

Original Article

The Effect of Consuming Chicory Juice by Breastfeeding Mothers on Neonatal Icterus

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ABSTRACT

Objective: Hyperbilirubinemia has been considered one of the most common clinical conditions in newborn babies. As a traditional medicine, chicory distillate may be beneficial in reducing bilirubin. This randomized, double-blind clinical trial was conducted to determine the effect of chicory extract on hyperbilirubinemia in neonates. **Methods:** The clinical trial was conducted among 154 participants with hyperbilirubinemia. The study group was selected and randomly divided into the control ($n = 77$) and intervention ($n = 77$) groups. In the intervention group, breastfeeding women received a 10% solution of chicory distillate (50 ml every 12 h), whereas, in the control group, the participants received sterile distilled water, 50 ml every 12 h. The infants' bilirubin level was measured before and 24, 48, and 72 h after the intervention. Fisher's exact and Chi-square tests were run to examine qualitative data, while a *t*-test was applied for independent variables. **Findings:** There was a significant difference between the intervention and control groups ($P < 0.001$). Within each group, a significant difference was found in bilirubin levels among different sampling times ($P < 0.001$). Although the bilirubin levels reduced during the time intervals in both groups, the reduction rate was significantly higher in the intervention group ($P < 0.001$). Based on the results, breastfeeding mothers should be aware of including chicory extract in their nutritional programs. **Conclusion:** Chicory extract consumption in breastfeeding mothers can reduce bilirubin in their neonate

KEYWORDS: *Chicory, hyperbilirubinemia, neonatal jaundice*

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INTRODUCTION

Hyperbilirubinemia is a common clinical condition in infants that is among the risks confronting the human fetus during its transition from intrauterine to extrauterine life.^[1] Bilirubin is formed as an end product of the breakdown of hemoglobin and its other containing proteins.^[2,3] Accumulation of bilirubin in the bloodstream leads to the deposition of yellow pigment on the skin surface of infants, giving them an icteric appearance, and worrying parents. However, the most important and dangerous complication of hyperbilirubinemia is neurotoxicity, which leads to encephalopathy due to its passage through the blood-brain barrier and deposition on brain cells. If not treated in time, hyperbilirubinemia can cause kernicterus which may end in a permanent neurological disorder.^[4,5]

Although several factors may increase the concentration of serum bilirubin levels in infants, increased red blood cell mass and bilirubin load on hepatocytes are among the main causative factors of this disorder. Another important factor in the development of icterus in infants is reduced hepatic bilirubin clearance. In addition, increased reabsorption of bilirubin from the gastrointestinal tract into the bloodstream impairs clearance of intestinal bilirubin and causes excessive load on the liver.^[6,7] Therefore, interrupting the enterohepatic cycle by feeding the infant frequently is one of the main measures in preventing and treating

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neonatal icterus. Despite that conventional phototherapy by special blue fluorescent lamps has been administered as the standard treatment for icterus for many years, this treatment is costly, needs electrical infrastructures, and requires its device. Treatments that increase defecation frequency prevent the reabsorption of fecal soluble bilirubin through the intestine by accelerating the excretion of meconium and feces.^[8,9]

In this regard, traditional herbal medicines have played a significant role in treating icterus by increasing defecation and interrupting the enterohepatic cycle.^[10] Over the past decade, the targeted review of indigenous pharmacopeias has been on the agenda of many national and international organizations to produce new drugs. The positive attitude of scientists and the growing tendency of governments to cooperate in ethnobotanical projects also imply the exponential value of these studies. Ethnobotanical science, defined as an effective tool for extracting indigenous knowledge of plants, studies how people of a nation or community use plants. Scientific record and investigation of the written and unwritten knowledge of traditional medicines among different ethnic groups in Iran not only provide scientists with a comprehensive and valuable database of medical knowledge and experiences of Iranians through several thousand years but also pave the way for the discovery of new drugs and development of the pharmaceutical industry.^[11] For example, cotoneaster was reported to reduce icterus in infants faster and decrease the duration of hospitalization.^[12] Jojoba was also found to reduce bilirubin concentration in the first 12 h of treatment.^[13] Despite the indigenous perception about the effect of the manna of *Hedysarum alhagi* on reducing neonatal icterus, administration of this substance resulted in no significant impact on the treatment of icterus.^[14] According to the findings of a study, consumption of barley flour and phototherapy was more effective than phototherapy. Still, the researchers noted that intake of barley flour, as the only treatment, was not a reliable treatment.^[15] Significant evidence indicates that only the extract of the chicory plant, among the extracts of *Fumaria officinalis*, chicory, cotoneaster, jujube, and manna of *Hedysarum alhagi*, can significantly reduce the indirect serum bilirubin.^[16] This finding can be justified by mentioning that other herbals reduce bilirubin by stimulating liver function and decreasing hepatic-intestinal circulation. At the same time, chicory performs the same function directly, emphasizing its greater efficiency.

Given that herbal medicines have fewer side effects, are more accessible, and are less expensive than the chemical drugs,^[4] the present study was conducted to determine the effect of chicory juice on neonatal icterus.

If the findings corroborate the efficiency of chicory in controlling neonatal icterus, this herbal medicine can be recommended by specialists and experts worldwide.

METHODS

This randomized clinical trial evaluated the therapeutic effects of chicory distillate on icteric breastfed neonates. The study was undertaken from January 2018 to December 2019 in the Pediatric Ward of Ganjavian Hospital in Dezful, Khuzestan province, Iran. The population of Dezful was 420,000 individuals, according to the last census in 2011.

If patients agree to participate, they will be placed in one of two intervention or control groups in the random allocation project using SPSS software (SPSS, Chicago, USA). The intervention group comprised breastfeeding women receiving 10% solution of chicory distillate, 50 ml every 12 h. The control group consisted of breastfeeding women receiving sterile distilled water, 50 ml every 12 h. Inclusion criteria: (1) neonates from termed laboring (more than 37 weeks), (2) icteric neonates with total bilirubin from 10 to 15 mg/dL, and (3) neonates with more than 2.5 kg body weight. Exclusion criteria: (1) mothers who cannot tolerate chicory distillate, (2) formula-fed neonates, and (3) icteric neonates who have another disease.

The study sample size was calculated as 77 participants in each group based on a previous study, the first-type error of 0.05, and the probability of the second-type error of 0.2 using the following formula. The process of subject recruitment is depicted in the diagram [Figure 1].

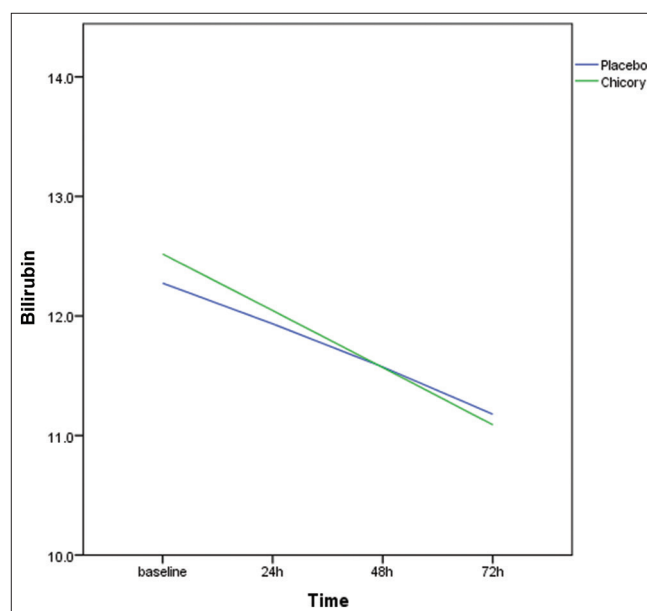


Figure 1: Comparison of bilirubin levels (mg/dL) in 24, 48, and 72 h between the study groups

Following the measurement of the neonatal bilirubin levels, mothers of infants whose bilirubin levels were 10–15 and did not need hospitalization were interviewed and trained to take 50 mL of the administered medication twice a day, morning and night, and breastfeed their babies for 3 days. The intervention group consumed 10 mg of blue flower chicory produced by Shafa Company, Kordestan, Iran, while the control group took 10 mg of distilled water. The infants' bilirubin levels were checked 24, 48, and 72 h after the first examination in the laboratory of Ganjavian Hospital in Dezful during similar times.

The collected data were analyzed through the SPSS version 23 using a *t*-test to examine the continuous data between groups. Moreover, repeated measure ANOVA was run to investigate bilirubin levels for each group at different times. The value of $P < 0.05$ was considered statistically significant.

RESULTS

The findings showed normal distribution of data. Table 1 represents the infants' levels of bilirubin based on the referral times. The bilirubin levels were also compared between the control and intervention groups [Table 2].

The study groups were compared at different testing times by controlling bilirubin before the

intervention. Due to the significant interaction between time and groups, bilirubin levels were investigated between and within the study groups. Moreover, bilirubin levels were measured and compared during different times separately. Followed by controlling the bilirubin level, a significant difference was observed between the study groups. A significant difference was also observed among the studied times in each group.

DISCUSSION

Chicory extract significantly reduced neonatal icterus based on the findings, so a significant difference was observed between the intervention and control groups at all testing times, followed by controlling the bilirubin variable ($P < 0.001$). Within-group investigations also represented a significant difference in bilirubin levels among the test times ($P < 0.001$). A significant decrease was found in bilirubin levels in both groups during the four test times. Still, bilirubin levels reduced more significantly in the intervention ($P < 0.001$) compared with the control ($P > 0.05$) group. This finding indicated that mothers' consumption of chicory had a significant effect on reducing bilirubin in the newborn, consistent with the results reported by Nabavi *et al.*^[16] These researchers added chicory extract directly to the blood samples of infants. They studied its effects while we examined the effect of chicory intake by breastfeeding mothers on the infants' bilirubin levels. In this regard, the impact of using chicory extract on the serum bilirubin by adding it to the blood samples of infants is still an area of investigation. In line with our findings, Barzegar *et al.*, Pashapur *et al.* and Khatami *et al.* reported a similar effect of chicory on reducing bilirubin.^[3,6,17] Khoshdel and Kheiri also studied the impact of consuming cotoneaster (bilineaster drops) by mother or infant on neonatal icterus. They noted that the intervention reduced the level of neonatal icterus and the duration of treatment and hospitalization.^[18] According to the literature and findings of the present study, future researchers are recommended to conduct similar studies over a larger sample size by prolonging the study period and better matching the samples.

According to the findings, chicory extract is an effective herb for treating neonatal icterus. Hence, it can be included in the nutritional programs for breastfeeding infants to reduce the treatment period.

Parental dissatisfaction to enter the study led to sample loss. Furthermore, some participants may have failed to provide the researcher with proper information that may have affected the study results.

Table 1: Comparison of bilirubin levels between the intervention and control groups in the studied periods

Time periods	Bilirubin levels of control group (mg/dL)	Bilirubin levels of intervention group (mg/dL)	<i>P</i>
After 0 h	12.27±1.21	12.52±1.13	0.197
After 24 h	11.93±1.29	12.04±1.14	0.571
After 48 h	11.57±1.38	11.57±1.20	0.983
After 72 h	11.18±1.52	11.09±1.32	0.699

Table 2: Comparison of bilirubin levels between the control and intervention groups over time

	Estimate (mg/dL)	95%CI (mg/dL)	<i>P</i>
Placebo			
Time 24-48 h	-0.36	-0.41--0.31	<0.001
Time 24-72 h	-0.75	-0.86--0.65	<0.001
Time 48-72 h	-0.39	-0.46--0.33	<0.001
Chicory			
Time 24-48 h	-0.48	-0.53--0.43	<0.001
Time 24-72 h	-0.95	-1.06--0.85	<0.001
Time 48-72 h	-0.48	-0.54--0.41	<0.001
Chicory to placebo			
Time 24-48 h	-0.13	-0.21--0.05	0.002
Time 24-48 h	-0.25	-0.38--0.12	<0.001
Time 48-72 h	-0.33	-0.53--0.13	0.001

CI=Confidence interval

AUTHORS' CONTRIBUTION

S. Vaziri Esfarjani, S. Zinatian, and M. Salimi developed the original proposal and prepared the first draft of the present manuscript. All authors read and approved the final manuscript.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Ahmadzadeh Asl M, Aria Sepehr M. Basic Principles of Research Method in Medical Sciences. 5th ed. Tehran, Iran: Noor Danesh Publications; 1389.
2. Eghbalian F. Evaluation the Complications of Exchange Transfusion in Hospitalized Neonates. *Avicenna J Clin Med* 2007;14:23-7.
3. Barzegar M, Valizadeh S, Farshbaf Kamel F, Kargar Maher MH. Comparison of Impact Home Versus Hospital Phototherapy for Term Healthy Newborns with Hyperbilirubinemia. *Med J Tabriz Uni Med Sciences Health Services* 2005;27:19-2.
4. Zargar A. Medicinal Plants. 3rd ed. Tehran: University of Tehran Press; 2006.
5. Burns N, Groves SK. The Practice of Nursing Research. 5th ed. Missouri, USA: Elsevier Saunders Publication; 2005.
6. Pashapur N, Makoei A, Akhundi A, Gol Mohammadloo S. Comparison of the therapeutic effect of phenobarbital and phototherapy with phototherapy in the treatment of non-hemolytic hyperbilirubinemia in term neonates. *J Nurs Midwifery* 2007;5:8-11.
7. Jazayeri GH. The Language of Food. 28th ed. Tehran: AmirKabir Publications; 2012.
8. Hojjati H, Sharif Nia H, Taheri N. Statistics and Research Methods in Nursing and Medical Sciences. 1st ed. Tehran, Iran: Jame-e-Negar Publishing House; 2020.
9. Heydarian M. Sina Medicine: Properties and Nature of Plants. 3rd ed. Mashhad: Navand Publications, Mashhad; 2012.
10. Khatami F, Soltani M. Home phototherapy; an alternative method for treatment of jaundice in healthy-term newborns. *Iran J Pediatr* 2007;17:(Suppl 2):193-198.
11. Ghannadi A, Zolfaghari B, Shamashian S. Necessity, importance, and applications of traditional medicine knowledge in different nations. *J Islam Iran Tradit Med* 2011;2:161-76.
12. Khoshdel A, Kheiri Q. Investigation of the effect of consumption of garlic (Billy Naster drops) by mother or baby on neonatal jaundice. *J Shahrekord Univ Med Sci* 2011;13:67-73.
13. Ebrahimimd S, Ashkani-Esfahani S, Poormahmudibs A. Investigating the efficacy of zizyphus jujuba on neonatal jaundice. *Iran J Pediatr* 2011;21:320-4.
14. Tarhani F, Delfan B, Momen Nasab M, Zendekar A, Zaman M. The effect of oral mangosteen on reducing physiological jaundice in infants. *Yafteh Q Res J Lorestan Univ Med Sci* 2004;6:55-8.
15. Mohsenzadeh A, Javadi T, Yari F, Shahkarami K. The effect of barley flour on the treatment of hyperbilirubinemia. *Yafteh Q Res J Lorestan Univ Med Sci* 2004;7:17-22.
16. Nabavi SS, Arab Hosseini A, Farid Nik Y. Investigation of the causes of jaundice leading to blood transfusion in infants born in Milad Hospital of Tehran from 2002-2007. *J Med Council Iran* 2010;28:36-44.
17. Jahangiri M, Sharif MR, Movahedian AH, Moravveji SA, Mohammadi-Ashiani A, Jazayeri H. Correlation between the reported transcutaneous bilirubin and serum bilirubin in icteric term neonates before and during phototherapy. *Feyz* 2013;17:54-60.
18. Khoshdel A, Kheiri S. Effect of shir-e-khesht (billinaster drop) consumption by the neonates or their mothers on the neonatal icter. *J Shahrekord Univ Med Sci* 2011;13:67-73.