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Analysis of a polyherbal galactagogue Batrisu vasanu, an indigenous Indian ethnomedicine

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Batrisu vasanu, katlu or battisa is an ethnobotanically popular polyherbal galactagogue and postpartum remedy in western India. It is only traditionally practised and is not reported scientifically. This study was focused on qualitative analysis of the ingredients added and their variations among marketed Batrisu vasanu products. Samples were collected in Gujarat (India) and from the ingredients mentioned on the pack, their botanical details were analysed using Ayurvedic Pharmacopoeia of India – Part I. Relative frequency of citation (RFC), number of herbs shared (N_h) by samples, and Jaccard coefficient was calculated to find the consistency in ingredient. A Cluster dendrogram was prepared to show diversity in sample ingredients. The composition of 16 collected samples showed 24.5±6.33 herbs per sample with a range of 26 herbs. Total 69 medicinal herbs of 64 species, from 58 genera belonging to 38 diverse plant families were reported. Gokshura was the only common herb present among all the samples. Further, N_h of 12.80±4.62 and average Jaccard coefficient of 0.35 suggests very poor similarity of samples. It is concluded that samples were added with diverse types of herbs, and were having a highly inconsistent polyherbal composition. These findings raise serious concerns about the quality of this ethnomedicinal product.

Keywords: Batrisu vasanu, Ethnomedicine, Galactagogue, Gokshura, Lactation, Postpartum care.

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Introduction

Physiologically and psychologically child birth is a significant event for women. But it also presents both physical and emotional challenges for her postpartum. During the postpartum period, good care and a balanced nutritious diet are essential for the recovery of the mother and the healthy development of the child[1]. Breast milk is an optimum source of nutrition for new-born[2,3]. It also provides immunity and nutrition to the child. Under various circumstances, namely preterm birth, mother-child separation, indirect lactation, anxiety, and depression, insufficient milk supply is reported[4]. Poor lactation is a major concern of breast lactation failure[3].

Lactation can be induced by various means, using superfoods, pharmaceutical drugs, herbal medicines, and also sometimes by psychological support and relaxation techniques[3,5]. Galactagogues are herbal or pharmaceutical drugs that initiate, maintain, or augment a sufficient rate of milk production to meet the need of the baby[6]. Owing to multiple concerns of new mothers to prescription drugs, many women explore complementary and alternative therapies[7]. Ethnomedicinal galactagogues are used in nearly all cultures and are of diverse nature for every society. For such practices, women mostly rely on their cultural knowledge and traditions than medical practitioners[8].

One of the widely consumed ethnomedicinal galactagogue and traditional supplementary food in Gujarat is Batrisu vasanu[9]. The word 'batrisu' here refers to thirty-two herbs, and 'vasanu' means its preparation. It is also known as Battisa or katlu and is taken during the first three months of lactation[10,11]. It is believed to improve lactation and health while it also boosts the immunity of the mother and the newborn. Due to the popularity of this herbal preparation, it is widely marketed at herbal drug and condiment shops in powder form. However, in absence of reference for this polyherbal mixture, the botanical composition of the marketed product is a serious concern. It was hypothesised that all marketed products follow the common code of medicinal herbs in Batrisu vasanu. Hence this study was aimed to qualitatively analyse the herbal ingredients used in

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Supplementary table is available online only.

marketed Batrisu vasanu products and identify variations among them.

Materials and Methods

The present study was carried out in Gujarat state (India) from November 2019 to February 2020. Purposively seven districts of Gujarat were selected, and in each district randomly ten shops of condiments and crude herbs (ayurvedic) stores were visited. Each shop was enquired for the marketed product with local popular name Batrisu vasanu or katlu. The products with on-pack information labels about ingredients were included in the study. Loose products without any ingredient information were excluded. Samples were then coded to maintain the confidentiality of the manufacturer for further research. Ingredients listed on packets were noted and redundant names were removed. Names of the herb written in vernacular names were validated using standard local language literature[12]. Further referencing was done with standard Ayurveda books and then Ayurvedic Pharmacopoeia of India (API) – Part I was used for confirming all plant details[13,14]. Additionally, the Food safety and standards authority of India (FSSAI) registration number, manufacturing and expiry dates and nutritional chart details were noted. The data were recorded in Microsoft excel and then statistical analysis and graphics were executed in R programming language[15]. Results are represented as fractions, percentage and mean±SD. Relative frequency of citation (RFC) was calculated for all herbs. To find the average number of herbs shared among all samples, the modified equation of the food pairing principle was used[16]. The mean number of herbs shared (N_h) was calculated by the following equation for n number of samples, where each sample (i) has a set of herbs (H).

$$N_h = \frac{2}{n(n-1)} \sum_{i \neq j} |H_i \cap H_j|$$

Statistically, the mean number of shared herbs (N_h) will be zero if none of the sample pairs (i, j) shares any herbs.

Hierarchical cluster analysis was performed using binary distance among each sample pair and the cluster dendrogram was prepared. To obtain the Jaccard similarity coefficient, each sample pairs were individually tested for a set of herbs present in it. The average Jaccard coefficient was calculated as the mean of Jaccard coefficients of all sample pairs.

Results

During the study period, a total of 16 marketed Batrisu vasanu products were collected. The samples were coded as BV01 to BV16 for further study. Only two samples, BV02 and BV05 had FSSAI numbers, manufacturing date and detailed nutrition chart on the packet. Names of the herbal ingredients were found written either in local language (Gujarati), English or botanical name. The number of herbs per sample in BV01 was highest and BV13 was the lowest (Fig. 1). There was a minimum of 10 herbs to a maximum of 36 herbs with range of 26 herbs per sample. Among the samples collected, the average number of herbs added as ingredients was 24.5±6.33.

After botanical validation of local and traditional names of the herbs, a total of 69 medicinally important herbs were found from these products. Sample wise distribution of each of these 69 herbs is given in Supplementary Table 1. As shown in Table 1, the list of these plants was made with their scientific name, API name, local name (Gujarati language), common name, family and part used. Botanically this study reports a total of 64 species of plants belonging to 58 important Genera. These medicinal plants belong to 38 diverse families, of which major families were Fabaceae (13.04%), Zingiberaceae (10.14%) and Piperaceae (8.69%). Of these medicinal plants, a total of 16 different parts

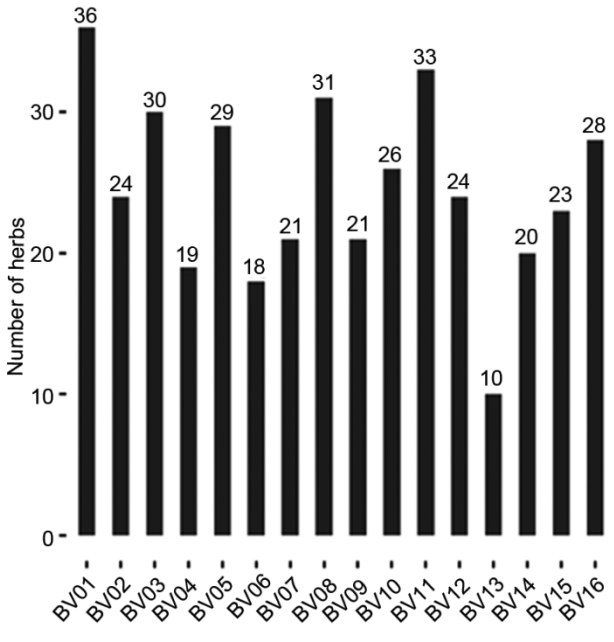

Fig. 1 — Bar plot showing the number of herbs per sample of Batrisu vasanu.

Table 1 — Alphabetically ordered list of herbs with their Relative frequency of citation (RFC) as used in Batrisu vasanu products

Sr. No.	Botanical name	Family	API name	Common name	Local Name	Part used	RFC
1	*Abutilon indicum* (L.) Sw.	Malvaceae	Atibalaa	Country mallow	Balbij, Baladana	Sd.	0.63
2	*Acacia nilotica* L.	Mimosaceae	Babbuula	Babul	Bawalgunder	Gum	0.44
3	*Acorus calamus* L.	Araceae	Vacha	The sweet flag	Vacha, Vaj, Ghodvach	Rz.	0.19
4	*Alpinia galanga* Willd.	Zingiberaceae	Kulanjana	Greater galangal	Panjad, Kulinjan	Rz.	0.44
5	*Amomum subulatum* Roxb.	Zingiberaceae	Sthulaila	Greater or Nepal cardamom	Elacho, Moti Elchi	Sd.	0.13
6	*Anacyclus pyrethrum* DC.	Asteraceae	Akarakarabha	Pellitory	Akkalkaro, Akkalgaro	Rt.	0.44
7	*Anethum sowa* Roxb. ex Flem.	Apiaceae	Satahva	Indian dil fruit	Suva	Fr.	0.38
8	*Asparagus adscendens* Roxb.	Asparagaceae	Musali	White musli	Safed mushali	Rt.	0.75
9	*Asparagus racemosus* Willd.	Liliaceae	Satavari	Asparagus	Shatavari	Rt.	0.88
10	*Asteracantha longifolia* Nees.	Acanthaceae	Kokilaksha	Long leaved barleria	Ekharo	Sd.	0.44
11	*Bambusa bambos* Druce.	Poaceae	Tugaksiri	Bamboo manna	Vaskapoor, Vanslochan	Resin	0.44
12	*Buchnania lanzan* Spreng.	Anacardiaceae	Priyala	Cuddapah almond	Charoli	kl.	0.06
13	*Butea monosperma* (Lam) Kuntze	Fabaceae	Palasa	Butea gum	Kamarkas	Gum	0.31
14	*Careya arborea* Roxb.	Lecythidaceae	Kumbhika	Kumbi	Vapumbha, Kumbhi	Fl.	0.25
15	*Cassia absus* L.	Fabaceae	Chakshushyaa	-	Chimed	Sd.	0.31
16	*Cinnamomum tamala* (Buch. Ham.) Nees & Eberm.	Lauraceae	Tvakapatra	Indian cinnamon	Tamal patra, Tejpatra	Lf.	0.38
17	*Cinnamomum zeylanicum* Blume.	Lauraceae	Tvak	Cinnamon bark	Taj, Dalchini	St. bk.	0.50
18	*Corchorus depressus* L.	Malvaceae	Chanchuka	Bahu phali	Bahuphali	Sd.	0.25
19	*Coriandrum sativum* L.	Umbelliferae	Dhanyaka	Coriander fruit	Dhana	Fr.	0.25
20	*Curculigo orchioides* Gaertn.	Amaryllidaceae	Talamuli	Golden eye grass	Kali musli, kalirnusali	Rz.	0.50
21	*Curcuma anguistifolia* Roxb.	Zingiberaceae	Tavkshir	East Indian arrowroot	Tavkir, Tavkheer	Rt.	0.06
22	*Curcuma longa* L.	Zingiberaceae	Haridra	Turmeric	Haldar	Rz.	0.25
23	*Cydonia oblonga* Mill.	Rosaceae	Amritaphala	Quince fruit	Bihidana, Bedaana	Sd.	0.13
24	*Dactylorhiza hatagirea* (D. Doon) Soo	Orchidaceae	Hattajari	Marsh orchids	Salampanja, Punjabi salam	Rt.	0.31
25	*Eletteria cardamomum* (L.) Maton	Zingiberaceae	Sukshmaila	Cardamom	Elaichi	Fr.	0.63
26	*Embelia ribes* Burm. F.	Myrsinaceae	Vidanga	Embelia	Vavding, Vayavadang	Fr.	0.25
27	*Foeniculum vulgare* Mill	Umbelliferae	Mishreya	Fannel fruit	Variyali	Fr.	0.44
28	*Glycyrrhiza glabra* L.	Fabaceae	Yashtimadhu	Licorice	Jethimadh, Mulethi	Rt.	0.06
29	*Hedychium spicatum* Ham. ex Smith	Zingiberaceae	Shati	Spiked ginger lily	Kapurkachri, Kapurkachali	Rz.	0.06
30	*Illicium verum* Hook. F.	Magnoliaceae	Takkola	Star anise of china	Badiyaan	Fr.	0.06
31	*Indigofera glandulosa* Wendl.	Fabaceae	-	-	Vakeriyo	Sd.	0.31
32	*Ipomoea hederacea* (L.) Jacq.	Convolvulaceae	Krishna bij	ivy-leaved morning glory	Mughalai	Sd.	0.25
33	*Lepidium sativum* L.	Cruciferae	Chandrasura	Common cress	Asaliyo, Aseriya	Sd.	0.25
34	*Mesua ferrea* L.	Guttifereae	Nagakesara	Cobras saffron	Nagkesar	Fl. bd.	0.56
35	*Mucuna pruriens* Baker.	Fabaceae	Atmagupta	Cowhage	Safed kaucha	Sd.	0.81
36	*Mucuna pruriens* Baker.	Fabaceae	Atmagupta	Cowhage	Kala kaucha	Sd.	0.06
37	*Myristica fragrans* Houtt.	Myristicaceae	Jatiphala	Nutmeg	Jaiphala, Jayfar	Sd.	0.63
38	*Myristica fragrans* Houtt.	Myristicaceae	Jatipatri	Mace	Javintri	Aril	0.50
39	*Nelumbo nucifera* Gaertn.	Nymphaeaceae	Kamala	Sacred lotus	kamalgatta, kamalkakdi	Sd.	0.13
40	*Papaver somniferum* L.	Papavaraceae	Khaskhasa	Poppy seeds	Khaskhas	Sd.	0.56

(*Contd.*)

Table 1 — Alphabetically ordered list of herbs with their Relative frequency of citation (RFC) as used in Batrisu vasanu products (*Contd.*)

Sr. No.	Botanical name	Family	API name	Common name	Local Name	Part used	RFC
41	*Piper chaba* Hunter non-Blume.	Piperaceae	Gajapippali	Java long pepper	Gajapipar	Fr.	0.06
42	*Piper longum* L.	Piperaceae	Pippali	Long pepper	lindipeepar, Pipali	Fr.	0.88
43	*Piper longum* L.	Piperaceae	Pippalimula	Piper root	Pipalimool, Ganthoda	Rt.	0.81
44	*Piper nigrum* L.	Piperaceae	Maricha	Black pepper	Kala mari	Sd.	0.88
45	*Piper nigrum* L.	Piperaceae	Maricha	Black pepper	Safed mari	Sd.	0.75
46	*Piper retrofractum* Vahl.	Piperaceae	Chavya	Cubeb	Chavaka, Chavka	St.	0.13
47	*Pistachia vera* L.	Anacardiaceae	Mukuulaka	Pistachio	Pista	Kl.	0.06
48	*Plantago ovate* Forssk.	Plantaginaceae	Snigdhajeerak	Ispaghula seed	Isabgol dana, Othamijiru	Sd.	0.25
49	*Plumbago zeylanica* L.	Plumbaginaceae	Chitraka	Lead war	Chitrak, Chitrakmula	Rt.	0.13
50	*Polygonatum verticillatum* (L.) All.	Liliaceae	Meda	Solomon's seal	Salamdana, Salam misri	Rt.	0.19
51	*Prunus amygdalus* Batsch	Rosaceae	Vaataama	Almond	Badamgir	Kl.	0.06
52	*Pterocarpus marsupium* Roxb.	Leguminoseae	Asana	Indian kino tree	Asan, Biyo	Ht. wd.	0.19
53	*Pueraria tuberosa* DC.	Fabaceae	Vidarikanda	Indian kudju	Vidarikand, Bhonykoru	Tub. rt.	0.38
54	*Quercus infectoria* Olivo	Fagaceae	Mayyaku	Oak-gall	Mayafal, Maujoophal	Gall	0.19
55	*Salmalia malabarica* (DC) Schott & Endl.	Bombacaceae	Mocarasa	Silk cotton tree	Semulmusli, Shaalmali	Rt.	0.06
56	*Sida cordifolia* L.	Malvaceae	Bala	Country mallow	Bala	Rt.	0.06
57	*Smilax china* L.	Liliaceae	Madhusnuhi	China root	Chopcheenee	Tub. rt.	0.44
58	*Sphaeranthus indicus* L.	Asteraceae	Mahamundi	East indian thistle	Bodiokalara, Mundi	Lf.	0.13
59	*Symplocos racemosa* Roxb.	Symplocaceae	Lodhra	Symplocos bark	Lodhar, Lodhra	St. bk.	0.13
60	*Syzygium aromaticum* (L.) Merr. And L.M. Perry	Myrtaceae	Lavanga	Clove	Laving	Fl. bd.	0.44
61	*Trachyspermum ammi* (L.) Sprague ex Turril	Umbelliferae	Yavani	Bishop's weed	Ajwain, Ajmo	Fr.	0.19
62	*Tribulus terrestris* L.	Zygophyllaceae	Gokshura	Caltrops fruit	Gokharu	Fr.	1.00
63	*Trigonella foenum-graecum* L.	Fabaceae	Methi	Fenugreek	Methi	Sd.	0.19
64	*Vitex negundo* L.	Verbenaceae	Renuka	Five-leaved chaste tree	Nirgundi, Nagodbiya, Harenu, Renuka	fr.	0.25
65	*Vitis vinifera* L.	Vitaceae	Draksha	Raisin	Draksh	Fr.	0.06
66	*Withania somnifera* Dunal.	Solanaceae	Asvagandha	Wintercherry	Ashwagandha, Aasandh	Rt.	0.94
67	*Zanthoxylum armatum* DC.	Rutaceae	Tumburu	Winged prickley ash	Tejbal	Fr.	0.56
68	*Zanthoxylum armatum* DC.	Rutaceae	Tejohva	Winged prickley ash	Tejovati	St. bk.	0.06
69	*Zingiber officinale* Roxb.	Zingiberaceae	Shunthi	Ginger	Sunth	Rz.	0.88

like flower (Fl.), fruit (Fr.), heartwood (Ht. wd.), leaf (Lf.), root (Rt.), Rhizome (Rz.), seed (sd.), stem bark (St. bk.), stem (St.), tuberous root (Tub. Rt.), kernel (Kl.), floral bud (Fl. Bd.), aril, resin, gall and gum were reported in the study. The major plant part used in products was the seed (26.09%) followed by fruit (18.84%) and root (15.94%). The relative frequency of the herbs ranged from 0.06 being the lowest to 1.00 being the highest. Analysis further showed that there is 14.49% (n=10) herbs with ≥0.75 RFC, 13.04% (n=9) herbs with ≥0.5 RFC, 34.78% (n=24) herbs with ≥0.25 RFC and 37.68% (n=26) herbs with ≥0.00 RFC. Medicinal herbs namely Gokshura, Asvagandha, Pippali, Satavari, Maricha, and Shunthi were the most commonly used in Batrisu vasanu product.

For collected samples, a statistical test was performed to find the average number of herbs shared (N_h) by them. It was found that all products shared an average of 12.80±4.62 medicinal herbs in common. Then to test the similarity in ingredients between each pair of samples, a hierarchical cluster dendrogram

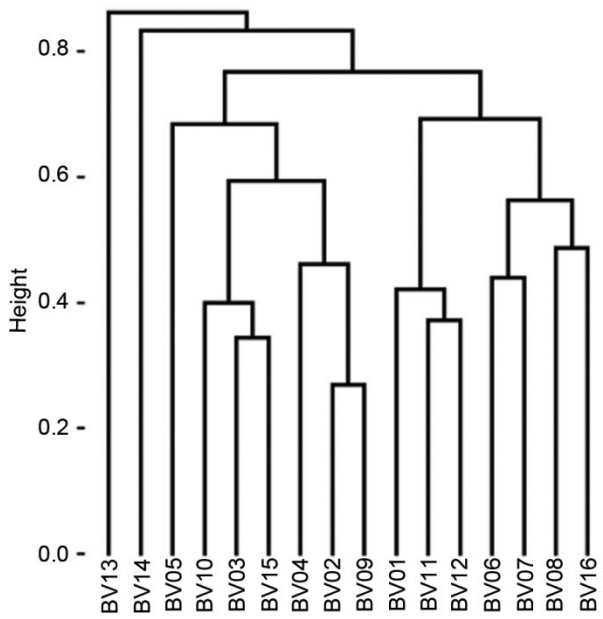

Fig. 2 — Cluster dendrogram showing pairing of BV samples along with their respective height.

was prepared as shown in Fig. 2. It shows two large clusters with a couple of sub-clusters in each of them. There are 5 closely similar pairs in terms of herbs they share. Jaccard coefficient of 0.79 between BV02 and BV09 shows maximum similarity, and 0.13 between BV08 and BV13 shows minimum similarity. Further, the average Jaccard coefficient for all sample pairs was found to be 0.35 (±0.12), indicating poor similarity for ingredients among samples.

Discussion

This is the first systematic study of Batrisu vasanu products sold over the counter in the market. These findings are significantly important to understand the variation of ingredients in it. Although traditionally Batrisu means 32 herbs, the present study shows only 24.5±6.33 herbs per sample. Also, some samples were having way below this expected number of herbs added. This result indicates the inconsistent numbers of herbs in marketed samples.

The most dominant family Fabaceae agrees with previous studies of the medicinal plants used for women's healthcare[17,18]. Among different reports about postpartum care, root, leaf, and seed are highly referred plant parts[17]. A similar result was obtained as seed, fruit and root are predominately used parts in Batrisu vasanu.

Further, the result of only 19 herbs (27.5%) having RFC more than 0.5 indicated a highly inconsistent herbal composition. Gokshura was found in all the products analysed, supporting its popularity for postpartum care. Gokshura is used as a diuretic, anti-inflammatory, anabolic, cardiotonic and for cough and asthma[19]. It is used as part of herbal decoction given to new mothers[20,21]. Satavari, Mishreya, and Vidarikanda are known for potential galactagogue activity and the treatment of female genitourinary tract disorders[19,22]. In ethnobotanical studies, Kulanjana, Sthulaila, Vidanga and Shunthi are also reported as a tonic in postpartum recovery and as galactagogue[23]. Additionally, Gokshura, Haridra, Methi, Babbuula, Shunthi, Jatiphala, and Yavaniare popular medicinal plants used during postpartum care in India[20]. Many herbs reported in this study are also used in diet therapy during postpartum care[21].

Findings of herb sharing showed an average of 12 herbs being shared among samples tested. However, differences in the numbers of herbs per sample might have resulted in poor sharing. This result was hence further strengthened by cluster dendrogram analysis and poor average Jaccard coefficient. Jaccard coefficient and herb sharing data supports the argument that herbs added in products were heterogeneous.

Ayurveda describes many galactagogues, of which 32 plants referred as Stanyajanan and Kseerjanana are botanically reported[24]. The plants reported in the present study like Meda, Draksha, Tugaksiri, Yashtimadhu and Kamala find their reference as a galactagogue in Ayurveda as well[25,26]. Further, the action of Vacha and Satavari like drugs has already been shown as an effective herbal galactagogue, as referred to in the Dravyaguna Vigyaan[27]. An elaborate review on galactagogue reports a significant research gap on clinical research with plant galactagogue as well as reports issues of its efficacy[28]. Meanwhile, a study has reported a positive correlation between milk production and consumption of traditional galactagogue foods[29]. A commercial polyherbal product Lactovedic was also shown to induce proliferation of acini and increased milk secretion[22]. Although it seems promising, clinical research in this area needs more attention as it concerns the health of the child and mother both. In Asia, herbs and polyherbal mixtures for self-treatment and as food supplements can be easily purchased from condimental shops and traditional healers[30]. It often does not follow any standards due to the lack of local regulatory bodies which poses a bigger challenge in addressing safety and quality concerns. Additionally,

the quality, pharmacological benefits and side effects of any galactagogue should be thoroughly studied as through lactation it gets exposed to baby also[31]. So, it is understood that postpartum health concerns are intense and requires more attention due to these traditional practices, unscientific diet and ethnomedicine usage.

Conclusion

In this study, the diverse numbers of medicinal herbs and their inconsistent usage in commercially marketed Batrisu vasanu product are concluded. A large number of herbs reported here confirms the variation in ingredients among marketed products. Further, the uneven number of herbs added per product and their varied types derive the same conclusion. The traditional belief with Batrisu vasanu is as a galactagogue and postpartum healer. However, the reported irregularity in samples signals a serious health concern for new mothers as well as new-born. For the safety of both, it is essential that pharmacokinetics and bioavailability information of this polyherbal product should be studied in detail. Such efforts will not only regularise its quality but will also increase its acceptability as ethnomedicine.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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