



## Ethno-Pharmacological Profile of *Corallium Rubrum* L., an Important Marine Drug, in the Unani System of Medicine

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**Abstract** – Since ancient times, various herbal medicines have been used in folk medicine to treat a variety of diseases. While the majority of drugs belong to the Kingdom of Plantae, some drugs from the Kingdom of Animalia are listed in various Materia medica of alternative medicines. Animal-derived drugs are mentioned in the Unani system of Medicine (USM) and have been used successfully to treat a variety of diseases. *Marjān* (*Corallium rubrum*) is a vital marine drug of animal origin that has been used in USM since ancient times and continues to be used today. It possesses a variety of beneficial pharmacological properties, including tonic effects on the heart, brain, stomach, and eyes, pregnancy protection, expectorant, and hemostyptic properties. It is used to treat hemoptysis, palpitation, bleeding piles, hemiplegia, heart failure, and general weakness. It is also an ingredient in a variety of Unani formulations with pharmacological significance. Unani physicians expanded the uses of Marjan and successfully used it to treat a variety of new diseases. There is a dearth of scientific research on its pharmacological and medicinal properties. The urgent need is to validate the Unani claims about its beneficial cardiac and nervine actions, as well as other significant actions mentioned in the Unani literature.

**Keywords** – Coral, cardiotonic, exhilarant and mood elevator, hemostyptic, *Marjan*, *Unani*.

### Introduction

One of the oldest systems in medicine is the Unani System of Medicine (USM). It is a unique system of healing that treats the body and invigorates the soul (*Tabī'at*). It is not common to use animal and mineral drugs in USM, but many of the drugs frequently used are described in the literature, such as *Hajrul Yahood* (*Lapis judicious*), *Gandhak* (Sulphur), *Phitkari* (alum), *Naushadar* (ammonium chloride), and *Jast* (zinc). Drugs of animal origin are frequently used, such as *Aqrab* (scorpion), *Baiza-e-Murgh* (hen's eggs), *Kaf-e-Darya* (Cuttlefish bone), *Luk* (Lac), and *Sartan* (crab). The Materia medica of USM has mentioned many marine products such as *ambar* (ambergris), *marjān* (*MJN*) (*Corallium rubrum*), *marwareed* (pearl), *sadaf* (pearl oyster), and *sang sarmahi* (otoliths from fishes). *MJN* is an essential marine drug

that has long been used in USM as a single drug or an ingredient in many Unani formulations for various diseases.<sup>1</sup>

*Corallium rubrum* L. (*CR*) is a distinctive species of the Mediterranean Sea, mainly found at depths of 10 to 200 m in the western Mediterranean basin. Red coral is a long-lived colonial and sessile organism.<sup>2,3</sup> The valuable red coral, *CR*, is a species forming a habitat that structures coralligenous outcrops.<sup>4</sup> It is linked with animal-dominated communities that grow between 10 and 200 m in depth. It is found in low light habitats, like caves, vertical cliffs, and projections, deep water, rocky bottom aggregates on banks. For corals, the appropriate growth temperature is from 8-20 °C.<sup>5-8</sup> The *CR* has been popular since ancient times and has been used in jewelry, religious objects, and medicinal purposes.<sup>9</sup> Reproduction is restricted and sexually reproduced by releasing eggs and sperm during one to several nights around the full moon.<sup>10</sup> It attains sexual maturity at about ten years of age, but only after 20 years, it reaches a high reproductive potential.<sup>11</sup> These colonies can live for several centuries, during which layered skeletal archives are created by their continuous

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Fig. 1. *Corallium rubrum* L.

calcification.<sup>10,11</sup>

Coral consists of a solid axial skeleton, primarily inorganic, covered with living tissues (coenenchyme), which has ectoderm, a cellular layer on the outer surface of the coenenchyme. Under the ectoderm, the mesoglea layer is composed of a thick acellular gelatinous collagen layer. A complex network of tiny canals in Mesoglea interacts with gastrodermal canals running parallel to the axial skeleton and polyps. A polyp is a fundamental unit of all coral species; a sac-like body made up of an ectoderm or epidermis outer layer and an inner layer gastrodermis/endodermis. Corals may be found solitary or in large colonies or reefs base on species.<sup>3,10,12</sup> There are two types of skeletal structures in the *Corallium*, i.e., axial skeleton and sclerite, and both are made of calcite rich in magnesium.<sup>13,14</sup> Specifically, coral is not a vegetable, animal, or mineral. It is soft, like a plant in the water but becomes stony hard in the air (Fig. 1).<sup>12</sup>

#### Scientific Classification

Kingdom:	Animalia
Subkingdom:	Radiata
Phylum:	Cnidaria
Class:	Anthozoa
Subclass:	Octacorallia
Order:	Alcyonaceae
Family:	Coralliidae
Genus:	<i>Corallium</i>
Species:	<i>Corallium rubrum</i> L.

**Geographical Distribution** – In the Mediterranean Sea, and adjacent to Western Africa, CR is found chiefly.<sup>5,9,15</sup> It exhibits in the Yemen sea,<sup>1</sup> Maldives, Lakshadweep, and Rameshwaram.<sup>16</sup> It is also found in the Red Sea, Persian Gulf, and Arabian coast.<sup>17</sup>

**Phytochemical Constituents** – Corals are biocomposites with essential components of minerals and organic macromolecules. Calcite and aragonite are the two polymorphs of  $\text{CaCO}_3$  detected in the skeletons of corals.

<sup>17,18</sup> Corals are rich in calcium carbonate.<sup>19</sup> Carotenoids, such as canthaxanthin (4,4'-diketo-b-carotene), are found in both soft and hard tissues of coral.<sup>20</sup> Four elements, calcium (Ca), magnesium (Mg), sulphur (S), and, to a lesser extent, strontium (Sr), were detected in measurable amounts. The average percentage of  $\text{MgCO}_3$  in the red coral skeletons is about 12 ppm. The average sulphur concentrations are about 3100, magnesium (Mg) 29500, strontium (Sr) 2600, sodium (Na) 4200, potassium (K) 140, phosphorus (P) 140, boron (B) 28, barium (Ba) 9, iron (Fe) 8, lithium (Li) 4, manganese (Mn) 1, and lead (Pb) 0.5 ppm. Calcium obtained from *MJN* is a natural form, easily digestible, and metabolized in the body.<sup>21</sup>

**Ethnopharmacology and Conventional Uses** – Coral has been known to humans for centuries, and it has been used to treat ailments and diseases since the beginning. Gaius Plinius Secundus (Pliny the Elder) described the corals' medicinal uses in his encyclopedia Natural History. According to Pliny, powdered calcined Coral was used orally with water for colic pains in the bowels, bladder affections, and kidney stones. It is used to treat fever and insomnia due to its soporific properties. Additionally, it is used to stop bleeding from the lungs or other body parts. It is a component of formulations primarily used to treat eye diseases. It has been used for medicinal purposes because it produces flesh.<sup>22</sup> CR is used to treat ophthalmic disorders, haemorrhages, coughs, rheumatism, and headaches, as well as acts as an anthelmintic.<sup>23,24</sup>

Its ash is used in tooth powder to help maintain healthy gums and teeth, and Kuhl (coryllium) is used to treat a variety of eye diseases. In stomatitis, hemoptysis, cough, phthisis, and asthma, egg yolk, acacia gum, and catechu with Marjān are recommended for administration.<sup>24,25,26</sup> Marjān is beneficial in haemorrhage when combined with kateera (*Sterculia urens*).<sup>27</sup> It resolves the spleen's inflammation while taking with water.<sup>28</sup> The hanging of *Marjān* on the stomach is beneficial in all gastrointestinal diseases.<sup>27</sup> Its powder with *Roghan balsan* (oil of *Commiphora opobalsamum* L.) helps treat earache.<sup>25,28</sup> As a nervine tonic, it is used in headaches, giddiness, and vertigo. It was administered in cases of chronic bronchitis and pulmonary tuberculosis and was found helpful in both cases. It is given as an antacid to cure dyspepsia and bilious headache.<sup>29</sup> The powder of Coral is used as a tonic and to control hyperacidity and vomiting caused by dyspepsia and biliousness.<sup>17</sup> It is used in asthma, carbuncle, cough, diabetes, dyspepsia, giddiness, gonorrhoea, headache, low fever, phthisis, spermatorrhoea, vertigo and urinary disease,<sup>14,18,28</sup> calcium deficiency, epistaxis, tuberculosis, catarrh,<sup>1</sup> melancholia, epilepsy, palpitation, renal calculi,

and piles.<sup>25</sup>

**Marjān (*Corallium rubrum*) in Unani System of Medicine** – *MJN* is a valuable drug of the Unani System of Medicine (USM) with diverse uses. It is the stony structure found on the surface of the Yemen Sea and in the Indian sea. Its size is about one yard or more. It has branches which are called “*Shākhah-i-Marjān*” and a root named “*Beikh-i-Marjān*”.<sup>1,30</sup> According to color, it has three types, i.e., red, white, and black. Red color *MJN* is large in size, shiny, best for medicinal purposes. White *MJN* is also good but less beneficial than red *MJN*. Black *Marjān* is not good in quality. *MJN* that is less holey is best in quality.<sup>30</sup> Various names are used in different countries, such as *Shākhah-i-Marjān* (Tehran), *Sang-i-Marjān* (Unani), *Bussud* (Arabic), *Prabala* (Sanskrit), *Parvara* (Hindi), *Coral* (English), and red coral or gem coral.<sup>18</sup>

**Pharmacological actions, therapeutic actions, and therapeutic applications** – The USM is holistic, and the basic concept of management is to help the body overcome the disturbing conditions leading to the disease condition. The drugs are used in natural form without extracting single molecules as per the *Mizaj* (temperament) of the disease and involvement of *Khilt* (humour). Heterotherapy in terms of the disease and drug's temperament is the fundamental principle of the treatment in USM. In Unani literature, various pharmacological and therapeutic actions of *MJN* have been described in detail. The some important actions are as *Mufarrih-i-Qalb* (exhilarant and mood elevator), *Muqawwi-i-Qalb* (cardiotonic), *Habis-i-Dam* (hemostyptic),<sup>1,27,30</sup> *Munaffith-i-Balgham* (expectorant),<sup>30</sup> *Muqawwi-i-Dimāgh* (brain tonic),<sup>31,32</sup> *Qābid* (constipative), *Mujaffif* (desiccant),<sup>1,27,32,33</sup> *Muqawwi-i-Mi'da* (stomachic),<sup>1</sup> *Muqawwi-i-'Ayn* (eye tonic), *Muhāfiz-i-Janīn* (protective to pregnancy), *Muhallil Waram* (resolvent of inflammation),<sup>1</sup> *Jālī* (detergent),<sup>1,27</sup> *Akkāl* (corrosive) *Mumasshif* (absorbent),<sup>1,31</sup> *Mumsik-i-Mani* (retentive of semen),<sup>33</sup> The main and dominant actions of *MJN* are exhilarant and mood elevator, cardiotonic, and hemostyptic.<sup>27</sup>

Based on its pharmacological actions, it is used for the management of hemoptysis (*Nafth al-Dam*), palpitation (*Khafaqān*), bleeding diarrhea (*Ishāl-i-Damwī*),<sup>27,30</sup> bleeding piles (*Bawāsīr Damiya*),<sup>27</sup> cardiac insufficiencies (*Du'f al-Qalb*),<sup>30</sup> weakness of stomach (*Du'f al-Mi'da*), hemiplegia (*Falij*), facial palsy (*Laqwa*), tremor (*Ra'sha*), coryza and catarrh (*Nazla-o-Zukām*), cerebraesthesia (*Du'f al-Dimagh*), general weakness (*Du'f al-Aam*) and leucorrhoea (*Sayalan al-Rahim*).<sup>32</sup>

**Adverse effects or interactions** – As it is in Unani, it has harmful effects on the kidney,<sup>27,31-34</sup> and the gall

bladder, as well as the brain.<sup>1</sup> It is advised to use it with caution if gallbladder, kidney, or brain problems exist. It is recommended to use it with some corrective (*Muslih*) in these diseases as given in the literature.

**Correction of adverse effects (*Muslih*)** – *Muslih* (corrective) concept is unique with USM and defined as a drug, diet, or any other substances that reduce or counter the adverse effects. These correctives are used with the prescribed drug to counter the adverse effect of the drug. *Tabasheer* or *Bamboo Manna* (*Bambusa arundinacea* Willd.),<sup>27,33,34</sup> *Anisoon* (seeds of *Pimpinella anisum*),<sup>1</sup> and *Kateera* (gum obtained from *Cochlospermum religiosum* L.) can be used with *MJN* to correct or reduce its adverse effects.<sup>27,31-34</sup>

The dose of *MJN*, as mentioned in Unani literature, is 64 mg to 1000 mg in the powder form (*Sufoof*), and its calcined (*Kushta*) form can be used in the dose of 8 mg to 16 mg.<sup>27</sup>

**Compound formulations of *C. rubrum* (*Marjān*)** – In USM, single drug as well multi-ingredient has been used for the management of various diseases. In multi-ingredient formulation, the drugs are mixed in specific proportions mentioned in Unani Pharmacopoeias and National formularies. These formulations result from thousands of years of clinical experience of Unani physicians who have written several books based on their personal clinical experience. The following compound formulations contain *Corallium rubrum* L. as an ingredient in it. These formulations are named based on their chief ingredient or the disease condition in which it has to be used. The actions of the formulation and their therapeutic effects are also mentioned with each in given Table 1:

**Antibacterial activity** – *Marjān* was assessed for its antibacterial activity in five bacterial strains using the disc diffusion method, which demonstrated good antimicrobial activity against microbial strains such as *Klebsiella pneumonia*, *Streptococcus mutans*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Staphylococcus aureus* at 25 µl/disc dilutions.<sup>41</sup>

**Preclinical studies (Animal model)** – *C. rubrum* L. (*Marjān*) in preclinical studies has demonstrated different activities in the animal models. There are some such noteworthy results reported here:

**Anti-osteoporotic activity** – Progressive bone loss has been induced by ovariectomy followed by a low calcium diet in female Sprague-Dawley rats. In the test drug group receiving *Marjān* 65 mg/kg body weight, femoral weight and density also reversed in animals, and calcium & phosphorus excreted in urine was relatively reduced. *Praval bhasma* (coral calx) effectively prevents bone loss

**Table 1.** Formulation having *C. rubrum* (*Marjān*) as an ingredient

S.No	Formulations	Dosage forms	Therapeutic application
1	Aksir Surfā	Powder	Migraine ( <i>Shaqīqa</i> ) and phlegmatic cough ( <i>Sual Balghamī</i> ) <sup>36</sup>
2	Dawa-e-Sahaj	Powder	Duodenal ulcers ( <i>Qurūh al-Isnā Asharī</i> ), oesophageal ulcer ( <i>Qurūh al-Mi'da</i> ), and Crohn's disease ( <i>Sahj wa Qurūh al-Am'a</i> ) <sup>36</sup>
3	Jawahar Mohra	Fine powder	The weakness of the stomach ( <i>Du'f al-Mi'da</i> ), enteropathy ( <i>Du'f al-Am'a</i> ), and diarrhea ( <i>Ishāl</i> ) <sup>38</sup>
4	Habb-e-Dawali	Tablet	Filariasis ( <i>D ā' al-Fīl</i> ) and varicose veins ( <i>Daw ā lī</i> ) <sup>37</sup>
5	Habb-e-Jawahar	Tablet	The weakness of the vital organs ( <i>Du'f al-A'da' Ra'isa</i> ) <sup>35</sup>
6	Habb-e-Sil	Tablet	Phthisis ( <i>Sīl</i> ) <sup>35</sup>
7	Qurs Anjbar	Tablet	Bleeding diarrhea ( <i>Ishāl al-Dam</i> ) and haemoptysis ( <i>Nafth al-Dam</i> ) <sup>35</sup>
8	Habb-e-Taoon Jawahar Wali	Tablet	Food poisoning ( <i>Hayda</i> ) and pestilence ( <i>Ta'ūn</i> ) <sup>37</sup>
9	Qurs Tabasheer Kafoori Luluvi	Tablet	Phthisis ( <i>Sīl</i> ), palpitation ( <i>Khafaqan</i> ), high-grade fever ( <i>Hummā al-Muharrīqa</i> ), and hectic fever ( <i>Hummā Diqqīyya</i> ) <sup>35</sup>
10	Qurs-e-Sozak	Tablet	Ulcers of ureters and urethra ( <i>Qurūh Majari al-Bawl</i> ), retention of urine ( <i>Ihtibās al-Bawl</i> ), and burning micturition ( <i>Sozish-I Bawl</i> ) <sup>39</sup>
11	Qurs Jiryān	Tablet	Spermatorrhoea ( <i>Jarayan</i> ), semen liquidity ( <i>Riqqat al-Manī</i> ), loss of libido ( <i>Du'f al-Bah</i> ), excessive nocturnal emission ( <i>Kathra al-Ihtilām</i> ), and premature ejaculation ( <i>Sur'a al-Inzal</i> ) <sup>39</sup>
12	Habb-e-Kabar	Tablet	Ascites succatus ( <i>Istisqa' Tabli</i> ), hepatitis ( <i>Waram al-Kabid</i> ), and splenitis ( <i>Waram al-Tihal</i> ) <sup>40</sup>
13	Habb-e-Teewaj	Tablet	Bleeding piles ( <i>Bawāsīr Damiya</i> ), polymenorrhoea ( <i>Kathrat-i-Tamth</i> ), and haemoptysis ( <i>Nafth al-Dam</i> ) <sup>37</sup>
14	Mufarrah Shaikh-ur Rais	Semisolid preparation	Cardiac insufficiency ( <i>Du'f al-Qalb</i> ) and palpitation ( <i>Khafaqan</i> ) <sup>38</sup>
15	Tiryāq-e-Rahim	Semisolid preparation	Leucorrhoea ( <i>Sayalan al-Rahim</i> ) and weakness of the uterus ( <i>Du'f al-Rahim</i> ) <sup>37</sup>
16	Mufarreh-e-Musvi	Semisolid preparation	Cardiac insufficiency ( <i>Du'f al-Qalb</i> ), palpitation ( <i>Khafaqan</i> ), and insanity ( <i>Waswas</i> ) <sup>37</sup>
17	Mufarreh Barid	Semisolid preparation	Cardiac insufficiency ( <i>Du'f al-Qalb</i> ), nervine weakness ( <i>Du'f al-A'sab</i> ), palpitation ( <i>Khafaqan</i> ) <sup>35</sup>
18	Majoon-e-Jalinoos Luluvi	Semisolid preparation	Nervine weakness ( <i>Du'f al-A'sab</i> ) and hepatic insufficiency ( <i>Du'f al-Kabid</i> ) <sup>35</sup>
19	Mufarreh Yaqooti Barid	Semisolid preparation	Cardiac insufficiency ( <i>Du'f al-Qalb</i> ) and debility/convalescence ( <i>Naqāhat</i> ) <sup>35</sup>
20	Mufarreh Motadil	Semisolid preparation	Flatulence ( <i>Nafkh al-Shikam</i> ) and cardiac insufficiency ( <i>Du'f al-Qalb</i> ) <sup>35</sup>
21	Majoon-e-Khabsul Hadeed	Semisolid preparation	Haemoptysis ( <i>Nafth al-Dam</i> ), bleeding piles ( <i>Bawāsīr Damiya</i> ), diarrhea ( <i>Ishāl</i> ), hepatic insufficiency ( <i>Du'f al-Kabid</i> ), and anemia ( <i>Sū'al-Qīnya</i> ) <sup>35</sup>
22	Mufarreh Barid Jawaharwali	Semisolid preparation	Cardiac insufficiency ( <i>Du'f al-Qalb</i> ), nervine weakness ( <i>Du'f al-A'sab</i> ), Melancholic fever ( <i>Hummā Sawdāwīyya</i> ), and bronchial asthma ( <i>Diq al-Revī</i> ) <sup>35</sup>
23	Sadri	Semisolid preparation	Cough ( <i>Su'āl</i> ) and bronchial asthma ( <i>Dhīq al-Nafas</i> ) <sup>39</sup>
24	Mufarreh Yaqooti Motadil	Semisolid preparation	Cardiac insufficiency ( <i>Du'f al-Qalb</i> ), hepatic insufficiency ( <i>Du'f al-Kabid</i> ), cerebraesthesia ( <i>Du'f al-Dimāgh</i> ), and palpitation ( <i>Khafaqan</i> ) <sup>35,38</sup>
25	Mufarreh Azam	Semisolid preparation	The weakness of the vital organs ( <i>Du'f al-A'da' Ra'isa</i> ), weakness of stomach ( <i>Du'f al-Mi'da</i> ), and flatulence ( <i>Tabkhīr al-Mi'da</i> ) <sup>38</sup>
26	Majoon-e-Luluvi	Semisolid preparation	Loss of libido ( <i>Du'f al-Bah</i> ) and nervine weakness ( <i>Du'f al-A'sab</i> ) <sup>38</sup>
27	Majoon-e-Hamal Ambari Alwi Khani	Semisolid preparation	The weakness of the uterus ( <i>Du'f al-Rahim</i> ) and abortion ( <i>Isqāt</i> ) <sup>35</sup>
28	Majoon-e-Hafiz-ul-Janeen	Semisolid preparation	Habitual abortion ( <i>Isqāt 'Ādī</i> ) <sup>36</sup>
29	Majoon Moin Hamal Ambari	Semisolid preparation	Inability of implantation in the uterus ( <i>Du'f-i-Istiqrār-i-Haml</i> ), habitual abortion ( <i>Isqāt 'Ādī</i> ) <sup>39</sup>

Table 1. continued

S.No	Formulations	Dosage forms	Therapeutic application
30	Kushta-e-Busud	Calx	Chronic cough ( <i>Su'āl-i- Muzmin</i> ), pharyngitis ( <i>Waram al-Halaq</i> ), acute pharyngitis ( <i>Waram al-Hanjara</i> ), tonsillitis ( <i>Waram al-Lawzatayn</i> ), and haemoptysis ( <i>Nafth al-Dam</i> ) <sup>35</sup>
31	Kushta Marjan Jawahar Wala	Calx	Cerebral asthenia ( <i>Du'f al-Dimāgh</i> ), cardiac insufficiency ( <i>Du'f al-Qalb</i> ), coryza, and catarrh ( <i>Nazla-o-Zukam</i> ), headache ( <i>Sudā'</i> ) and cough ( <i>Su'āl</i> ) <sup>35,38</sup>
32	Kushta Marjan Sada	Calx	Cardiac insufficiency ( <i>Du'f al-Qalb</i> ), cerebral asthenia ( <i>Du'f al-Dimāgh</i> ), coryza & catarrh ( <i>Nazla-o-Zukam</i> ), and cough ( <i>Su'āl</i> ) <sup>35,38</sup>
33	Kushta-e-Sang-e-Yashab Qawi	Calx	Chronic diarrhea ( <i>Ishāl-i-Muzmin</i> ) <sup>37</sup>
34	Kuhl Al Jawahar	Micro-fine powder	The weakness of eyesight ( <i>Du'f-i-Basarat</i> ), vascular keratitis ( <i>Sabal</i> ), blepharitis ( <i>Sulāq</i> ), and corneal opacity ( <i>Bayad al-'Ayn</i> ) <sup>35,38</sup>
35	Surma-e-Noorani	Micro-fine powder	Night blindness ( <i>Shabkorī</i> ), cataract ( <i>Nuzūl al-Mā'</i> ), weakness of eyesight ( <i>Du'f-i-Basarat</i> ), and other eye diseases <sup>39</sup>
36	Shiyaf-e-Aqleemiya	Suppository*	Ecchymosis of the eyelids ( <i>Tarfa</i> ), pain in the eyes ( <i>Waja' al-Chashm</i> ) <sup>36</sup>
37	Shiyaf-e-Loban	Suppository*	Trachoma ( <i>Jarab al-'Ayn</i> ), fatty swelling of upper eyelids ( <i>Shirnāq</i> ), amaurosis ( <i>Kumna</i> ), blepharitis ( <i>Sulāq</i> ), herpes ( <i>Namla</i> ), infection involving the head, face and hair follicles ( <i>Sa'fa</i> ), sclerosis of eyelids ( <i>Jus'a-al-Ajfan</i> ), itching of eyelids ( <i>Hikka al-Ajfan</i> ) <sup>36</sup>
38	Aksireen	Suppository*	Ulcers of eyes ( <i>Qurūh al-'Ayn</i> ) <sup>35</sup>

\*grind in water and apply in the eye

due to calcium and estrogen deficiency and can effectively manage bone metabolic disorders such as osteoporosis.<sup>42</sup>

Total bone and cortical bone mass were restored in the distal femoral metaphysis, and the endocortical surface was significantly decreased in coral calcium-fed ovariectomized mice. After coral calcium feeding, ovariectomized mice had a greater number of trabeculae and a greater ratio of bone volume to total volume, whereas trabecular separation decreased in all treatment groups. Coral calcium was found to be protective of bone in the proximal tibia and lumbar vertebrae, implying that it may protect against postmenopausal bone loss.<sup>43</sup>

**Anti-atherosclerotic activity** – Atherosclerosis was induced in rabbits by feeding a cholesterol-rich diet for six months. These animals were given red coral in a dose of 50 mg/day for six months. The plasma and aortic lipid composition were investigated, and the atherosclerotic lesions of the aorta were examined by histologic scrutiny at the end of the study experiment. The plasma cholesterol level was decreased up to 65%, while the percentage of HDL was increased. The atheroma formation was repressed, and the sphingomyelin levels in plasma were also reduced.<sup>44</sup> Anna Pavala Sindhooram (Coral formulation) has been investigated for atherosclerosis in rabbits. APS has been found to lower plasma lecithin and aortic sphingomyelin in these studies, thus confirming hypolipidemic action.<sup>45</sup>

**Hemostatic activity** – The *C. rubrum* at a dose of 2000 mg/kg BW was found safe in Swiss albino mice in an acute toxicity study. Treatment of the animals was 500 mg/kg body weight/p.o. Blood surveys showed a marked decrease in bleeding and clotting time compared to the control animals. There was also a substantial reduction in bleeding comparable to that of the standard hemostatic drug.<sup>42</sup>

**Hepatoprotective activity** – In acute and 28-day repeated oral toxicity trials, up to 4000 mg/kg was non-toxic in CCl<sub>4</sub>-induced liver injury in Wistar rats. Mild diarrhea was observed in repeated oral toxicity. Hematological and biochemical parameters showed near-normal levels proving hepatoprotective *C. rubrum* (*Marjān*) against CCl<sub>4</sub> induced liver damage.<sup>46</sup>

#### Clinical trials

**In hyperacidity** – A study in which patients with hyperacidity were enrolled was carried out. Two samples of *Tubiphora musica* and *C. rubrum* (*Marjān*) were prepared and given to patients for 21 days. The chief and associated symptoms were observed and scored cautiously. The study results showed that *C. rubrum* had a better effect than *Tubiphora musica*.<sup>46</sup>

**In hepatitis** – The hepatoprotection activity of *C. rubrum* (*Marjān*) was evaluated in patients with different types of hepatitis, such as alcoholic, drug-induced, and infectious hepatitis, at a dose of 100-200 mg three times

daily 28 days. The biochemical investigations such as *S. bilirubin*, SGOT, SGPT, Alkaline phosphatase, and Gamma-glutamyl transferase were observed at baseline and after treatment. The liver's elevated biochemical parameters were found to have been restored to normal levels.<sup>48</sup>

### Discussion

Overall, Unani Medicine considers the patient as a whole, connecting their physical, emotional, and spiritual aspects. All life, including plants and animals, is based on four foundations: fire (*Nār*), air (*Hawā'*), earth (*Arḍ*) and water (*Pānī*). These basics have specific qualities (*Kayfiyat*), i.e., hot & dry, hot & moist, cold & dry, and cold & moist respectively.<sup>50,51,52</sup> Each plant, every animal, and every human being has its own unique and special temperament (*Mizāj*). The *Mizāj* is defined as a new material state having a different quality from that of the elements. It is a resulting uniform balance or homeostasis that emerges after the combination of several factors. It can be divided into two major categories: human (*Mizāj Insānī*) and drugs (*Mizāj Advia*) temperament.<sup>1,52</sup> The disease management is based on the principle of heterotherapy (*'Ilāj bi'l Didd*), i.e., opposite temperament drugs treat a specific disease for a particular temperament.<sup>49</sup>

Each temperament combines two of the four qualities: two primaries, heat and coldness, two secondaries, moistness, and dryness. Temperament has primary and secondary quality, such as hot & wet, hot & dry, cold & wet, and cold & dry. When two elements interact, if their opposite qualities are of equal magnitude, the resulting quality will be moderate in hotness and coldness and moderate temperament. When hot and cold properties interact, a new 'intermediate' property arises that is neither hot nor cold to the same degree as it was previously. Likewise, the interaction of different components creates a drug's temperament, which influences its pharmacological activity. Based on temperament, the drugs are classified as moderate (*Mu'tadil*), hot and moist (*Hārr Raṭb*), hot and dry (*Hārr Yābis*), cold and moist (*Bārid Raṭb*) and cold and dry (*Bārid Yābis*).<sup>1,52,53</sup>

The body contains four *Akhlat* (humours), *Dam* (sanguine), *Balgham* (phlegm) and *Safra* (yellow bile), and *Sawdā* (black bile). The human temperament depends on the prevailing humour (*khilt*) and is divided into four types, namely *Damwī* (sanguineous), *Balghamī* (phlegmatic), *Safrawī* (bilious), and *Sawdāwī* (melancholic). The dominance of sanguine in the body causes sanguine temperament; similarly, the dominance of phlegm, yellow bile, and black bile in the body causes phlegmatic, bilious,

and melancholic temperament. The characteristics of sanguineous, phlegmatic, bilious, and melancholic are hot and wet, cold and wet, hot and dry, and cold and dry, respectively.<sup>50,51,52</sup>

There has been a revival of interest in natural drugs due to increased awareness about the adverse effects of conventional drugs on human health in recent years. The acceptance of natural drugs is increasing day by day, and there is an urgent need to find out the lesser-known drugs for non-communicable diseases. The *MJN* is an important drug used to manage various diseases such as cardiac insufficiency, palpitation, hemoptysis, bleeding diarrhea, bleeding piles, hemiplegia, facial palsy, coryza, cerebraesthesia, leucorrhea, and general weakness. The *MJN* is a rich source of natural calcium that is best suitable for oral use and used in cardiac problems. It is a general vitalizer in USM and increases physical endurance and, by revitalizing these organs, increases cardiac, cerebral, and gastric efficacy. The pharmacological properties of *MJN* may result from synergetic interactions of its different phytochemicals. Therefore, the overall effects of *MJN* cannot be replicated with its isolated chemical constituents or extract in various solvents.

Traditional medicines and holistic approaches play a significant complementary role in preventing and treating modern-day disorders with fewer adverse effects. The WHO has recognized the importance of traditional and folk medicine and suggested integrating these systems with a conventional medical system to deal with the health problem effectively. It is evident from the results of various studies that *MJN* has many specific therapeutic properties in many diseases that offer significant preventive and curative potential. Further research on the healing properties and uses will allow a more comprehensive understanding of coral health benefits.

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### Author contributions

The authors have accepted responsibility for this manuscript's entire content and approved its submission.

### Competing interests

Authors state no conflict of interest.

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