



Received on 16 November, 2016; received in revised form, 30 March, 2017; accepted, 04 April, 2017; published 01 May, 2017

## A SYSTEMATIC REVIEW OF PHYTOTHERAPIES FOR NEWBORN JAUNDICE IN IRAN

Roya Raeisi <sup>1</sup>, Saeid Heidari-Soureshjani <sup>2</sup>, Majid Asadi-Samani <sup>\*3</sup> and Tahra Luther <sup>4</sup>

Department of Pediatrics <sup>1</sup>, Faculty of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran.

Cellular and Molecular Research Center <sup>2</sup>, Medical Plants Research Center <sup>3</sup>, Shahrekord University of Medical Sciences, Shahrekord, Iran.

University of Michigan <sup>4</sup>, Department of General Surgery, Ann Arbor, Michigan, USA.

### Keywords:

Phytotherapy,  
Neonatal jaundice,  
Traditional medicine, Iran

### Correspondence to Author:

**Majid Asadi-Samani**

Ph.D


3 Medical Plants Research Center,  
Shahrekord University of Medical  
Sciences, Shahrekord, Iran.

**E-mail:** biology\_2011@yahoo.com

**ABSTRACT:** Neonatal jaundice is one of the most common diseases among neonates that may cause irreparable complications such as kernicterus. This systematic review article was conducted to report and introduce medicinal plants that are used to treat neonatal jaundice in Iranian traditional medicine. To conduct this systematic review, the terms jaundice and icterus combined with the terms ethnobotanical, ethno-medicinal plants, ethnopharmacology, phytotherapy, and Iran were used to search for potentially relevant publications in Google Scholar, and Scientific databases ISI, PubMed, and Scopus. According to ethnobotanical evidence, six plant species from five families consisting of *Cotoneaster discolor*, *Ziziphus jujube* Miller, *Hordeum vulgare* L., *Alhagi graecorum* Boiss, *Fumaria parviflora*, and *Chicorium intybus* have been more frequently reported to be used to treat neonatal jaundice in Iran on which a number of studies have been conducted. However, a combination of two or more number of these plants has been reported to be used for treating neonatal jaundice. Although the plants and their compounds cause reduction in neonatal jaundice through different mechanisms of action, they cannot be considered an independent treatment in most cases. Therefore, it is recommended to use plants and their compounds as a complementary treatment to reduce bilirubin.

**INTRODUCTION:** Newborn jaundice is one of the common health care issues in Iran <sup>1</sup> and the world such that around 80% of preterm infants and 60 % of term infants develop this condition <sup>2</sup>. This disease occurs on the first days of life for several reasons such as giving birth in places other than general hospitals, polymorphism UGT1A1, low gestational age, low birth weight, sepsis, and high transcutaneous/total serum <sup>3</sup>, reasons due to dissolving hematoma,

a blood incompatibility between mother and fetus or bruises on the baby's body, metabolic diseases and liver diseases <sup>2, 4</sup>, G6PD deficiency as well as unknown reasons <sup>1</sup>. Newborn jaundice is a complication that is easily diagnosed but requires to adopt a therapeutic approach quickly <sup>5</sup>, because this complication may lead to a destructive complication named encephalopathy bilirubin or kernicterus if left untreated <sup>6</sup>, and can cause neurological disorders, cerebral palsy, auditory nerve damage, choreoathetoid, and other problems <sup>7</sup>. From medical perspective, neonatal hyperbilirubinemia is categorized into different types the most important of which are neonatal jaundice and hemolytic jaundice. Phototherapy, use of chemical drugs, and vaccination are effective to treat and prevent hyperbilirubinemia <sup>5</sup>.

<b>QUICK RESPONSE CODE</b>	<b>DOI:</b> 10.13040/IJPSR.0975-8232.8(5).1953-58
	Article can be accessed online on: <a href="http://www.ijpsr.com">www.ijpsr.com</a>
DOI link: <a href="http://dx.doi.org/10.13040/IJPSR.0975-8232.8(5).1953-58">http://dx.doi.org/10.13040/IJPSR.0975-8232.8(5).1953-58</a>	

Phototherapy is one of the most important approaches to treat neonatal hyperbilirubinemia that has been used in the modern medicine for some decades<sup>8-10</sup>. However, certain short-term complications such as thermal imbalance, electrolyte imbalance, dehydration of the body, interfering with emotional interaction between mother and infant, tan baby syndrome, and circadian rhythm disorders in infants have been reported to occur after use of phototherapy<sup>11</sup>.

Besides that, induction of changes and mutations in DNA<sup>12</sup> and reduced duration of exclusive breastfeeding<sup>13</sup> are some other complications due to phototherapy. Therefore, it is necessary to seek out alternative therapeutic approaches with fewer side effects and use of medicinal plants to treat diseases has attracted much attention<sup>14-22</sup>. Iranians use several medicinal plants and plant-based compounds alongside conventional treatments as well<sup>23-31</sup>. Certain reasons such as fewer side effects, lower costs, more convenient access, and higher satisfaction with medicinal plants have caused mothers to use them for neonatal jaundice<sup>32</sup>. This systematic review was conducted to report and describe the medicinal plants whose use in treating neonatal jaundice in Iran through reviewing the ethnobotanical evidence and clinical studies. Phytotherapy choices in Iranian traditional medicine can help pharmacists and other researchers develop more effective drugs for treatment of neonatal jaundice. To conduct this review article, the terms jaundice and icterus combined with the terms ethnobotanical, ethnomedicinal plants, ethnopharmacology, phytotherapy, and Iran were used to search for potentially relevant publications indexed in databases ISI, PubMed, and Scopus. Besides that, the researchers searched for relevant library references to medicinal plants that addressed

traditional use of medicinal plants. After retrieval of relevant publications, the abstracts and other references retrieved by the researchers were analyzed and only those related to the plants whose effects in reducing neonatal jaundice according to the traditional medicine were investigated in experimental and clinical studies were selected. The articles and references without any citation were excluded from final analysis.

**Phytotherapy with the plants effective on neonatal jaundice:** In different regions of Iran, several phyto-therapies are used to treat jaundice in patients at different ages and are still being used. Certain plants such as *Cynara scolymus* L., *Coriandrum sativum* L., *Rhuscoriaria* L., *Silybum marianum* (L.) Gaertn., *Berberis integerrima* Bunge, *Descurainia sophia* (L.) Webb ex Prantl, *Alhag igraecorum* Boiss., *Astragalus fasciculifolius* subsp. *arbusculus* (Bornm. and Gauba) Tietz, *Cassia fistula* L., *Tamarindus indica* L., *Salvia macrosiphon* Boiss., *Malva sylvestris* L., *Fumaria vaillantii* Loisel., *Phyllanthus emblica* L., *Plantago major* L., *Plantago ovate* Forssk., *Rheum ribes* L., *Rumex acetosella* L., *Polypodium vulgare* L., *Embelia ribes* Burm.f., *Adiantum capillus-veneris* L., *Ziziphus jujuba* Miller, *Cotoneaster nummularius* Fisch. and C.A. Mey., *Salix alba* L., *Salix excelsa* J.F. Gmel., *Viola odorata* L., and *Tribulus terrestris* L. are among the drugs that are used to treat jaundice<sup>33</sup>. However, because neonatal jaundice is a highly important issue and plant administration to neonates can put their health at risk, therefore we exclusively investigated the plants that have been reported to be effective on jaundice. In ethnobotanical studies and evidence of Iran, six plant species from five families are more frequently used to treat neonatal jaundice and also additional studies have investigated their effects (**Table 1**).

**TABLE 1: THE MOST IMPORTANT PLANTS USED TO TREAT NEONATAL JAUNDICE IN IRAN**

Sl. no	Family name	Botanical name	Local name	Part used	Preparation
1	Rhamnaceae	<i>Cotoneaster discolor</i>	Shirkhesht	Manna	Drop
2		<i>Ziziphus jujuba</i> Miller	Annab	Fruit	Extract/ Soak
3	Poaceae	<i>Hordeum vulgare</i> L.	Ard-e-jo	Seed	Flour
4	Fabaceae	<i>Alhagi graecorum</i> Boiss.	Taranjabin	Manna	Soak
5	Fumariaceae	<i>Fumaria parviflora</i>	Shahtare	Aerial parts	Soak
6	Asteraceae	<i>Chicorium intybus</i>	Kasni	Aerial parts/Roots	Soak

**Cotoneaster:** Cotoneaster is a yellowish white substance which is derived from the gum of a tree

called *Purgative manna* from Rosaceae family. Ethnobotanical studies of Iran have demonstrated

that administration of mothers or newborns with low doses of cotoneaster could be effective in treating neonatal jaundice<sup>34, 35</sup>. A study demonstrated that use of cotoneaster by mothers and newborns could lead to decreased bilirubinemia in the newborns. However, the decrease was more marked in the newborns that were directly administered<sup>36</sup>. Besides that, Khoshdel *et al.*, study demonstrated that administration with cotoneaster alongside conventional method could help decrease indirect bilirubin and shorten hospital stay<sup>37</sup>. In a clinical trial, the infants were assigned to two groups and each group was separately administered with cotoneaster and placebo while all infants underwent phototherapy. The findings demonstrated that cotoneaster caused rapid decrease in the symptoms of the disease and was associated with acceleration of recovery in hospitalized infants<sup>38</sup>. Azadbakht *et al.*, prepared a cotoneaster drop and conducted microbiological experiments on it before administration. The findings demonstrated that decrease in bilirubin level to lower than 10 mg/dl was shorter in cotoneaster-administered group than in control group<sup>39</sup>. Moreover, in a study on 200 infants with icterus, the bilirubin levels of the infants were controlled by spectrophotometry and the findings demonstrated that after administration with cotoneaster-based drop, 88% of the infants that were treated with cotoneaster were recovered after three days, but only 21% of the infants treated with phototherapy alone were recovered fully<sup>40</sup>.

Other studies have reported that use of cotoneaster is useful for neonatal jaundice but have subjected it to simultaneous use standard treatment<sup>41</sup>. However, only a study on the effect of cotoneaster drop reported that the decrease in bilirubin level was not significantly different<sup>42</sup>. According to the available evidence, cotoneaster can be suggested a standard product alongside phototherapy to decrease neonatal jaundice and have pharmacists take it into account.

**Ziziphus jujube:** *Z. jujuba*, commonly called jujube, is used as a fresh or dried fruit. Ethnobotanical studies and review articles have indicated that *Z. jujube* has hypo-bilirubinemic properties and can be used to treat jaundice<sup>33-35, 41, 43</sup>. A study demonstrated that 1 mg/kg of *Z. jujube*

extract caused decrease in the serum bilirubin levels of infants after 12 days<sup>44</sup>.

**Hordeum vulgare:** *H. vulgare* has long been used to treat different diseases including jaundice according to Iranian traditional medicine<sup>32, 45</sup>. In a study, infants were assigned to two groups of 45 each, cases and controls. In the case group, soft and smooth *H. vulgare* flour was sprinkled on all parts of the body except for around the umbilicus and face. In the control group, the infants were treated with phototherapy alone. The findings demonstrated that use of this plant caused decrease in both hospital stay and bilirubin level<sup>45</sup>.

**Chicorium intybus:** *C. intybus* is known as a widely accepted drug among the therapists of Iranian traditional medicine and infants are washed with this plant so that they can use its anti-jaundice properties or water-diluted essence of this plant can be orally administered to the plants. Besides that, mixture of *C. intybus* with cotoneaster and manna and then oral use of this mixture by mothers is another approach to administer this plant<sup>32</sup>. A study on synergistic effect of some plants on neonatal jaundice found that among the extracts of certain plants such as *C. intybus*, *Alhagi pseudoalhagi*, *Z. jujuba*, *F. parviflora*, only *C. intybus* caused a significant decrease in the bilirubin levels of the infants through affecting bilirubin directly<sup>42</sup>.

**Manna:** Manna is a gum that is derived from the leaf and branch of a plant named Alhagi. Ethnobotanical studies have shown that in Iran, oral use of manna, alone or in combination with cotoneaster, by mother or infant (at lower doses) and washing infant with infusion manna is effective in treating jaundice<sup>32, 34, 35</sup>. Saboute *et al.*, studied the effect of oral manna on jaundice in hospitalized infants and reported that manna was not effective on neonatal jaundice as a plant-based drug<sup>46</sup>. Moreover, a study showed that use of manna extract caused no significant difference in infants' bilirubin levels between before and after use<sup>42</sup>. In addition, a clinical trial determined that use of manna caused no significant effect on decrease in neonatal jaundice and therefore this plant cannot be used as a hypobilirubinemic drug<sup>47</sup>. However, it is necessary to investigate the difference in methods to use this extract between traditional medicine and modern medicine in additional studies.

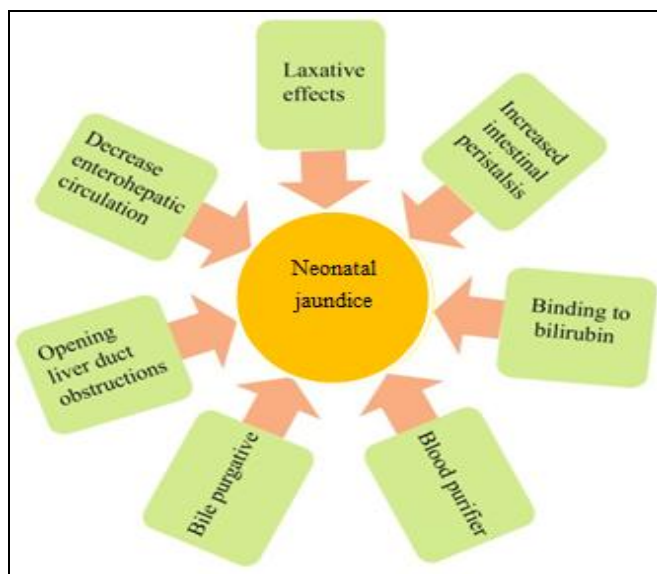


***Fumaria parviflora*:** *F. parviflorais* from family Fumariaceae and is orally used as boiled and/or alongside brown sugar and *Sisymbrium irio*. This plant is used as an ethnobotanical treatment for neonatal jaundice<sup>32, 34</sup>. However, some clinical trials have confirmed that this plant has no effect in treating neonatal jaundice<sup>42, 43</sup>. Some other plants, including *Descurainia sophia*, *Saccharum officinarum*, *Salix alba*, *Viola odorata*, and *Prunus domestica*, have been used to treat neonatal jaundice and have been less frequently investigated in additional studies despite use of them in traditional medicine<sup>32, 34, 35</sup>. In some cases for which plant-based essences and extracts are used, it is likely that a combination of these plant-based compounds is used. The main component of most of these combinations is cotoneaster extract<sup>32</sup>.

This review was conducted to report the plants and plant-based compounds that are effective on neonatal jaundice according to ethnobotanical studies and clinical trials. Several plants are used to treat jaundice by people and therapists due to having cold nature according to traditional medicine. These plants and their compounds cause decrease in bilirubin in neonatal jaundice through different methods. Increased activities of liver enzymes and enterohepatic circulation are some mechanisms that have been taken into account more frequently. Some plants decompose bilirubin directly and cause serum levels of bilirubin to decrease<sup>43</sup>. Increased frequency of urination and defecation that cause decrease in entero-hepatic circulation is another mechanism that has been considered especially for use of *Z. jujube* fruit<sup>44</sup>. For cotoneaster, no mechanism to decrease bilirubin has yet been raised but it has been confirmed that that this plant-based compound cause excretion of bilirubin via defecation and therefore decrease in neonatal jaundice<sup>36</sup>. Taken together, the action mechanisms of plants and their compounds to excrete bilirubin offered by most studies are illustrated in **Fig. 1**. But, it is obvious that more accurate physiochemical studies are needed to determine the action mechanisms of the plants and plant-based compounds.

However, some other plants such as *H. vulgare*, because of containing antioxidant phenolic compounds<sup>48, 49</sup>, cause decrease in oxidative stress markers and increase in antioxidant markers and

therefore terminate incidence of harmful histological and biochemical changes in the liver<sup>50</sup>, and regulate liver enzymes activities<sup>51</sup>. Actually natural compounds such as medicinal plants via their antioxidant activities can decrease oxidative stress and in this way prevent of a lot of disease<sup>52-59</sup>.



**FIG. 1: ACTION MECHANISMS OF MEDICINAL PLANTS AND THEIR COMPOUNDS TO DECREASE NEONATAL JAUNDICE**

**CONCLUSION:** Most studies consistently recommended use of phytotherapeutic properties of the plants as an alternative treatment alongside modern medicine, because plant-based treatments have a slower process, and for neonatal jaundice that may lead to irreparable complications such as kernicterus, decreased duration of treatment is a very important and essential issue. Therefore, it can be argued that plant-based treatments as alternative medicine can be used alongside standard and advanced treatments so that the level of bilirubin, duration of hospital stay, and related complications may be decreased. However, it is necessary to investigate the active compounds of the plants on decrease in indirect bilirubin more accurately. So, new phytotherapy choices in Iranian traditional medicine can help pharmacists and other researchers to develop more effective drugs for treatment of neonatal jaundice.

**CONFLICTS OF INTEREST:** There is no conflict of interest to declare.

**FUNDING / SUPPORT:** None.

**REFERENCES:**

- Najib KS, Saki F, Hemmati F and Inaloo S: Incidence, Risk Factors and Causes of Severe Neonatal Hyperbilirubinemia in the South of Iran (Fars Province). Iranian Red Crescent Medical Journal 2013; 15(3): 260-263.
- National Institute for Health and Care Excellence. Neonatal jaundice London: Royal College of Obstetricians and Gynaecologists; 2010.
- Olusanya BO, Osibanjo FB and Slusher TM: Risk factors for severe neonatal hyperbilirubinemia in low and middle-income countries: A systematic review and meta-analysis. PLoS ONE 2015; 10(2): e0117229.
- Kalakhetti BK, Singh R, Bhatta NK, Karki A and Baral N: Risk of neonatal hyperbilirubinemia in babies born to 'O' positive mothers: a prospective cohort study. Kathmandu University Medical Journal 2009; 7(25): 11-15.
- Ullah S, Rahman K and Hedayati M: Hyperbilirubinemia in neonates: types, causes, clinical examinations, preventive measures and treatments: a narrative review article. Iranian Journal of Public Health 2016; 45(5): 558-568.
- Xie B, da Silva O and Zaric G: Cost-effectiveness analysis of a system-based approach for managing neonatal jaundice and preventing kernicterus in Ontario. Paediatrics and Child Health 2012; 17(1): 11-16.
- Maisels MJ: Managing the jaundiced newborn: a persistent challenge. Canadian Medical Association Journal 2015; 187(5): 335-343.
- Rennie J, Burman-Roy S, Murphy MS and Group GD: Neonatal jaundice: summary of NICE guidance. BMJ 2010; 340(19): c2409.
- Sherbiny HS, Youssef DM, Sherbini AS, El-Behedy R and Sherief LM: High-intensity light-emitting diode vs fluorescent tubes for intensive phototherapy in neonates. Paediatrics and International Child Health 2016; 1-7.
- Moerschel SK, Cianciaruso LB and Tracy LR: A practical approach to neonatal jaundice. American Family Physician 2008; 77(9): 1255-1262.
- Xiong T, Tang J and Mu DZ: Side effects of phototherapy for neonatal hyperbilirubinemia. Chinese Journal of Contemporary Pediatrics 2012; 14(5): 396-400.
- Ramy N, Ghany EA, Alsharany W, Nada A, Darwish RK, Rabie WA and Aly H: Jaundice, phototherapy and DNA damage in full-term neonates. Journal of Perinatology 2016; 36(2): 132-136.
- Waite WM and Taylor JA: Phototherapy for the treatment of neonatal jaundice and breastfeeding duration and exclusivity. Breastfeeding Medicine 2016; 11: 180-185.
- Nasri H, Baradaran A, Shirzad H and Rafeiean-Kopaei M: New concepts in nutraceuticals as alternative for pharmaceuticals. International Journal of Preventive Medicine 2015; 5(12): 1487-1499.
- Asadi-Samani M, Bahmani M and Rafeiean-Kopaei M: The chemical composition, botanical characteristic and biological activities of *Borago officinalis*: a review. Asian Pacific Journal of Tropical Medicine 2014; 7S1: S22-28.
- Asadi-Samani M, Rafeiean-Kopaei M and Azimi N: *Gundelia*: a systematic review of medicinal and molecular perspective. Pakistan Journal of Biological Sciences 2013; 16(21): 1238-1247.
- Kooti W, Ahangarpour A, Ghasemiboroon M, Sadeghnezhadi S, Abbasi Z, Shanaki Z, Hasanzadeh-Noohi Z and Asadi-Samani M: Effect of apium graveolens leaf extract on serum level of thyroid hormones in male rat. Journal of Babol University of Medical Sciences 2014; 16(11): 44-50.
- Kooti W, Hasanzadeh-Noohi Z, Sharafi-Ahvazi N, Asadi-Samani M and Ashtary-Larky D: Phytochemistry, pharmacology, and therapeutic uses of black seed (*Nigella sativa*). Chinese Journal of Natural Medicines 2016; 14(10): 732-745.
- Mahmoudian-Sani MR, Luther T, Asadi-Samani M, Saeedi-Boroujeni A and Gholamian N: A new approach for treatment of type 1 diabetes: Phytotherapy and phytopharmacology of regulatory T cells. Journal of Renal Injury Prevention 2017; 6(3): 158-163.
- Rouhi-Boroujeni H, Mosharraf S, Gharipour M, Asadi-Samani M and Rouhi-Boroujeni H: Antihyperlipidemic effects of sumac (*Rhus coriaria* L.): Can sumac strengthen anti-hyperlipidemic effect of statins. Der Pharmacia Lettre 2016; 8: 143-147.
- Sani MRM, Asadi-Samani M, Rouhi-Boroujeni H and Banitalebi-Dehkordi M: Phytopharmacology and phytotherapy of regulatory T cells: A new approach to treat multiple sclerosis. Der Pharmacia Lettre 2016; 8(3): 215-220.
- Sani MRM, Asadi-Samani M, Saeedi-Boroujeni A, Banitalebi-Dehkordi M and Bahmani M: Suppressive effects of medicinal plants and their derivatives on inflammasome complex: A systematic review. International Journal of PharmTech Research 2016; 9(6): 325-335.
- Asadi-Samani M, Kooti W, Aslani E and Shirzad H: A systematic review of Iran's medicinal plants with anticancer effects. Journal of Evidence-Based Complementary & Alternative Medicine 2016; 21(2): 143-153.
- Ahmadipour S, Ahmadipour S, Mohsenzadeh A and Asadi-Samani M: The importance of some native medicinal plants of Iran effective on gastrointestinal disorders in children: A review. Der Pharmacia Lettre 2016; 8(1): 61-66.
- Asadi-Samani M, Moradi MT, Bahmani M and Shahrani M: Antiviral medicinal plants of Iran: A review of ethnobotanical evidence. International Journal of PharmTech Research 2016; 9(5): 427-434.
- 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. Journal of Nephro pharmacology 2017; 6(1): 3-8.
- Cheraghi M and Asadi-Samani M: Hematopoietic medicinal plants based on ethnobotanical documents of Iran: A strategy to develop nature-based drugs effective on anemia. Der Pharmacia Lettre 2016; 8(5): 393-399.
- Cheraghi M and Asadi-Samani M: Atherosclerosis: Pathophysiology and promising herbal remedies in traditional Persian medicine. Der Pharmacia Lettre 2016; 8(5): 58-66.
- Mardani M, Rezapour S, Eftekhari Z, Asadi-Samani M, Rashidipour M, Afsordeh O, Kazemzadeh F and Bahmani F: Chemical composition of elamit *scrophularia deserti*. International Journal of PharmTech Research 2016; 9(6): 285-290.
- Moradi MT, Asadi-Samani M, Bahmani M and Shahrani M: Medicinal plants used for liver disorders based on the ethnobotanical documents of Iran: A review. International Journal of PharmTech Research 2016; 9(5): 407-415.
- Shabaniyan S, Bahmani M and Asadi-Samani M: The medicinal plants effective on female hormones: A review of the native medicinal plants of Iran effective on estrogen,

- progesterone, and prolactin. Journal of Chemical and Pharmaceutical Sciences 2016; 9(3): 1270-1276.
32. Fakhri M, Azadbakht M, Yousefi SS, Mousavinasab SN, Farhadi R and Azadbakht M: Medicinal plants for treatment of neonatal jaundice by Community of Attars (Traditional Healers) of several urban areas in Mazandaran province, Northern of Iran. British Journal of Medicine and Medical Research 2016; 14(11): 1-13.
  33. Amiri MS and Joharchi MR: Ethnobotanical investigation of traditional medicinal plants commercialized in the markets of Mashhad, Iran. Avicenna Journal of Phytomedicine 2013; 3(3): 254-271.
  34. Amiri MS, Joharchi MR and Taghavizadeh Yazdi ME. Ethno-Medicinal Plants Used to Cure Jaundice by Traditional Healers of Mashhad, Iran. Iranian Journal of Pharmaceutical Research 2014; 13(1): 157-162.
  35. Heydari M, Heydari H, Saadati A, Gharehbeblou M, Tafaraji J and Akbari A: Ethnomedicine for neonatal jaundice: A cross-sectional survey in Qom, Iran. Journal of Ethnopharmacology 2016; 193: 637-642.
  36. Rafieian-Kopaei M, Khoshdel A, Kheiri S and Shemian R: Cotoneaster: A Safe and Easy Way to Reduce Neonatal Jaundice. Journal of Clinical and Diagnostic Research 2016; 10(4): SC01-SC03.
  37. Khoshdel A and Kheiri S: Effect of shir-e-khesht (billinaster drop) consumption by the neonates or their mothers on the neonatal icter. Journal of Shahrekord University of Medical Sciences 2011; 13(4): 67-73.
  38. Ghotbi F, Nahidi S and Zangi M: Surveying the effect of cotoneaster spp.(shir khesht) on neonatal jaundice. Research in Medicine 2007; 30(4): 347-352.
  39. Azadbakht M, Pishva N, Mohammadi-samani S and Alinejad F: Effect of Manna from Cotoneaster discolor on infant Jaundice (effect on blood bilirubin level). Journal of Medicinal Plants 2005; 2(14): 36-44.
  40. Azadbakht M, Pishva N, Mohammadi Samani S and Alinejad F: The effect of purgative manna on the infant jaundice. Iranian Journal of Pharmaceutical Sciences 2005; 1(2): 95-100.
  41. Khodashenas E, Khakshour, Momeni E, Sinaii M and Mir M. Systemic review of herbal medicine efficacy on neonatal Icterus. Journal of North Khorasan University of Medical Sciences 2016; 7(3): 683-689.
  42. Nabavizadeh SH, Majid O-b and Anushiravani A: Direct *ex vivo* effects of herbal extracts on serum bilirubin in neonatal blood samples. African Journal of Biochemistry Research 2009; 3(5): 226-228.
  43. Nabavizadeh S and Nabavi M: The effect of herbal drugs on neonatal jaundice. Iranian Journal of Pharmaceutical Research 2010; 3(2): 39-40.
  44. Ebrahimim S, Ashkani-Esfahani S and Poormahmudibs A: Investigating the Efficacy of Zizyphus Jujuba on Neonatal Jaundice. Iranian Journal of Pediatrics 2011; 21(3): 320-324.
  45. Marwat S, Hashimi M and Khan K: Barley (*Hordeum vulgare* L.) A Prophetic Food Mentioned in Ahadith and its Ethnobotanical Importance. American-Eurasian Journal of Agricultural and Environmental Sciences 2012; 12(7): 835-841.
  46. Saboute M, Amini L, Kalani M and Valipour N: The Effects of Oral Manna on Reducing Neonatal Serum Bilirubin Levels. Journal of Isfahan Medical School 2012; 30(185): 458-462.
  47. Tarhani F, Momennasab M, Delfan B, Zendehkar A and Zaman M: A study of oral Taranjabin effects on reducing neonat's hyprebilirubinemia. Yafte 2004; 6(3): 55-59.
  48. Zhao H, Dong J, Lu J, Chen J, Li Y, Shan L, Lin Y, Fan W and Gu G: Effects of extraction solvent mixtures on antioxidant activity evaluation and their extraction capacity and selectivity for free phenolic compounds in barley (*Hordeum vulgare* L.). Journal of Agricultural and Food Chemistry 2006; 54(19): 7277-7286.
  49. Duh PD, Yen GC, Yen WJ and Chang LW: Antioxidant effects of water extracts from barley (*Hordeum vulgare* L.) prepared under different roasting temperatures. Journal of Agricultural and Food Chemistry 2001; 49(3): 1455-1463.
  50. Khalaf G and Mohamed AG: Effect of barley (*Hordeum vulgare*) on the liver of diabetic rats: Histological and biochemical study. Egyptian Journal of Histology 2008; 2: 245-255.
  51. Shah P, Parmar M, Thakkar V and Gandhi T: Protective effect of *Hordeum vulgare* linn. on acetaminophen-induced liver damage. Journal of Young Pharmacists 2009; 1(4): 336-340.
  52. Saffari Chaleshtori J, Soreshjani EH, Reisi F, TabaTabaiefar MA, Asadi-Samani M, Navid Z and Bahmani M: Damage intensity of carvacrol on prostatic cancer cells lineDu145 and molecular dynamic simulation of it effect on apoptotic factors. International Journal of PharmTech Research 2016; 9(6): 261-273.
  53. Ghatreh-Samani M, Esmaeili N, Soleimani M, Asadi-Samani M, Ghatreh-Samani K and Shirzad H: Oxidative stress and age-related changes in T cells: is thalassemia a model of accelerated immune system aging? Central European Journal of Immunology 2016; 41(1): 116-124.
  54. Gholamian-Dehkordi N, Luther T, Asadi-Samani M and Mahmoudian-Sani MR: An overview on natural antioxidants for oxidative stress reduction in cancers; a systematic review. Immunopathologia Persa 2017; 3(2): e12.
  55. Parsaei P, Bahmani M, Naghdi N, Asadi-Samani M and Rafieian-Kopaei M: A review of therapeutic and pharmacological effects of thymol. Der Pharmacia Lettre 2016; 8(2): 150-154.
  56. Rabiei Z, Bigdeli MR and Asadi M: The effect of dietary virgin olive oil on brain lipid levels and brain edema in rat stroke models. Journal of Zanjan University of Medical Sciences and Health Services 2013; 21(86): 56-64.
  57. Rouhi-Broujeni H, Siahpoosh A, Asadi-Samani M and Mohammadi-Farsani K: Effect of extract of *Varthemia persica* DC on whole blood acetylcholinesterase activity in rats. Der Pharmacia Lettre 2016; 8(3): 80-84.
  58. Saffari-Chaleshtori J, Heidari-Soreshjani E and Asadi-Samani M: Computational study of quercetin effect on pre-apoptotic factors of Bad, Bak and Bim. Journal of Herbmed Pharmacology 2016; 5(2): 61-66.
  59. Samarghandian S, Asadi-Samani M, Farkhondeh T and Bahmani M: Assessment the effect of saffron ethanolic extract (*Crocus sativus* L.) on oxidative damages in aged male rat liver. Der Pharmacia Lettre 2016; 8(3): 283-290.

**How to cite this article:**

Raeisi R, Heidari-Soreshjani S, Asadi-Samani M and 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.