetite	Not recommended more than 1 g/day

Besides, Rumbold et al.[159] and Mistry et al.[160] investigated the role of antioxidants in reducing oxidation of fatty acids and decrease in fatty streaks in fetal heart. Clinical trials have demonstrated that oxidative stress due to hyperlipidemia during pregnancy causes circulatory disorders in fetus, delayed fetal development, and increased eclampsia.

Moreover, Jenkins et al. reported that there was significant association between decrease in SOD and increase in miscarriage in pregnant women with hyperlipidemia.[161] According to the evidence, the antioxidant properties of the plants are due to polyphenols, flavonoids, flavonols, gallic acid, and anthocyanins that cause decrease in malondialdehyde (MDA) and increase in SOD, catalase, and glutathione peroxidase (GPX).[162]

Some of the potent antioxidants that not only improve hyperlipidemia in pregnant women but also play a role in protecting the cardiovascular system of the fetus and the mother are as follows: allyl propyl disulphide, sterol, saponin, and quercetin in onion, allicin, allyl di- and trisulphide, alliin, ajones, vinyldithiins in garlic, cyanidin, malvidin, peonidin, pelargonidin, petunidin and bioflavonoids in cranberry, bioflavonoids, polyphenols and triterpenoids, quercetin, catechin, phloridzin and chlorogenic acid in apple, anthocyanin (cyanidin-3-rutinoside) and phenolic compounds (flavonol p-coumaroylquinic acid) in cherry, punicalagins, ellagic acid, unicic acid, phytoestrogens, and anthocyanins in pomegranate, vitamins A, B, and E and lycopene in tomato, anthocyanin, vitamins A and E, polyphenols, oligostibenes, and ampelopsins in red grapes and zingiberene, curcumen, bisabolene, gingerols, and zerumbone in ginger.[163]

Conclusion

There are effective plants that can play a fundamental role in cardiovascular health in mother and fetus by reducing hyperlipidemia.

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Conflict of Interests

Authors have no conflict of interests.

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