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## A REVIEW OF IRANIAN MEDICINAL PLANTS WITH TERATOGENIC AND ABORTION-INDUCING SIDE EFFECTS

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**ABSTRACT:** Compounds with teratogenic effects can cause genetic defects during pregnancy and subsequently lead to unwanted abortions. Unwanted abortions and postnatal genetic defects can impose economic and psychological burden on the community. This systematic review was conducted to report medicinal plants with teratogenic and abortion-inducing side effects that are used in Iran. To conduct this systematic review, all articles specifically on the teratogenic and abortion-inducing effects of Iranian medicinal plants were retrieved from the Institute for Scientific Information (ISI) and PubMed and their findings evaluated. Many plants have been reported to display teratogenic and abortion-inducing effects, but a limited number of them were experimentally examined and demonstrated to have such effects. Certain plants such as *Perovskia abrotanoides* and *Lawsonia inermis* can simultaneously exert teratogenic and abortion-inducing effects. Plants and their derivatives can cause teratogenic effects and lead to unwanted abortion through several action mechanisms. Such plants cannot be considered harmless solely because they are natural; therefore, they should be used during pregnancy cautiously, under physician's supervision, and at specific doses.

**INTRODUCTION:** Excessive and irregular use of drugs during pregnancy can have adverse effects on fetus <sup>1-5</sup>. Meanwhile, excessive use of medicinal plants can cause toxic effects on the fetus <sup>6</sup>. There are no definite or specific guidelines for use of most plants or nature-based products in many countries, while such substances can cause adverse effects on either pregnant women or fetuses <sup>7</sup>.

Besides that, there is scant evidence on the side effects due to use of the medicinal plants and nature-based products during pregnancy <sup>8</sup>. Birth defects represent one of the dangerous side effects of herbal drugs mainly due to misconception that using such drugs is harmless. Declined quality of life, stigma, adverse effects on social relationships, psychological diseases and pressure are some of the consequences of birth defects experienced by parents and affected children <sup>9-13</sup>. In 2013, an estimate of 22.9 billion dollars was spent on hospital stays due to birth defects in the USA <sup>14</sup>. In addition, some plants can cause abortion and even endanger maternal health in some cases <sup>15</sup> such that some mothers may experience certain problems such as psychological

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trauma, anxiety, emotional problems, declined life satisfaction, and depression after unwanted abortion<sup>16-18</sup>. Indeed, some users may be unaware of the abortive effects of these plants, and no information on the medicinal plants is usually provided for physicians. Therefore, having inadequate knowledge about this field has caused numerous problems among women who have spent tremendous costs on pregnancy or are planning for pregnancy<sup>19,20</sup>.

This systematic review was conducted to report medicinal plants with teratogenic and abortive side effects that are used in Iran. To achieve this purpose, the articles on the prevention of serious side effects related to pregnancy, published in reliable journals, were examined.

**Search strategies:** To conduct the review, Anomaly, Malformation, Birth defect, Teratogen, Miscarriage, Abortion, and Stillbirth combined with Medicinal plants, Herb, and Phyto were used to search for relevant publications indexed in the Institute for Scientific Information (ISI) and PubMed. After identifying accessible articles and abstracts as well as other obtained references, we examined those publications that examined mainly the teratogenic and abortive properties of Iranian medicinal plants. The references without citation were excluded from the review.

**RESULTS:** Only 19 articles in PubMed and 41 articles in ISI were retrieved of which 27 were indexed in both databases. Further study of the articles indicated that 36 articles should be examined. After the study of the abstracts and full texts of the article, eight articles were excluded because they did not mainly address the purpose of this review. In addition, six studies investigated the plants that were reported to have no teratogenic and abortive effects. In some of the articles published in reliable databases, certain plants such as *Elaeagnus angustifolia* L.<sup>21</sup>, *Peganum harmala* L.<sup>22</sup>, and *Carthamus tinctorius* L.<sup>23</sup> were reported to exert teratogenic effects and some other plants such as *Peganum harmala* L.<sup>24, 25</sup> and saffron<sup>25, 26</sup> demonstrated to cause abortive effects. However, a few number of studies were conducted mainly to investigate the effects of these plants and their derivatives.

### Plants and phytochemicals with teratogenic side effects:

***Lavandula officinalis*:** A study investigated the rate of bone anomalies due to antiepileptic drugs and *L. officinalis* comparatively. This study demonstrated that both the essential oils of this plant and phenytoin caused femoral and tibial abnormalities and affected other growth factors negatively, and finally increased the number of abnormal fetuses in mice, but the side effects induced by phenytoin were much more severe than those due to *L. officinalis*<sup>27</sup>.

***Lawsonia inermis*:** The pulverized dried leaf of *L. inermis* is used as a cosmetic product in Iran. Seven-day administration with 100 mg/kg hydroalcoholic *L. inermis* extract caused parietal bones not to develop and extra ribs to develop in mice fetuses<sup>28</sup>.

***Perovskia abrotanoides*:** *P. abrotanoides* has several uses in Iranian traditional medicine including treatment of parasitic infections. The ethanolic extract of this plant causes certain anomalies such as spina bifida, aglossia, gastroschisis, polydactyly, and tarsal extensor as well as skeletal anomalies. However, the induced maternal toxicity was not highly severe in the studied groups<sup>29</sup>.

**Silymarin:** Silymarin is a plant-based compound. One of the main constituents of silymarin, named milk thistle, has many uses in Iranian traditional medicine including treatment of liver diseases. In addition to inducing weight loss, this plant-based compound caused craniofacial, limb, and vertebral column malformations in mice fetus. In addition, silymarin caused growth restriction in the mice and therefore should be cautiously prescribed during pregnancy<sup>30</sup>.

**HESA-A:** HESA-A is a combination of aquatic plants consisting of *latisulcatus* (king prawn; family: Penaeidae), *Carum carvi* L. (Apiaceae), *Penaeus* (Melicertus), and *Apium graveolens* L. (Apiaceae). This plant has antitumor and cytotoxic properties. However, Moallem *et al.*, studies demonstrated that HESA-A displayed teratogenic effects at 50, 100, 200, 400, and 800 mg/kg<sup>31</sup>, and 20 and 40  $\mu\text{g/L}$ <sup>32</sup> in mouse fetus.

The plants with teratogenic effects on laboratory mice and the administered doses are shown in **Table 1.**

**TABLE 1: THE MOST IMPORTANT IRANIAN MEDICINAL PLANTS WITH TERATOGENIC EFFECTS ON LABORATORY MICE**

S.no.	Name	Botanical Name	Part used/ Phytochemical	Dose	Remarks
1	<i>Silybum marianum</i>	Khar Maryam	Silymarin	50, 100 and 200 mg/kg/day	Craniofacial malformations, abnormalities in limb and vertebral column
2	<i>Lavandula officinalis</i>	Ostokhodous	Essential oil	800mg/kg for 8, 9, 12, 13 days of pregnancy	Reduced the embryo weight, CRL index, length and ossification of femur and tibia and increased the number of abnormal embryos
3	<i>Perovskia abrotanoides</i>	Barazmobl	Hydroalcoholic and aqueous extract	0.125 or 0.25 g/kg for 8-11 days	Polydactyly, spina bifida, aglossia, tarsal extensor, gastroschisis, and numerous skeletal abnormalities
4	<i>Lawsonia inermis</i>	Henna	Hydro alcoholic extract	(0.3 ml)10 and 100 mg/kg for 7 days	Parietal bones absent in embryos and more extra ribs

#### Abortive plants:

***Stachys lavandulifolia* Vahl:** Hydroalcoholic *S. lavandulifolia* extract exert effect on pituitary–gonadal axis because of containing flavonoids. In addition, this extract causes decrease in progesterone concentration and affects fetal life adversely<sup>33</sup>.

***L. inermis*:** As with teratogenic effects, hydroalcoholic *L. inermis* extract caused increase

in abortion in the laboratory mice. Mean progesterone level decreased in the treated mice<sup>34</sup>. Absus n-hexane fraction (CAF). CAF is a compound derived from *Cassia absus*. Hamidi study demonstrated that phytoestrogens present in this plant, namely chaksine and beta-sitosterol, caused hormonal disorders and missed abortions in mice<sup>35</sup>. The plants with abortive effects on laboratory mice and the administered doses are shown in **Table 2.**

**TABLE 2: THE MOST IMPORTANT IRANIAN MEDICINAL PLANTS WITH ABORTIVE EFFECTS ON LABORATORY MICE**

S.no.	Name	Botanical Name	Part used/Phytochemical	Dose	Effects
1	<i>Lawsonia inermis</i>	Hanna	Hydro alcoholic extract of leaves	1 mg/kg and 10 mg/kg	reduced the embryo weight, CRL index, length and ossification of femur and tibia and increased the number of abnormal embryos
2	<i>Cassia absus</i>	Cheshmizeh	Seed extract	100, 200, and 500 mg/kg b.wt./day	Hormonal imbalance, decline in the fertility index, and an increase in the rate of missed abortions of fetuses
3	<i>Stachys lavandulifolia</i> Vahl	Chay Koohi	Hydroalcoholic extract of shoot	50, 100, 150 and 200 mg/kg between 7-12th days of pregnancy	changes the activity level of hypothalamus-pituitary gland-gonad axis, decreases progesterone concentration, failure in fetus survival
4	<i>Perovskia abrotanoides</i>	Barazmobl	Hydroalcoholic and aqueous extract of shoot	0.125 or 0.25 g/kg for 8-11 dayes	Resorption, stillborn, fetal malformations including spina bifida, polydactyly, aglossia, tarsal extensor, numerous skeletal abnormalities and gastroschisis

As with chemical drugs, medicinal plants should be taken under physicians' supervision. Medicinal plants and herbal drugs produced from these plants display various properties<sup>36-46</sup>; however, their

effects depending on their compounds and even the concentration of these compounds in them<sup>47-58</sup>. Most conducted studies have not offered any specific action mechanism of causing gene

mutations. Malformations due to herbal drugs occur usually in the first trimester, because organogenesis occurs in this period<sup>59</sup>. In this period, estrogenic and flavonoid plant-based compounds can be considered one of the most important causes of bone changes and malformations in fetuses<sup>60</sup>. There is little information about the safety or unsafety of the herbal drugs and their derivatives<sup>61</sup>.

In addition, scant evidence exists to determine whether the side effects are caused directly by toxic effects of the drugs or the teratogenic effects are due to inappropriate use of them or associated contaminations<sup>59</sup>. Nutraceutical drug interaction is another factor for exacerbated toxic effects of the medicinal plants on fetus. For example, St. John's Wort alongside antidepressants cause several side effects<sup>8</sup>. Besides that, the incidence of side effects due to the medicinal plants is related to their doses of use<sup>30</sup>. Some studies reported that using low doses of certain plants had no effect on laboratory mice fetuses<sup>62, 63</sup>.

However, the side effects are caused by nature-based products mainly due to two factors. First, phytoestrogens present in these plants cause hormonal changes<sup>8</sup>. Although use of phytoestrogens found in the plants depends on the age, health status, and other factors, they should be used cautiously during pregnancy. For example, use of soybean should be restricted during pregnancy because of phytoestrogens<sup>64</sup>. Phytoestrogenic compounds in plants cause decrease in the ability of uterine tubes to support fetal growth and uterine ability to support implanting in blastocyte-stage<sup>64, 65</sup>.

Another cause of medicinal plants-induced abortion is apoptosis<sup>30</sup>. Programmed cell death in mammals' blastocytes (in both inner trophectoderm and cell mass) is partly essential for fetal evolution and progression to subsequent stages. Deviation from normal apoptosis causes early fetal death. Medicinal plants as an external agent, can cause disruption in this normal function and exacerbate the dysfunction by the present compounds<sup>30, 66</sup>.

It is a misconception that medicinal plants have negligible side effects compared to their numerous benefits and consequently such plants are not used

cautiously during pregnancy<sup>19</sup>. It is therefore necessary to take into consideration the adverse effects of the medicinal plants on infertility and associated toxicities<sup>60</sup>. One of the limitations of the present review is that all reviewed studies were conducted on laboratory animals, and their findings could not be definitely generalized to humans<sup>67</sup>.

**CONCLUSION:** The present review indicated that some medicinal plants or their derivatives can display teratogenic effects if used inappropriately or without physician's order, and abortive effects in the laboratory animals. Therefore, given the significance of pregnancy, it is necessary to take into account certain cautions to use them to maintain fetal and maternal health. Plants and their derivatives should not be considered harmless merely because they are natural; therefore, any medicinal plants should be used cautiously and under physician's supervision and advice.

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## REFERENCES:

1. Shabaniyan S, Kalbasi S, Shabaniyan G, Khoram B, Ganji F. The effect of metoclopramide addition to lidocaine on pain of patients with grades II and III post-episiotomy repair. *J Clin Diagn Res.* 2017; 11(4): 11-4.
2. Shabaniyan S, Khalili S, Lorigooini Z, Malekpour A, Heidari-Soureshjani S. The effect of vaginal cream containing ginger in users of clotrimazole vaginal cream on vaginal candidiasis. *J Adv Pharm Technol Res* 2017;8: 80-4.
3. Shabaniyan S, Kazemi-Vardanjani A, Bahmani M. Trichomoniasis phytotherapy: An overview of the most important medicinal plants affecting *Trichomonas vaginalis*. *J Chem Pharm Sci* 2016; 9(3):1255-62.
4. Shabaniyan G, Shabaniyan M, Shabaniyan A, Heidari-Soureshjani S. Comparison of atracurium and methocarbamol for preventing succinylcholine-induced muscle fasciculation: A randomized controlled trial. *J Adv Pharm Tech Res.* 2017; 8(2):59.
5. Shabaniyan S, Farahbod F, Rafieian M, Ganji F, Adib A. The effects of Vitamin C on sperm quality parameters in laboratory rats following long-term exposure to cyclophosphamide. *J Adv Pharm Tech Res.* 2017; 8(2):73.
6. Shirani M, Shabaniyan S, Yavangi M. A systematic review of iranian medicinal plants effective on female infertility. *J Glob Pharm Tech.* 2016; 10(8):44-9.
7. Lucas AO, Stoll BJ, Bale JR. Reducing birth defects: meeting the challenge in the developing world. Washington (DC): National Academies Press; 2003.



8. Rousseaux CG, Schachter H. Regulatory issues concerning the safety, efficacy and quality of herbal remedies. *Birth Defects Res B Dev Reprod Toxicol* 2003; 68(6):505-10.
9. Louik C, Gardiner P, Kelley K, Mitchell AA. Use of Herbal Treatments in Pregnancy. *Am J Obstet Gynecol* 2010;202(5):439.e1-.e10.
10. Singh VP, Moss TP. Psychological impact of visible differences in patients with congenital craniofacial anomalies. *Prog Orthod* 2015; 16:5.
11. Pruthi GK, Mohta A. Psychosocial burden and quality of life in parents of children with anorectal malformation. *J Indian Assoc Pediatr Surg* 2010; 15(1):15-8.
12. Coppola G, Costantini A, Tedone R, Pasquale S, Elia L, Barbaro MF, et al. The impact of the baby's congenital malformation on the mother's psychological well-being: an empirical contribution on the clubfoot. *J Pediatr Orthop* 2012;32(5):521-6.
13. Azhar AS, AlShammasi ZH, Higgi RE. The impact of congenital heart diseases on the quality of life of patients and their families in Saudi Arabia: Biological, psychological, and social dimensions. *Saudi Med J* 2016; 37(4):392-402.
14. Arth AC, Tinker SC, Simeone RM, Ailes EC, Cragan JD, Grosse SD. Inpatient Hospitalization Costs Associated with Birth Defects Among Persons of All Ages - United States, 2013. *MMWR Morb Mortal Wkly Rep.* 2017; 66(2):41-6.
15. Rasch V, Sørensen PH, Wang AR, Tibazarwa F, Jäger AK. Unsafe abortion in rural Tanzania – the use of traditional medicine from a patient and a provider perspective. *BMC Pregnancy Childbirth* 2014; 14: 419.
16. Lamb EH. The Impact of Previous Perinatal Loss on Subsequent Pregnancy and Parenting. *J Perinat Edu* 2002; 11(2): 33-40.
17. Bicking Kinsey C, Baptiste-Roberts K, Zhu J, Kjerulff KH. Effect of miscarriage history on maternal-infant bonding during the first year postpartum in the First Baby Study: a longitudinal cohort study. *BMC Women's Health* 2014; 14: 83.
18. Schwerdtfeger KL, Shreffler KM. Trauma of Pregnancy Loss and Infertility for Mothers and Involuntarily Childless Women in the Contemporary United States. *J Loss Trauma* 2009; 14(3): 211-27.
19. John LJ, Shantakumari N. Herbal Medicines Use During Pregnancy: A Review from the Middle East. *Oman Med J* 2015; 30(4):229-36.
20. Khadivzadeh T, Ghabel M. Complementary and alternative medicine use in pregnancy in Mashhad, Iran, 2007-8. *Iran J Nurs Midwifery Res* 2012; 17(4):263-9.
21. Niknam F, Azadi A, Barzegar A, Faridi P, Tanideh N, Zarshenas MM. Phytochemistry and Phytotherapeutic Aspects of *Elaeagnus angustifolia* L. *Curr Drug Discov Technol* 2016;13(4):199-210.
22. Niroumand MC, Farzaei MH, Amin G. Medicinal properties of *Peganum harmala* L. in traditional Iranian medicine and modern phytotherapy: a review. *J Tradit Chin Med.* 2015; 35(1):104-9.
23. Nobakht M, Fattahi M, Hoormand M, Milanian I, Rahbar N, Mahmoudian M. A study on the teratogenic and cytotoxic effects of safflower extract. *J Ethnopharmacol* 2000; 73(3):453-9.
24. Moloudizargari M, Mikaili P, Aghajanshakeri S, Asghari MH, Shayegh J. Pharmacological and therapeutic effects of *Peganum harmala* and its main alkaloids. *Pharmacogn Rev* 2013; 7(14):199-212.
25. Mollazadeh H, Emami SA, Hosseinzadeh H. Razi's Al-Hawi and saffron (*Crocus sativus*): a review. *Iran J Basic Med Sci* 2015; 18(12):1153-66.
26. Gohari AR, Saeidnia S, Mahmoodabadi MK. An overview on saffron, phytochemicals, and medicinal properties. *Pharmacogn Rev* 2013; 7(13):61-6.
27. Bahmanpour S, Bahaadinie F, Dehkordi AJ, Akhondi F. A comparison between osteogenic index, gross and skeletal abnormalities in the embryo of treated-mice with herbal *Lavandula officinalis* and those with chemical phenytoin antiepileptic drugs. *J Appl Anim Res.* 2008; 33(1):85-8.
28. Jafarzadeh L, Seifi N, Shahinfard N, Sedighi M, Kheiri S, Shirzad H, et al. Antioxidant Activity and Teratogenicity Evaluation of *Lawsonia inermis* in BALB/c Mice. *J Clin Diagn Res* 2015; 9(5): FF01-4.
29. Moallem SA, Niapour M. Study of embryotoxicity of *Perovskia abrotanoides*, an adulterant in folk-medicine, during organogenesis in mice. *J Ethnopharmacol* 2008; 117(1):108-14.
30. Gholami M, Moallem SA, Afshar M, Amoueian S, Etemad L, Karimi G. Teratogenic effects of silymarin on mouse fetuses. *Avicenna J Phytomed* 2016; 6(5):542-9.
31. Moallem SA, Ahmadi A, Moshafi M, Taghavi MM. Teratogenic effects of HESA-A, a natural anticancer product from Iran, in mice. *Hum Exp Toxicol* 2011; 30(8): 851-9.
32. Moallem SA, Ahmadi A, Niapour M, Hosseini T, Habibi G. Role of apoptosis in HESA-A teratogenicity in mouse fetus. *Drug Chem Toxicol* 2009; 32(3):186-90.
33. Jafarzadeh L, Rafieian-Kopaei M, Samani RA, Asgari A. The Effect of Hydroalcoholic Extract of *Stachys lavandulifolia* Vahl on Pregnant Mice. *EXCLI J* 2012; 11: 357-62.
34. Esteki R, Miraj S. The Abortifacient Effects of Hydroalcoholic Extract of *Lawsonia inermis* on BALB/c Mice. *Electronic Physician* 2016;8(6):2568-75.
35. Hamed A, Khoshnoud MJ, Tanideh N, Abbasi F, Fereidoonnezhad M, Mehrabani D. Reproductive Toxicity of *Cassia absus* Seeds in Female Rats: Possible Progesteronic Properties of Chaksine and b-Sitosterol. *Pharm Chem J* 2015; 49(4): 268-74.
36. Mirhoseini M, Moradi MT, Asadi-Samani M. Traditionally used medicinal plants in the treatment of kidney stone: a review on ethnobotanical studies in Iran. *Ambient Sci* 2016; 3(2):16-21.
37. Raeisi R, Heidari-Soureshjani S, Asadi-Samani M, Luther T. A systematic review of phytotherapies for newborn jaundice in Iran. *Int J Pharm Sci Res* 2017; 8(5): 1953-58. doi: 10.13040/IJPSR.0975-8232.8(5).1953-58.
38. Nikfarjam M, Bahmani M, Heidari-Soureshjani S. Phytotherapy for depression: A review of the most important medicinal plants of flora of Iran effective on depression. *J Chem Pharm Sci* 2016; 9(3):1242-7.
39. Nikfarjam M, Bahmani M, Heidari-Soureshjani S. Phytotherapy for anxiety in Iran: A review of the most important Anti-anxiety medicinal plants. *J Chem Pharm Sci* 2016; 9(3):1235-41.
40. Moradi B, Heidari-Soureshjani S, Asadi-Samani M, Yang Q, Saeeidi –Boroujeni A: Efficacy and mechanisms of medicinal plants as immunotherapy in treatment of allergic rhinitis: A systematic review. *Int J Pharm Sci Res* 2017; 8(5): 1892-99. doi: 10.13040/IJPSR.0975- 8232.8(5).1892-99.
41. Baharvand-Ahmadi B and Asadi-Samani M. A mini-review on the most important effective medicinal plants to treat hypertension in ethnobotanical evidence of Iran. *J Nephropharmacol* 2017; 6(1): 3-8.

42. Asadi-Samani M, Rafieian-Kopaei M, Azimi N. Gundelia. a systematic review of medicinal and molecular perspective. Pak J Biol Sci 2013; 16(21):1238-47.
43. Mahmoudian-Sani MR, Luther T, Asadi-Samani M, Saeedi-Boroujeni A, Gholamian N. A new approach for treatment of type 1 diabetes: Phytotherapy and phytopharmacology of regulatory T cells. J Renal Inj Prev 2017; 6(3):158-163.
44. Afkhami-Ardakani M, Hassanzadeh S, Shahrooz R, Asadi-Samani M, Latifi M, Luther T. Phytotherapy and phytopharmacology for reduction of cyclophosphamide-induced toxicity in the male urinary system. J Renal Inj Prev 2017; 6(3):164-170.
45. Asadi-Samani MA, Moradi MT, Mahmoodnia L, Alaei S, Asadi-Samani F, Luther T. Traditional uses of medicinal plants to prevent and treat diabetes; an updated review of ethnobotanical studies in Iran. J Nephropathol 2017; 6(3):118-125.
46. Gholamian-Dehkordi N, Luther T, Asadi-Samani M, Mahmoudian-Sani MR. An overview on natural antioxidants for oxidative stress reduction in cancers; a systematic review. Immunopathol Persa 2017; 3(2): 12.
47. Moradi MT, Karimi A, Alidadi S, Ghasemi-Dehkordi P, Ghaffari-Goosheh MS. Cytotoxicity and in vitro antioxidant potential of *Quercus Brantii* acorn extract and the corresponding fractions. Int J Pharmacogn Phytochem Res 2016; 8(4):558-62.
48. Karimi A, Mohammadi-Kamalabadi M, Rafieian-Kopaei M, Amjad L, Salimzadeh L. Determination of antioxidant activity, phenolic contents and antiviral potential of methanol extract of *Euphorbia spinidens* Bornm (Euphorbiaceae). Trop J Pharm Res 2016; 15(4):759-64.
49. Karimi A, Moradi MT, Alidadi S, Hashemi L. Anti-adenovirus activity, antioxidant potential, and phenolic content of black tea (*Camellia sinensis* Kuntze) extract. J Complement Integr Med. 2016; 13(4):357-63.
50. Asadi-Samani M, Bahmani M, Rafieian-Kopaei M. The chemical composition, botanical characteristic and biological activities of *Borago officinalis*: a review. Asian Pac J Trop Med 2014; 7S1:S22-8.
51. Rafieian-Kopaei M, Baradaran A. Plants antioxidants: From laboratory to clinic. J Nephropathol 2013; 2(2): 152-153.
52. Mansouri E, Asadi-Samani M, Kooti W, Ghasemiboroon M, Ashtary-Larky D, Alamiri F, et al., Anti-fertility effect of hydro-alcoholic extract of fennel (*Foeniculum vulgare* Mill) seed in male Wistar rats. J Vet Res 2016; 60(3): 357-363.
53. Kooti W, Hasanzadeh-Noohi Z, Sharafi-Ahvazi N, Asadi-Samani M, Ashtary-Larky D. Phytochemistry, pharmacology, and therapeutic uses of black seed (*Nigella sativa*). Chin J Nat Med 2016; 14(10): 732-745.
54. Bahmani M, Sarrafchi A, Shirzad H, Rafieian-Kopaei M. Autism: Pathophysiology and promising herbal remedies. Curr Pharm Des 2016; 22(3):277-285. DOI: 10.2174/1381612822666151112151529.
55. Rafieian-Kopaei M, Shahinfard N, Rouhi-Boroujeni H, Gharipour M, Darvishzadeh-Boroujeni P. Effects of *Ferulago angulata* extract on serum lipids and lipid peroxidation. Evid Based Complement Alternat Med 2014; 2014: 680856. doi: 10.1155/2014/680856.
56. Sarrafchi A, Bahmani M, Shirzad H, Rafieian-Kopaei M. Oxidative stress and Parkinson's disease: New hopes in treatment with herbal antioxidants. Curr Pharm Des 2016; 22(2): 238 – 246. DOI: 10.2174/1381612822666 15111 2151653
57. Rouhi-Boroujeni H, Heidarian E, Rouhi-Boroujeni H, Deris F, Rafieian-Kopaei M. Medicinal Plants with multiple effects on cardiovascular diseases: a systematic review. Curr Pharm Des 2017; 23(7): 999-1015. DOI: 10.2174/1381612822666161021160524.
58. Akhlaghi M, Shabaniyan G, Rafieian-Kopaei M, Parvin N, Saadat M, Akhlaghi M. *Citrus aurantium* Blossom and preoperative anxiety. Rev Bras Anesthesiol 2011; 61(6):702-12.
59. Chuang CH, Doyle P, Wang JD, Chang PJ, Lai JN, Chen PC. Herbal medicines used during the first trimester and major congenital malformations: an analysis of data from a pregnancy cohort study. Drug Safety 2006;29(6):537-48.
60. Gradolatto A, Basly JP, Berges R, Teyssier C, Chagnon MC, Siess MH, et al. Pharmacokinetics and metabolism of apigenin in female and male rats after a single oral administration. Drug Metab Dispos 2005; 33(1):49-54.
61. Sachdeva P, Patel BG, Patel BK. Drug Use in Pregnancy; a Point to Ponder! India J Pharm Sci 2009; 71(1):1-7.
62. Etemad L, Zafari R, Moallem SA, Vahdati-Mashhadian N, Skouei Shirvan Z, Hosseinzadeh H. Teratogenic Effect of Verbascoside, Main Constituent of *Lippia citriodora* Leaves, in Mice. Iran J Pharm Res 2016; 15(2):521-5.
63. Golalipour MJ, Ghafari S, Maleki A, Kiani M, Asadi E, Farsi M. Study of Embryotoxicity of *Mentha piperita* L. During Organogenesis in Balb/c Mice. Int J Morphol 2011; 29(3):862-7.
64. Patisaul HB, Jefferson W. The pros and cons of phytoestrogens. Front Neuroendocrinol 2010; 31(4):400-19.
65. Jefferson WN, Padilla-Banks E, Goulding EH, Lao SP, Newbold RR, Williams CJ. Neonatal exposure to genistein disrupts ability of female mouse reproductive tract to support preimplantation embryo development and implantation. Biol Reprod 2009;80(3):425-31.
66. Torchinsky A, Fein A, Toder V. Teratogen-induced apoptotic cell death: does the apoptotic machinery act as a protector of embryos exposed to teratogens? Birth Defects Res C Embryo Today 2005; 75(4):353-61.
67. Kennedy DA, Lupattelli A, Koren G, Nordeng H. Safety classification of herbal medicines used in pregnancy in a multinational study. BMC Complement Altern Med 2016; 16(1):102.

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