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Original Article

Investigating the Impact of Sumac Capsules on Postpartum Bleeding among Women at Risk of Bleeding: a three-blind randomized clinical trial

Mahsa Payranj[1], Maryam Moradi[2,3]*, Hassan Rakhshandeh[4], Vahid Ghavami[5], Seyed Mostafa Moshirian Farahi[6], Maliheh Gharaee Najafabadi[7], Morvarid Irani[8], Azin Niazi[9]

[1]Student Research Committee, Faculty of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
[2]Global and Women's Health, School of Public Health and Preventive Medicine, Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, Australia
[3]Nursing and Midwifery Care Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
[4]Pharmacological Research Center of Medicinal Plants, Mashhad University of Medical Sciences, Mashhad, Iran
[5]Department of Biostatistics, School of Health, Mashhad University of Medical Sciences, Mashhad, Iran
[6]Medical Toxicology Research Center, Mashhad University of Medical Science, Mashhad,Iran
[7]Obstetrics and Gynecology Specialist, 9th Day Hospital, Torbat Heydariyeh, Iran
[8]Department of Midwifery, School of Nursing and Midwifery, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran
[9]School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran

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***Corresponding Author**
Maryam Moradi
Global and Women's Health, School of Public Health and Preventive Medicine, Faculty of Medicine, Nursing and Health Sciences, Monash University, Level 4, 553 St Kilda Road, Melbourne VIC 3004, Australia
Tel: +61-3-9903-0291
E-mail: maryam.moradi.fu@gmail.com

Objectives: Postpartum hemorrhage is a leading cause of maternal mortality worldwide. Emerging evidence suggests that the sumac plant possesses astringent and anti-inflammatory properties that may help reduce menstrual bleeding. Therefore, this study aimed to determine the effect of sumac capsules on postpartum bleeding among women at risk of excessive bleeding.

Methods: This randomized, triple-blind clinical trial was conducted in 2022-2023. Participants were 72 women who were referred for vaginal delivery to the 9th Day Hospital in Torbat Heydariyeh city, Iran. Participants were randomly divided into two groups immediately after delivery, the placebo group received routine care. The intervention group, in addition to routine care, received two oral capsules of 500 mg sumac immediately after the expulsion of the placenta and fetal membranes, as well as two hours later. The amount of bleeding was measured using plastic bags for blood collection, which were weighed along with the sheets and pads used at hours 1, 2, 3, and 4 postpartum. Data analysis was performed using SPSS version 27, and statistical significance was set at $p < 0.05$. 65 women completed the study.

Results: The sumac group exhibited lower mean bleeding volumes than the placebo group at all measured time points (first, second, third, and fourth hours after delivery). The independent t-test analysis revealed significant differences between the two groups' bleeding volume at the end of the first hour ($p = 0.013$), second hour ($p < 0.001$), third hour ($p < 0.001$), and fourth hour ($p < 0.001$); that was less in sumac group. Overall, the sumac group demonstrated a significantly lower mean total bleeding volume in the first four hours after delivery (215.78 ± 16.92 cc) compared to the placebo group (261.51 ± 17.258 cc) ($p < 0.001$).

Conclusion: Sumac capsules can be considered as a potentially effective and safe intervention for reducing postpartum bleeding among women at risk.

Keywords: clinical trial, medicinal plant, postpartum bleeding, postpartum hemorrhage, risk factors, sumac

INTRODUCTION

Postpartum bleeding is a significant concern in obstetrics and one of the leading causes of maternal mortality worldwide [1]. Studies report that the prevalence of vaginal bleeding following vaginal delivery varies from 0.8% to 28.9% across studies [2]. The risk of severe bleeding or death is higher among women in low- or middle-income countries [3]. Most deaths linked to bleeding transpire in the first 24 hours. Postpartum hemorrhage is defined as blood loss of 500 cc or more following the completion of the third stage of delivery. The mean blood loss during vaginal childbirth is approximately 400-600 cc, increasing to 1,000 cc during cesarean section [1].

The causes of postpartum bleeding include uterine atony, birth canal ruptures, coagulation disorders, and abnormal placental adhesion. Persistent bleeding can lead to many physical complications and even death [4-6]. Uterine atony, which is an inadequate contraction of the uterus, is the most common cause of postpartum bleeding. Preventing uterine atony is essential in managing postpartum bleeding [7-9]. Routine assessment for identifying risk factors and individuals at risk of bleeding before and during delivery is crucial in preventing severe postpartum bleeding. Oxytocin is the primary medication used to prevent and treat postpartum bleeding. However, it can cause side effects such as water intoxication, nausea, headaches, hypotension, seizures, coma, and potentially increased maternal mortality [4].

Synthetic drugs, including oxytocin, despite their effectiveness, come with side effects and high costs, highlighting the need to explore safer and more affordable alternatives. There is a growing global trend toward the use of herbal medicines, which are increasingly being recognized as a complementary treatment for preventing postpartum bleeding [10]. Emerging evidence suggests that certain herbal medicines, such as dill seed extract, fennel seed extract, date, grape seed, and plants like sumac, may effectively reduce postpartum bleeding. These plants possess tannin, which has astringent properties, which result in uterine contraction and the cessation of bleeding [5, 6]. In addition, the effects of the Urtica dioica plant, which possesses contractile and anti-inflammatory properties, have been demonstrated to reduce postpartum hemorrhage [11]. The sumac plant, scientifically known as *Rhus coriaria*, is a mountain shrub that grows to a height of 1-5 meters. It produces clustered fruits, belongs to the Anacardiaceae family, and possesses antioxidant, anti-microbial, anti-pyretic, anti-inflammatory, and anti-hemorrhagic properties [12]. Sumac is also rich in magnesium, calcium, tannin, flavonoids, and other polyphenolic compounds. Its astringent properties are attributed to malic acid, tannic acid, gallic acid, and tannin [13]. In traditional medicine, sumac is frequently used to treat various types of bleeding, such as stomach and gum bleeding, dysentery, and severe uterine bleeding [14]. Tannin and flavonoids induce estrogen receptor stimulation, myometrial smooth muscles, and uterine vessel contraction [15]. With its polyphenolic, tannin, and flavonoid components, sumac demonstrates both astringent and anti-inflammatory properties. By affecting the vascular endothelium, it initiates TNF-alpha endothelial nitric oxide synthase activation, leading to vasoconstriction and the cyclooxygenase pathway activation, ultimately reducing uterine bleeding [16].

In a randomized controlled trial involving 54 Iranians, those demonstrated that sumac capsules are effectively effective in reducing bleeding in women suffering from menorrhagia [16]. Similarly, according to Persian traditional medicine, Zakeri et al. [17] introduced sumac as a complementary treatment to manage abnormal bleeding. Healthcare providers and midwives should have comprehensive knowledge of the risk factors for postpartum bleeding in at-risk individuals to ensure a safe delivery for both the mother and fetus [18, 19]. Given sumac's astringent and anti-inflammatory properties, its ability to reduce menstrual bleeding, coupled with the limited research in this area, this study was conducted to evaluate the impact of sumac capsules, ingested immediately postpartum, on postpartum bleeding in women with elevated risk of postpartum bleeding. If demonstrated as effective, sumac could serve as a cost-effective herbal solution to reduce postpartum bleeding in conjunction with conventional medications.

MATERIALS AND METHODS

1. Study registration

The study was a triple-blind clinical trial registered with the Iranian Clinical Trial Center (IRCT) under the code IRCT20220314054275N1. It involved 72 women planning vaginal delivery at the maternity department of the '9th Day' Hospital in Torbat Heydariyeh, Iran. Recruitment occurred between December 2022 and March 2023.

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2. Inclusion and exclusion criteria

After selecting eligible mothers for the study and explaining the research objectives, written informed consent was obtained from all participants. The inclusion criteria for the study were as follows: providing written consent to participate, being literate, Iranian, and a resident of Torbat Heydariyeh, being aged between 15-50 years, expressing a willingness to undergo a vaginal birth, having a term pregnancy, entering the active phase of labor, achieving a score equal to or greater than 10% of what the nomogram predicts for postpartum bleeding, having no major medical conditions, no history of cesarean section or uterine surgery, not taking any specific medications, experiencing no excessive bleeding during childbirth, no third and fourth degree tears, no cervix or uterus tears, no use of herbal or chemical drugs before and during delivery, absence of labor signs in the active phase of labor, no temperature exceeding 38 degrees Celsius during the study, no rupture of fetal membranes lasting more than 12 hours, no rapid or prolonged labor, no reported sumac allergy, and no previous cesarean deliveries. The exclusion criteria for the study included the following: serious postpartum complications in the mother, unwillingness to continue participating, sensitivity to sumac, urine leakage during blood or pad collection, or requiring aggressive measures and drug therapy to control post-delivery bleeding.

3. Sample size

The sample size was calculated using data from the placebo group (oxytocin) in a study by Khojastehfard et al. [20]. In this study, the sample size was calculated using a repeated measures variance analysis model with five repetitions, a between-group factor with two levels, an assumed interaction between study groups and time, a first type error level of 0.05, and a test power of 80%. Based on the mean bleeding in the oxytocin group (18.61), the aim was to identify a reduction in bleeding of up to 4 units (18.57) in the intervention group compared to the placebo group, along with intra-group changes similar to those in the oxytocin group and a first-order autoregressive correlation of 0.7. Based on this, we calculated that each group requires a sample size of 31 participants to detect the effect of interest in each group. Allowing for a 15% sample dropout rate, the final sample size was 36 participants in each group.

Therefore, by equally allocating individuals in two study groups, our final sample size was determined to be 72. The website www.sealedenvelope.com was used to randomly assign participants into two groups: Sumac and placebo. Consequently, 18 blocks, each consisting of 4 members, were inadvertently generated through the aforementioned site. However, based on the randomly generated sequence, the configurations of the blocks were as follows: (ABBA), (ABAB), (BAAB), with codes A and B randomly assigned to the two study groups.

The study was conducted as a triple-blinded trial. To ensure allocation concealment, a pharmacist assistant coded sealed opaque envelopes and packaged medications into correspondingly coded containers (A and B). The medications appeared indistinguishable. Only the pharmacist assistant, who was uninvolved in the study's execution, was aware of the group allocations. Both participants and the researcher, who administered the medication and assessed the degree of bleeding, were blinded to the codes. The first participant was given the first matching coded container, and this process continued until the sample size was achieved. Additionally, the statistician was blinded to the codes. Upon completing the analysis, the pharmacist assistant disclosed the codes: A representing the placebo group and B representing the Sumac group.

4. Intervention

The sumac capsules and placebo were formulated in the Research and Development laboratory of Pars Tak Rukh Pharmaceutical Company (http://parstechrokh.com/), located in the Health Park of Mashhad University of Medical Sciences.

Sumac fruit was purchased from a commercial market, and a botanist confirmed its identity. In a laboratory, the fruit was pulverized into powder and processed using the soaking method for extraction. The aqueous extract was prepared by adding 300 cc of distilled water to 100 grams of sumac powder and heating the solution at 37 degrees Celsius for 72 hours. The extract, with a thick, syrup-like viscosity, was procured by filtering and removing the water through a rotary evaporator. This concentrated extract was dehydrated in an oven at 37℃ over 72 hours and pulverized using a grinder. It was then prepared in 500 mg capsules using a capsule-filling machine. The placebo capsules were filled with Avicel powder, resembling the drug sample in color and volume but lacking the dry sumac extract. At first, 72 individuals were initially chosen for the research. Four participants withdrew from the Sumac group due to excessive bleeding of over 500 cc, administration of oxytocin prophylaxis beyond national guidelines, post-delivery high

blood pressure, and lack of interest in continuing with the study. In the placebo group, three individuals dropped out for similar reasons: excessive bleeding exceeding 500 cc, administration of oxytocin prophylaxis beyond national guidelines, and ineligibility for the study. The final analysis included 65 participants (32 in the Sumac group and 33 in the placebo group) (Fig. 1).

5. Procedure

After measuring the mother's height and recording it in her nomogram, the demographic and pregnancy profile form was completed through an interview with the mother for all research units. Upon admission, the patient's blood sample was also dispatched to the laboratory for hemoglobin, hematocrit, and platelet tests to determine the patient's blood group. The patient's nomogram revealed the hemoglobin and platelet test results.

During the active delivery phase, the researcher was present at the mother's bedside to complete the data specific to this phase based on the delivery partograph form. All women were placed in lithotomy, and an obstetrician and midwifery student carried out delivery according to hospital protocol. The researcher examined the second and third delivery steps and recorded the corresponding data forms. Immediately following the baby's complete delivery, the birth time was recorded. In cases of rupture or episiotomy, sterile gauze was applied to the perineal area to reduce contamination. This was done to prevent bleeding due to placental separation during the third and fourth steps. After confirming there was no amniotic fluid leakage and drying the area, the linen cloth or cotton soaked in amniotic fluid was removed from beneath the mother's buttocks to quantify bleeding in the third step. The blood collection bag was subsequently weighed and placed beneath the mother. Management of the third stage in both groups was conducted in accordance with national guidelines. In both the intervention and placebo groups, following the baby's birth, an infusion of 30 units of oxytocin in 1,000 cc of crystalloid was administered. The placenta was removed utilizing the Brant Andrus maneuver. The placental ejection mechanism, along with the weight, diameter, and length of the placenta, were recorded in the data form during the third stage. Subsequently, the baby's weight and placental weight were measured using a baby scale and docu-

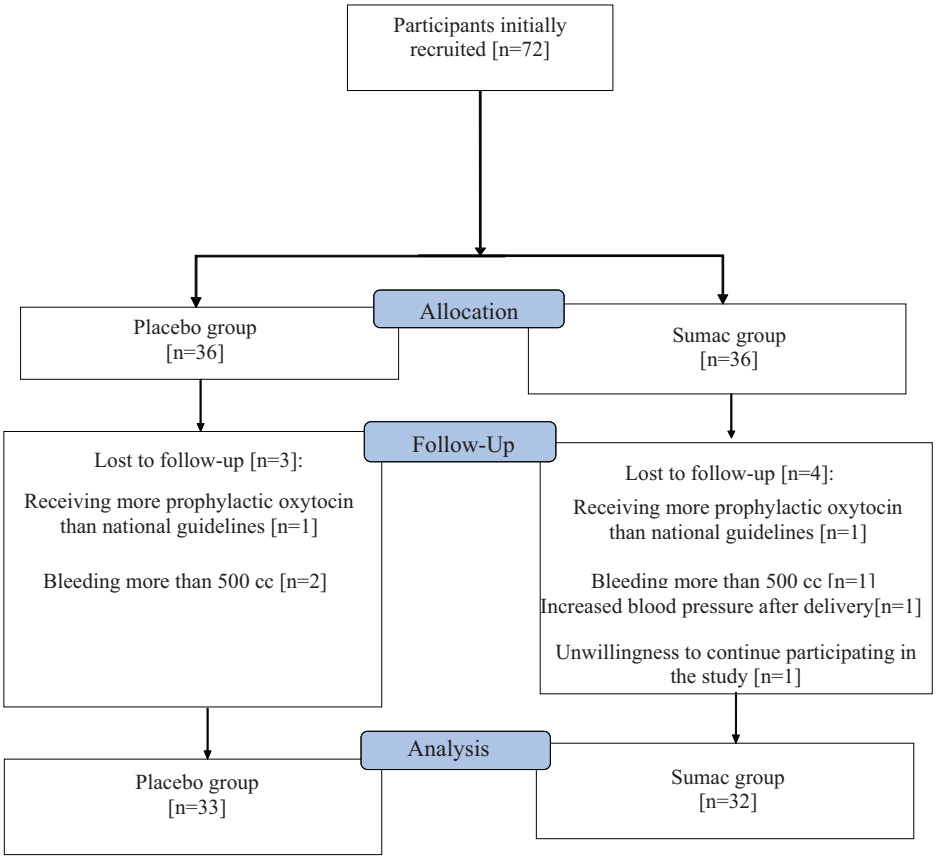

Figure 1. Consort flow diagram of the study participants.

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mented on a nomogram. Following the complete expulsion of the placenta and confirmation of uterine contraction, uterine massage was conducted to facilitate the removal of blood and clots from the uterine cavity and vagina into a blood collection bag. After uterine bleeding and clots had ceased, the blood collected under the mother was assessed by weight. The weight was lower than the initial weight of the blood bag (70 grams), and the outcome was documented in the bleeding information form. Additionally, the researcher recorded other essential data needed to complete the nomogram to predict the risk of postpartum hemorrhage for each research unit. The score was calculated, and if it reached at least 10%, the study continued. In conjunction with receiving 30 units of oxytocin in the intervention group, two oral capsules of 500 mg of dry sumac extract with 30% efficiency (equivalent to 1 gram of sumac) were administered immediately following placental discharge. The onset of the drug's effect was calculated one hour after ingestion, considering the pumice used in the capsule and sumac powder (based on the pharmacist's estimate). In the placebo group, alongside the routine oxytocin method, a placebo containing a 500 mg capsule with an inactive substance (Avisel powder) was administered at the same time as the intervention and again immediately after placental discharge two hours later. The operator performed a rupture repair or episiotomy immediately after the completion of the third stage of delivery. To measure the bleeding rate during episiotomy repair in the fourth stage, a pre-weighed sterile gauze was positioned under the mother's buttocks, and sterile gauze with a specific weight, typically utilized for vaginal tampons during tears or episiotomy repair, was inserted into the vagina. These materials were positioned on the patient, and their weight after recovery was deducted from the initial weight, with the findings recorded in the blood loss data form. After the procedure, a single-use absorbent sheet was weighed to collect the bleeding during the mother's fourth stage, and a weighted pad was provided to the mother. The bleeding amount was gauged based on the pad's weight every fifteen minutes during the first and second hours and every thirty minutes for the third and fourth hours. After subtracting the initial weight, the pad's final weight was noted in the bleeding information form. The researcher also recorded the baby's weight, height, head circumference, chest circumference, placental weight, and placental diameter in the corresponding data forms. The mother's bleeding volume was measured by weighing diapers and pads at the end of hours 1, 2, 3, and 4.

6. Analysis

The collected data were analyzed using SPSS program version 27, applying various statistical tests, including the Shapiro-Wilk test, independent t-test, Mann-Whitney U test, Chi-square test, Kruskal-Wallis test, and Friedman test, with a significance level set at 0.05.

RESULTS

A total of sixty-five women completed the study. The mean age of participants was 29.47 years in the sumac group and 28.97 years in the placebo group, with no statistically signifi-

Table 1. Comparison between demographic data of research units in two groups of sumac and placebo

Variable	Group		p value
	Sumac (n = 32)	Placebo (n = 33)	
Age	29.47 ± 9.36	28.97 ± 7.64	0.814*
Number of pregnancies	1.19 ± 2.47	1.36 ± 2.36	0.519**
Number of deliveries	0.672 ± 1	1.32 ± 1.27	0.803**
Interval between last delivery and recent one (months)	27.18 ± 38.88	23.67 ± 37.63	0.788**
Length of active phase of labor (minutes)	40.41 ± 56.72	37.62 ± 64.64	0.243**
Length of second stage of labor (minutes)	21.43 ± 28.97	20.47 ± 32.79	0.465*
Length of third stage of labor (minutes)	10.31 ± 3.05	11 ± 2.95	0.170**
Infant's weight (grams)	3409 ± 33.497	3525 ± 72.499	0.350*
Placenta's weight (grams)	688 ± 37.87	712 ± 90.86	0.270*
Breastfeeding duration (minutes)	4.9 ± 33.53	6.8 ± 35.42	0.208*

*T-test, **Mann-Whitney test.

cant difference between the groups (p = 0.814). Moreover, the two groups exhibited no statistically significant differences in variables such as the number of previous pregnancies and deliveries, the length of time between the last and current delivery, the duration of the active phase, the second and third stages of labor, baby's weight and placental weight, or breastfeeding duration, all of which were homogeneous (p > 0.05) (Table 1). The Mann-Whitney test results indicated that the mean bleeding volume in the first and second hours postpartum was significantly lower in the intervention group compared to the placebo group (p < 0.001). The mean bleeding volume in the first (56.31 cc) and second (68.09 cc) hours after delivery in the sumac group had lower volumes than in the placebo group, which was 63.24 cc and 79.06 cc, respectively.

Furthermore, the bleeding amounts at the end of the third hour (43.79 cc) and the fourth hour (47.66 cc) in the sumac group were lower than in the placebo group, with measurements of 58.18 cc and 61.03 cc, respectively. The independent t-test results showed a statistically significant difference (p < 0.001) that was less in the Sumac group.

The average bleeding in the first 4 hours after delivery was 261.51 ± 17.26 cc in the control group and 215.78 ± 16.92 cc in the sumac group, with significantly lower bleeding in the sumac group (p < 0.001) (Table 2).

After adjusting for potential confounding factors, including abortion history, body mass index, infant's head circumference, and income, using the multiple regression models, the average bleeding during the first, second, third, and fourth hours, as well as the total bleeding in the first four hours post-delivery, was significantly lower in the sumac group compared to the placebo group (p < 0.001).

There were no reports of side effects among the study participants from either medication or placebo.

DISCUSSION

Postpartum bleeding is a significant concern following childbirth [21]. Addressing this issue requires the implementation of safety, practical, and cost-effective measures. The use of complementary medicine is on the rise globally, including in the treatment of postpartum bleeding. However, the current literature is limited. Our study is the first to determine the impact of sumac capsules on postpartum bleeding among women at risk of excessive bleeding. Our study demonstrated that consuming 2 grams of sumac capsules notably reduced postpartum bleeding. The bleeding during the first, second, third, and fourth hours and the total bleeding in the initial four hours postdelivery was notably lower in the sumac group compared to the placebo group. Sumac is rich in magnesium, calcium, tannin, flavonoids, and other polyphenolic compounds, all exhibiting astringent and anti-inflammatory properties. The influence of tannin and flavonoids on blood vessels and uterine muscle contractions could elucidate the cessation of bleeding [22]. Given the scarce research on sumac's influence on postpartum bleeding, analogous studies investigating postpartum bleeding were cited in the discussion. Some of these studies have analyzed the influence of compounds akin to those identified in sumac, such as tannins and flavonoids, on uterine muscle contractions.

Borazjanizadeh [16] conducted a study to evaluate the impact of sumac capsules on bleeding in women with menorrhagia, demonstrating the effectiveness of sumac in reducing menorrhagia-induced bleeding without any reported side effects. However, the study did not include a placebo, implement blinding, or use a dose of sumac comparable to that in the current study. Therefore, the present study aims to evaluate the effect of sumac capsules on postpartum hemorrhage in women at risk of bleeding. Mehrabani Natanzi et al. [23] conducted a study on

Table 2. The bleeding mean in different hours after delivery in both groups of sumac and placebo

Variable	Group		p value
	Sumac (n = 32)	Placebo (n = 33)	
Bleeding rate during the third stage (cc)	56.31 ± 16.67	55.85 ± 11.34	T = 0.132 0.869**
Total bleeding in the first hour (cc)	56.31 ± 9.40	63.24 ± 10.96	0.013**
Total bleeding in the second hour (cc)	68.09 ± 6.10	79.06 ± 5.10	< 0.001**
Total bleeding in the third hour (cc)	43.79 ± 6.23	58.18 ± 6.22	< 0.001*
Total bleeding in the fourth hour (cc)	47.66 ± 5.86	61.30 ± 4.89	< 0.001*
Total bleeding in the first four hours (cc)	215.78 ± 16.92	261.51 ± 17.58	< 0.001**

*T-test, **Mann-Whitney test.

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the impact of sumac fruit aqueous extract on skin wound healing in male rats. The study demonstrated that sumac extracts enhanced collagen synthesis and expedited the processes of epithelialization and wound contraction. Furthermore, it decreased inflammation and the infiltration of macrophages and neutrophils in the wound area during the inflammatory phase, thereby accelerating the healing process with no documented side effects [23]. Sumac is a rich source of magnesium calcium, tannins, flavonoids, and a variety of polyphenolic compounds, such as tannic acid, gallic acid, acidalaphic, quercetin, quercitrin, isoquercitrin, myristicin, and myricitrin [24].

In the current study, 2 grams of sumac aqueous extract in dried powder form inside capsules were used to decrease postpartum bleeding, potentially through mechanisms akin to wound contraction. Zakeri et al. [17] also suggest using sumac as an adjunctive therapy for managing abnormal bleeding based on Persian traditional medicine. Previous studies have highlighted sumac's coagulating properties, attributed to its phenolic, tannin, and flavonoid compounds, which align with the findings of this study [17]. Zahra et al. [25] conducted a clinical trial to investigate the effects of rectal dill suppositories on postpartum bleeding in high-risk women. The findings showed that rectal dill suppositories significantly diminished postpartum bleeding without adverse effects. Postpartum bleeding was evaluated at various intervals post-delivery, utilizing a nomogram to predict bleeding risk [25]. Significantly, this triple-blind study administered two doses of one gram of sumac. Dill seeds contain limonene, ketones, polyphenols, carone, and tannins, while Barhang contains tannins and flavonoids that interact with estrogen receptors, contract uterine smooth muscle, and reduce postpartum bleeding, mirroring the effects of the compounds found in sumac.

Yu et al. [26] conducted a study on the injection of milkweed plant products to mitigate postpartum hemorrhage following vaginal childbirth. The similarity in ingredients between milkweed plants and sumac suggests that sumac could reduce postpartum bleeding via a similar mechanism. The study indicated that using milkweed plants as a supplement along with oxytocin yielded superior results in mitigating postpartum bleeding compared to using oxytocin alone. The combined treatment group had a lower crude rate of side effects at 5.4% compared to 9.8% in the oxytocin group. Additionally, the milkweed plant contains various compounds with antioxidant properties, including flavonoids, malic acid, oleic acid, sterols, triterpenes (like ursolic acid), leonorine alkaloids, stapidrine, and tannins, which directly affect the uterine smooth muscle. This research's findings align with the current study, indicating that the use of sumac capsules in women at risk of postpartum bleeding exhibited no side effects.

Mojahed et al. [27] conducted a clinical trial to evaluate the effects of moisturizer on bleeding post-vaginal childbirth, and the results demonstrated that consuming 100 grams of Mazafati Bam dates reduced postpartum hemorrhage compared to the placebo group. Additionally, it was noted that tannin in dates induced uterine myometrium muscle contractions, reducing postpartum bleeding with no side effects [27]. Similarly, our study discovered that the group receiving sumac capsules experienced less postpartum bleeding than the control group. The findings of this study are consistent with the current study, as the compounds in both dates and sumac (tannins and flavonoids), and the method of measuring postpartum bleeding by weighing the skin and pads are similar. However, the current study differs in that it did not evaluate postpartum bleeding among at-risk mothers and was not conducted in a blinded manner.

Yadegari et al. [28] assessed the effect of dates on the volume and duration of postpartum bleeding and demonstrated that consuming 100 grams of date fruit within two hours after delivery resulted in significantly reduced bleeding compared to the placebo group, with no observed side effects. Dates contain calcium, linoleic acid, oleic acid, and stearic acid tannins, which promote uterine muscle contractions. The study's findings regarding the reduction of postpartum bleeding, along with the composition of dates akin to that found in sumac, align with the current study. The primary distinction is that post-delivery bleeding was monitored for 10 days using the pectoral blood evaluation chart for measurement, without the potential for double blinding. In a comparable study titled "Effect of grape seed powder on the volume of postpartum bleeding," Izadpanah et al. [29] found that consuming 150 mg of grape seed powder significantly reduced postpartum bleeding compared to the placebo group. The grape seed powder contains omega-3, omega-6, vitamins E and C, proanthocyanidins, linolenic acid, gallic acid, flavonoids, magnesium, calcium, iron, phosphorus, potassium, caron, and tannins, which play a substantial role in reducing bleeding. Tannins, linoleic acid, and gallic acid, along with flavonoids, which are present in grape seed powder [30, 31], are also found in sumac, implying a parallel mechanism for reducing postpartum bleeding. This study shares similarities with the current study regarding the research methodology, uti-

lizing a placebo and control group and quantifying postpartum bleeding. Additionally, the outcomes of this study are consistent with the current research findings on the decrease of postpartum bleeding. Izadpanah et al. [29] measured maternal hemorrhage 24 hours after the delivery, while in the current study, we measured hemorrhage within the first, second, third, and fourth hours post-delivery, as well as the total bleeding in the first four hours. Moreover, we concentrated on mothers at risk of bleeding.

However, a study conducted by Mahdovian et al. [32] titled "The Effect of Oral Dill Seed Extract on Bleeding after Vaginal Childbirth" demonstrated that the consumption of 0.018 grams of dill seed extract led to a significant decrease in postpartum bleeding compared to oxytocin. The compounds present in dill seeds, such as limonene, ketone, polyphenols, carone, and tannin, induce contractions in the smooth muscle of the uterus, similar to the compounds found in sumac. The measurement of bleeding in the study was consistent with the current research; however, bleeding was assessed at the end of the first two hours after delivery, blinding was not implemented, and the primary drug treatment, oxytocin, was excluded from the intervention group. Mahdavian et al. [32]'s study uncovered a significant link between the mother's occupation, economic status, and the bleeding volume. The current study showed a statistically significant disparity in family income between the two groups.

Side effects: No adverse effects were reported from using sumac capsules or the placebo in this study, and the mothers indicated high satisfaction.

1. Strengths and limitations

Our study is the first to evaluate the effect of sumac capsules on postpartum bleeding in women at risk of excessive bleeding. However, our study presents several limitations. One limitation of the current study was the inability to ensure complete discharge of amniotic fluid despite strict control measures. This resulted in some amniotic fluid mixing with the bleeding, which was an unavoidable research constraint. However, random allocation was employed to address this issue. On a positive note, the strengths of the research included the implementation of blinding procedures and the researcher's continuous presence from the onset of active bleeding until four hours post-delivery to ensure accurate measurements.

It is recommended that the impact of sumac capsules on bleeding volume within the first 24 hours after delivery be investigated, as well as their influence on late post-delivery bleeding (occurring after the initial 24 hours).

CONCLUSION

The results of this study suggest that sumac capsules may be a potentially effective option for reducing postpartum bleeding among at-risk women, with no reported side effects. Considering the worldwide burden associated with postpartum bleeding, future research involving larger sample sizes that explore the optimal dosage and treatment duration is needed.

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AUTHORS' CONTRIBUTIONS

Conceptualization and Methodology: Mahsa Payranj, Maryam Moradi, Hassan Rakhshandeh, Vahid Qavami, Mostafa Moshirian Farahi, Azin Niazi; Resources/Preparation of Herbal Medications: Mostafa Moshirian Farahi, Hassan Rakhshandeh; Data Collection: Mahsa Payranj, Maleihe Qaraei Najafabadi, Morvarid Irani; Data Analysis: Mahsa Payranj, Vahid Qavami, Maryam Moradi; Data Management: Vahid Qavami, Maryam Moradi; Data Interpretation: Mahsa Payranj, Vahid Qavami, Maryam Moradi, Hassan Rakhshandeh, Mostafa Moshirian Farahi; Writing – Original Draft: Mahsa Payranj, Maryam Moradi; Review and Editing: Mahsa Payranj, Maryam Moradi, Hassan Rakhshandeh, Vahid Qavami, Mostafa Moshirian Farahi, Maleihe Qaraei Najafabadi, Morvarid Irani, Azin Niazi; Supervision and leadership: Maryam Moradi.

ETHICAL APPROVAL

This research was reviewed and approved by the Research Ethics Committee of Mashhad University of Medical Sciences (IR.MUMS.NURSE.REC.1401.005). All participants provided written informed consent at the beginning of the study and

were assured of data confidentiality, voluntary participation, and their right to withdraw at any time.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interests.

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ORCID

Mahsa Payranj, https://orcid.org/0009-0004-4386-2222
Maryam Moradi, https://orcid.org/0000-0002-9084-8907
Hassan Rakhshandeh, https://orcid.org/0000-0002-2118-1096
Vahid Ghavami, https://orcid.org/0000-0001-6358-0207
Seyed Mostafa Moshirian Farahi, https://orcid.org/0000-0003-2393-6859
Maliheh Gharaee Najafabadi, https://orcid.org/0009-0007-9168-0054
Morvarid Irani, https://orcid.org/0000-0002-8905-0965
Azin Niazi, https://orcid.org/0000-0001-6586-2769

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