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Medicinal plants used for women's healthcare in Al-Madinah Al-Munawarah, Saudi Arabia

A Abdelhalim[a,*,†] & N Saleem[b]

[a]Chemistry Department, College of Science, 30002 Taibah University, Al-Madinah Al-Munawarah, Saudi Arabia

[b]Biology Department, College of Science, 30002 Taibah University, Al-Madinah Al-Munawarah, Saudi Arabia

E-mail: [†]abeerb@ymail.com; nabila.atwani@gmail.com

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There is persistent use of traditional medicine for women's health care in Al-Madinah Al-Munawarah, they generally depend on traditional medicinal plants as the source for the treatment of their reproductive health issues. This study aims to document and collect information on herbal remedies used by traditional healers for women's healthcare in Al-Madinah Al-Munawarah. Data about traditional uses of medicinal plants for female healthcare were collected through qualitative tools (questionnaire, interviews, and group discussions). A total of 31 medicinal plant species from 15 different families have been documented as being used for female healthcare. Different methods of preparation of the medicinal remedy were prescribed usually as maceration or decoction of one plant or as a mixture of two or more plant species with an average dose of two glasses per day. Literatures confirm the use of most of these plants in the treatment of women's gynecological problems. This study indicates that a wide range of remedies are used by women for the treatment of several complications and problems associated with women's health issues.

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Medicinal plants have been used to treat diseases for thousands of years[1]. Traditional herbal remedies have increased in popularity in many parts of the world due to their effectiveness, fewer side effects, and are relatively low in cost[2]. According to the World Health Organization (WHO), a majority of the world's population in developing countries depend on traditional medicine for their healthcare needs[3]. A substantial number of Al-Madinah Al-Munawarah women seek treatment from traditional healers for their health issues especially for the problems associated with their reproductive system, such as fertility, menstruation, menstrual colic, menopause problems, pregnancy, labor, postpartum problems and other gynaecological problems.

Saudi Arabia's flora is considered to be one of the richest biodiversity areas among the Arabian Peninsula. The country possesses a great number of endemic species and a wide range of flora. It has been estimated that there is a total of 2250 species, representing 142 families[4]. Al-Madinah Al-Munawarah, the western part of Saudi Arabia, is one of the biggest oasis in the region which has a desert climate that is characterized by hot dry summer and cold rainy winter[5].

There have been very few studies conducted about the use of medicinal plants in Al-Madinah Al-Munawarah and to date, no such kind of study has been carried out. Hence, this study aims to document the medicinal plants used in Al-Madinah Al-Munawarah by traditional medical practitioners related to women's healthcare. For this purpose, local or common names of the medicinal plants, their main used parts, their method of preparation and administration and finally the ethnopharmacological practices were recorded and compared against *in vitro*, *in vivo* and clinical pharmacological studies of the claimed uses. This study has provided important baseline information that would improve the knowledge and the application of the reported medicinal plants as safe therapeutic alternatives.

Material and Methods

Study area

Al-Madinah Al-Munawarah (24º 28'N 39º 36'E) is a desert oasis located in the north-western part of Saudi Arabia to the east of the Red Sea surrounded by

*Corresponding author

several mountains located on a flat mountain plateau at the junction of the three valleys. For this reason, there are large green areas amongst a dry mountainous region. Al-Madinah Al-Munawarah has a hot desert climate that is distinguished by extremely hot summers and mild winters with very little rainfall which falls almost entirely from November to May.

Data collection

This survey was conducted between January and March, 2015 from 31 interviewees (21 midwives and 10 practitioners). Prior to completing the study, all the interviewees signed a consent form and were approved to participate in this study. The informants were between the age of 45 and 65 years old. Details of the plants that were used for dealing with gynaecological problems of women were collected from the practitioners. The information was collected through a questionnaire, interviews and group discussions that were all conducted in practitioners' local language (Arabic). The collected data from the informants included the names of the used plants, their traditional use, parts, method of preparation for the remedy, dosage and the duration of treatment.

Samples of the surveyed species were collected for herbarium preparation following standard procedure[6] and given a herbarium specimen number (Table 1). The identification of specimens was undertaken using the relevant volumes of the Flora of Saudi Arabia which then was confirmed by plant taxonomic experts. A voucher specimen (M.P. 1-31) has been deposited in the author's research laboratory at the Department of Chemistry, Faculty of Science, Taibah University.

Data analysis

The factor of informant consensus (Fic)

The F_{ic} value indicates the uniformity of the information about a specific plant use shared by all the informants to treat a particular category of ailment. The value of this factor ranges from 0 to 1. A value close to 1 means that the species used by most of the informants for the same category of ailment, indicating more consistent information. The value close to 0 indicates a disagreement among the use of the species for the treatment of a specific ailment. The F_{ic} was calculated as[7]:

$$F_{ic} = (n_{ur} - n_t)/(n_{ur} - 1)$$

Where

n_{ur}: number of use reports per each category
n_t: number of species used

Use value (UV)

The use value (UV)[8] established to know the relative importance of locally used species with respect to other species. High value of UV means that the plant is very important.

The UV is calculated as:

$$UV = \Sigma U/n$$

Where

U: number of uses per species
n: number of informants

Results and Discussion

The medicinal plants reported in the current study are documented (Table 1) by family name, as are the species within each family. Arabic names are provided. Altogether 31 plant species representing to 15 families were documented from the study area. Apiaceae and Lamiaceae families were noted to have the largest number of species (5 species), followed by Brassicaceae (4 species). Different parts of the medicinal plant species were used (whole plant, leaves, stem, fruits, seeds, bark and root); but leaves were the most commonly used part. The most common method of administration was either as infusions or decoctions taken orally or applied tropically. Many species were used to deal with more than one gynaecological aliment, for instance the majority of species were used for postpartum recovery (12 species). Fourteen plants were used to treat menstrual colic, eleven plants for vaginal and uterus infections**,** nine plants for treating amenorrhea and five to treat infertility. *In vitro*, *in vivo* and clinical studies were conducted by researcher in order to investigate the tradition uses of some of the reported plants.

The use value (UV) was calculated for each plant. The species with the highest UV values were *Allium sativum* and *Cuminum cyminum* with a UV of 0.93. *A. sativum* is used for vaginal infections, high blood pressure, and to control diabetes during pregnancy, while *C. cyminum* is used to relieve the postpartum gas and general weakness. *Teucrium polium* used for infertility, uterus cleansing, and menstrual colic was reported with UV of 0.89. All of the medicinal attributions were classified into 12 ailment categories cited by the interviewees:

Table 1 — Plants and herbs used for treatment of various human ailments in Al-Madinah Al-Munawarah

Family name	*Scientific Name* (voucher specimen)	Local name	Part used	Methods of use	Recommended uses	Administration, dosage, duration of the treatment	Use value (UV)
Alliaceae	*Allium cepa L.* (M-AC)	Basal	Bulbs	Oral	Controls diabetes during pregnancy Constipation Boosting immunity Menstrual colic	Fresh with meals, for menstrual colic eating raw onions 4 to 5 days before the period	0.87
	Allium sativum L. (M-AS)	Thom	Bulbs	Oral	Controls diabetes during pregnancy Vaginal infections Prevents hair loss Treating high blood pressure	2 to 4 fresh garlic cloves daily	0.93
Apiaceae	*Ammi visnaga L.* (M-AV)	AI-Khillah	Seeds	Oral	Urinary tract stones Increase menstruation flow	5 tsp Boiled with a big cup of water and the decoction is left for 5 minutes then is drunk on two or three portions through the day	0.41
	Carum carvi L. (M-CC)	Karawiyah	Seeds	Oral	Promoting lactation in women after giving birth Relief of postpartum gas Reduce menopausal symptoms Help start menstruation Menstrual colic Urinary tract infections	2 tsp of seeds in boiled water for 10 minutes and drunk after each meal or chewing seeds after every meal	0.82
	Cuminum cyminum L. (M-CY)	Kammon	Seeds	Oral	Relief of postpartum gas General weakness	Boiled with water and the decoction is drunk first thing in the morning	0.93
	Foeniculum vulgare Mill. (M-FV)	Shamaar	Seeds and fruits	Oral	Infertility Promoting lactation in women after giving birth Reduce menopausal symptoms Relief of postpartum gas Menstrual colic Help start menstruation	2 tsp of seeds in boiled water for 10 minutes 3 times daily	0.75
	Pimpinella anisum L. (M-PA)	Yansoon	Seeds	Oral	Relief of postpartum gas Promoting lactation in women after giving birth Fungus and bacterial inflammation (internal female parts) Reduce menopausal symptoms Helping delivery of newborn Increase menstruation flow Breast augmentation	Boiled with water and the decoction is drunk as one glass 2-3 times daily until recovery	0.85

(*contd.*)

Table 1 — Plants and herbs used for treatment of various human ailments in Al-Madinah Al-Munawarah (*contd.*)

Family name	*Scientific Name* (voucher specimen)	Local name	Part used	Methods of use	Recommended uses	Administration, dosage, duration of the treatment	Use value (UV)
Asteraceae	*Artemisia herba-alba* Asso (M-AH)	Sheeh	Leaves	Oral	Helping delivery of newborn Menstrual colic	Dried or fresh leaves soaked in hot water for infusion for 15 minutes and is drunk as one glass once daily	0.21
				Topical	Vaginal tightening Fungus and bacterial inflammation (internal female parts)	Dried or fresh leaves soaked in water for one day and then wash the vagina with the solution	
	Achillea fragrantissima (Forssk) (M-AF)	Qaisoom	Leaves	Oral and topical	Fungus and bacterial inflammation (internal female parts)	Dried leaves boiled with water and the decoction is drunk as one glass 2-3 times daily until recovery or applied externally to the vagina	0.31
			Leaves	Oral	Stimulate menstrual flow	Dried leaves soaked in hot water for infusion for 15 minutes and is drunk as one glass two times daily	
Brassicaceae	*Lepidium sativum* L (M-LS).	Habb al Rashad	Seeds	Oral	Uterus cleansing Menstrual colic	Mix 1 tsp of seeds with 7 pieces of dates and eat first thing in the morning throughout the days of menstrual cycle	0.32
				Oral	Infertility and ovarian stimulation	Mix the same amounts of the seeds with Nigella sativa and crushed Commiphora molmol, to be taken regularly from the second day of the menstrual cycle until completion and for a period of not less than 90 days	
				Oral	Promoting lactation in women after giving birth Helping delivery of newborn	Boiled with water and the decoction is drunk as one glass 2 times daily Should not be drunk before the third trimesters	
	Boswellia sacra Flueck (M-BS)	Luban-Dakar	Gum	Oral	Stimulate the uterus and menstrual flow Uterus fibroids	2 tsp of seeds in boiled water for 10 minutes 3 times daily	0.42
	Commiphora molmol Engl. (M-CM)	Murr	Gum	Oral	Stimulate the menstrual flow Uterus cleansing after giving birth	Boiled with water and the decoction is drunk as one glass 2-3 times daily	0.25
				Tropical	Uterus cleansing Vaginal infection	Boiled with water and the decoction is applied 2 times daily to the uterus Smashed gum is mixed with honey and Prunus mahaleb to make a dough and to be applied inside the vagina as a suppository	
	Commiphora opobalsamum L. (M-CO)	Basham, Balasan	Leaves	Oral	Uterus cleansing after giving birth	Boiled with water and the decoction is drunk daily for one weak	0.15

(*contd.*)

Table 1 — Plants and herbs used for treatment of various human ailments in Al-Madinah Al-Munawarah (*contd.*)

Family name	*Scientific Name* (voucher specimen)	Local name	Part used	Methods of use	Recommended uses	Administration, dosage, duration of the treatment	Use value (UV)
			Bark	Tropical	Bacterial inflammation (internal female parts)	Boiled with water then wash with the solution after giving birth	
Cucurbitaceae	*Citrullus colocynthis* L. Schrad (M-CC)	Hanthal	Fruit leaves	Tropical	Female fungal infection	Fresh fruit and leaf juice (smashed up) is applied on painful areas externally	0.12
			Fruit seeds	Oral	Increase menstruation flow	Fruit and 5 to 7 seeds soaked in hot water for infusion for 10 minutes and is drunk as one glass daily	
			Roots	Tropical	Abortion (Still born)	Fresh roots are ground to a fine paste and applied over the vagina.	
	Juniperus procera (Hochst. ex Endl.) (M-JP)	Ar'ar	Bark	Oral Topical	Birth control agents Enlarged uterus	The bark soaked in water is drunk, or applied as a vaginal wash	0.34
			Seeds	oral	Stimulate menstrual flow	Boiled with water and the decoction is drunk 3 times in the week before the period	
Fabaceae	*Acacia tortilis* (Forssk.) (M-AT)	Talh	The whole branches	Topical	Vaginal tightening	Woman wrapped in a blanket and vagina exposed to the fumes for about 20 minutes	0.11
	Trigonella foenum-graecum L.(M-TF)	Helbah	Seeds	Oral	Promoting lactation in women after giving birth Controls diabetes Menstrual colic Helping delivery of newborn	1 tsp of crushed seeds in water 3 times daily	0.75
				Topical	Breast augmentation	Crushed seeds mixed with a bit of olive oil and applying it topically	
Lamiaceae	*Lavandula angustifolia* Mill. (M-LA)	Khozama	Leaves and flower	Topical	Vaginal infections	Crushed Leaves soaked in boiled water for infusion for 10 minutes and is applied externally to affected areas, 2-3 times daily until improvement occurs	0.64
			Leaves	Oral	Menstrual colic	Dried or fresh leaves soaked in hot water for infusion for 10 minutes and is drunk as tea	
	Melissa officinalis L (M-MA)	Malleseh	Leaves	Oral	Menstrual colic Promoting lactation in women after giving birth Uterus cleansing	Dried or fresh leaves soaked in hot water for infusion for 5 minutes and is drunk as one glass once daily	0.63
	Origanum syriacum L. (M-OS)	Za'tar	Leaves	Oral	Regulate menstrual cycle Menstrual colic Stimulate fertility Vaginal infections	Dried or fresh leaves soaked in hot water for infusion for 10 minutes and is drunk as one glass once daily	0.77

(*contd.*)

Table 1 — Plants and herbs used for treatment of various human ailments in Al-Madinah Al-Munawarah (*contd.*)

Family name	Scientific Name (voucher specimen)	Local name	Part used	Methods of use	Recommended uses	Administration, dosage, duration of the treatment	Use value (UV)
	Salvia triloba L. (M-ST)	Meriamia	Leaves	Oral	Swollen Feet during pregnancy Morning sickness Menstrual colic Menopause Vaginal cleansing Ovarian stimulation	Boiled with water and the decoction is drunk as one glass 2-3 times daily until recovery	0.88
	Teucrium polium L. (M-TP)	Jaa'deh	Flowers	Oral	Infertility Uterus cleansing Menstrual colic	Fresh flowering parts soaked in hot water for infusion for 2 minutes and is drunk once daily for 40 days	0.89
Lythraceae	*Lawsonia inermis* L. (M-LI)	Henna	Leaves, soft shoots	Topical	Decorating and dyeing hands and feet Dyeing hair	Leaves soaked in water for at least 5 hours and applied to hair and skin	0.44
Myrtaceae	*Eugenia caryophyllata* Thunb (M-EC)	Qarunful	Flower buds	Oral	Flatulence Constipation	One teaspoon of crushed flower buds soaked in boiled water for infusion for 10 minutes and is drunk once daily	0.56
Poaceae	*Cymbopogon schoenanthus L.* Spreng (M-CS)	Athkhar	Whole plant	Oral	Stimulate the uterus and menstrual flow Menstrual colic	Dried or fresh leaves soaked in hot water for infusion for 5 minutes and is drunk as one glass once daily	0.32
Punicaceae	*Punica granatum* L. (M-PG)	Ruman	Peel	Tropical	Vaginal tightening	Put wet finder in crushed dried peels and massage the vaginal area	0.61
Ranunculaceae	*Nigella sativa* L. (M-NS)	Habit elBaraka	Seeds	Oral	Promoting lactation in women after giving birth Sexual potency Boosting immunity	One teaspoon of seeds soaked in boiled water for infusion for 10 minutes and is drunk once daily	0.76
				Topical	Helping delivery of newborn	Make a water bath (2 tea spoons of seeds boiled in two cups of water) for 15 minutes	
Rosaceae	*Prunus mahaleb* L. (M-PM)	Mahlab cherry	Seeds	Oral	Stimulate menstrual flow Menstrual colic Vaginal tightening	Boiled with water and the decoction is drunk as one glass 2-3 times daily until recovery	0.53
Rosaceae	*Rosa arabica* Crép (M-RA)	Ward	Flowers	Oral	Uterus cleansing after giving birth	Dried leaves boiled with water and the decoction is drunk until recovery	0.12
Rutaceae	*Ruta graveolens* L. (M-RG)	Sudab	Leaves Seeds	Oral	Menstrual colic Contraceptive	Crushed dried leaves soaked in hot water for infusion for 15 minutes and is drunk once daily	0.12

increasing female fertility, inducing labor, postpartum recovery, treating amenorrhea, treating dysmenorrhea, as a galactagogue, control diabetes, reducing menopausal symptoms, treating urinary tract infections, vaginal and uterus infections, cosmetics and menstrual colic. The calculated F_{ic} values were found in the range of 0.33 to 0.98. The highest F_{ic} value was recorded in the treating of urinary tract

infections (0.98) and reducing menopausal symptoms (0.96) categories. The lowest F_{ic} value was for the inducing labor use category (0.33). Table 2 shows these categories with their F_{ic} values.

Foeniculum vulgare and Lepidium sativum have currently been reported for infertility problems. *In vivo* studies showed that the extract of *F. vulgare* caused an increase in the estrogen, progesterone, and prolactin serum level in female mice[9]. The effectiveness of *L. sativum* for the treatment of infertility is supported by experimental study on female rabbits, the results showed an increase in conception rate and plasma Luteinizing hormone (LH) levels when fed with diet containing *Lepidium sativum* seed powder[10]. On the other hand, *Salvia triloba* has an adverse effect on female fertility, evidence from preclinical studies suggested that the ingestion of the ethanolic extract of *S. triloba* by female rats for one month not only had no effect on the occurrence of pregnancy but also reduced the number implantations and viable Foetuses[11].

Galactagogues include foods, herbal medicines and pharmaceutical drugs are substances that used to increase the milk production. Around the world there are a large number of plants being used as galactagogues. This survey reported seven medicinal plants that were used as galactagogue in Madina these are *Carum carvi*, *F. vulgare*, *Pimpinella anisum*, *L. sativum*, *Trigonella foenum-graecum*, *Melissa officinalis*, and *Nigella sativa. In vivo* experiments supported the use of the reported plants as a galactagogue. A mixture of plant extract of *Carum Carvi*, *T. foenum-graecum* and *Medicago Sativa* was found to increase daily milk production by 20-40% in cows when introduced orally and daily for 8 weeks[12]. The extract of *F. vulgare* seeds shows a significant increase of prolactin level in the serum in mice[9]. *L. sativum* seeds were tested for their effect on the mammary gland of young adult virgin rats and found to exhibit a strong mammotrophic and lactogenic effects supporting it use as a galactagogue[13]. The aqueous and ethanolic extracts of the seeds of *N. sativa* on milk production were studied in rats and showed an increase of about 31.3% and 37.6%, respectively in milk production compared to control rats[14]. Herbs associated with galactogogue properties, due to its antispasmodic effects, are not permitted during pregnancy as it may cause uterine contractions, miscarriages, or premature labor[15]. Four of the seven galactagogue plants are also being used to induce labor in Almadina. Pharmacological investigations support the use of benzyl isothiocyanate compound isolated from *L. sativum* on uterine contraction in rats[16]. *In vivo* experimental studies also supported the antispasmodic effect of *C. carvi*[17], *F. vulgare*[18], *P. anisum*[19], *M. officinalis*[20] and *N. sativa*[21].

Table 2 — Informant consensus factor values by various gynecological aliments

Category	Species	Use citations	F_{ic}
Increasing female fertility	8	16	0.53
Inducing labor	5	7	0.33
Postpartum recovery	12	64	0.83
Treating amenorrhea	9	24	0.65
Treating dysmenorrhea	5	24	0.83
Using as lactagogue	6	30	0.83
Controls diabetes	3	7	0.67
Reducing menopausal symptoms	4	69	0.96
Treating urinary tract infections	2	49	0.98
Vaginal and uterus infections	7	15	0.57
Cosmetics	8	16	0.53
Menstrual colic	10	61	0.85

Menstrual problems include menstrual pain (primary dysmenorrhea), absence of menstruation (amenorrhea), heavy or light menstruation and irregular menstruation. More than half of all postmenarcheal females suffer from uncomfortable symptoms at least once in their life[22]. Unfortunately the use of non-steroidal anti-inflammataory drugs (NSAIDs) to treat the dysmenorrhea has undesirable side effects making the use of herbal medicines as alternatives for dysmenorrhea treatment more feasible. About 68% (21 plants) of the reported plants are used to treat menstrual problems. The use of *F. vulgare*, *Boswellia sacra*, *Lavandula angustifolia* and *Teucrium polium* for treating primary dysmenorrhea is supported by experimental data. *F. vulgare* and *Boswellia sacra* inhibited the uterus contraction of rat that was induced by oxytocin and prostaglandin E2[22,23] and caused uterine relaxation[24]. In a clinical study performed on 70 single female, *T. polium* decreased the pain in primary dysmenorrhea in the first and the second months and its effect was comparable to mefenamic acid[25]. A cream of a mixture of *L. angustifolia*, *Salvia sclarea* and *Origanum majorana* in a 2:1:1 ratio was tested in 48 females, all outpatients massaged their lower abdomen from the end of their last menstruation to the beginning of their next

menstruation. This showed a significant reduction in the duration of primary dysmenorrhea[26]. *Pimpinella anisum* has been reported to minimize the menopausal hot flashes in a clinical study including 36 postmenopausal women. In this experiment the women were asked to take a capsule contains 330 mg of *P. anisum* three times daily for four weeks which resulted in decreasing the frequency and severity of the hot flashes in postmenopausal women[27].

Numbers of studies have investigated the antimicrobial properties for the treatment of vaginal and uterus infections. After delivery, the vaginal pH becomes more basic due to the neutralizing effect of the alkaline amniotic fluid and the normal discharge from the uterus after childbirth makes a suitable environment for the growth of the aerobic bacteria. The presence of microorganism in the vagina could transfer to the uterine cavity due to weak immune system the mother has after a tiresome labor[28]. Plants provide an extensive resource for anti-infection active components and can be considered as a wealthy source of many biologically active compounds, such as alkaloids, terpenoids, and flavonoids which have been found to possess antiviral, antibacterial, and antifungal effect[29]. For example, *Achillea fragrantissima is* widely used as an eye lotion, for colic, indigestion, stomach pains and female vaginal infections. *Acacia* is used by healers as an antiseptic and for treatment of genital infections; studies showed that water extracts of *Acacia nilotica* inhibited some of the bacteria species with low minimum inhibitory concentration.

The use of *Allium cepa, A. sativum*, and *T. foenum-graecum* for diabetes treatment were reported. The plant extracts were found to highly lowered the blood glucose in diabetic induced rats[25,30-33]. Two plants were used to boost immunity in the current study. *Nigella sativa* and *A. cepa* were suggested to be used as a nutritional therapeutic remedy for boosting the immune status and lower the induced toxicity of anticancer drugs such as cyclphosphamide in rats[34,35]. *A. sativum* was studied clinically and proved to lower the high blood pressure[36]. Water extract of Ammi visnaga seeds significantly reduced the deposition of calcium oxalate in rats kidneys supporting the claimed use of this plant for the urinary tract stones treatment[37].

Conclusion

This study investigated the medicinal plants related to women's healthcare in Al Madinah Al Al-Madinah Al-Munawarah. The persistent use of traditional medicine by women is indicative of the importance of ethnobotanical research for maintaining traditional resources and in particular to focus on used species for women's health care. The study showed that a wide range of remedies are used by women for many problems and disorders associated with women's health issues including fertility, inducing labor, as galactagogues, treatment of menstrual problems, and antimicrobial infections. Literature was surveyed for the gynecological claimed use of the reported medicinal plants and was compared against *in vitro*, *in vivo* and clinical pharmacological studies.

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Conflict of Interest

The authors have declared that there is no conflict of interest.

Author Contributions

This work was carried out in collaboration between both authors. Author AA performed the ethnobotanical analyses and wrote the first draft of the manuscript. Author NS designed the study and conducted ethnobotanical interviews. Both authors read and approved the final manuscript.

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