

# Meta-analytical Study of Cardiac Drugs described by Ibn Sina (980–1037) in the Contemporary Research<sup>^</sup>

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## 1 Introduction

A number of clinical and experimental research work had been done to screen the cardiac drugs mentioned by Abū 'Alī Ibn Sīnā in his book *Risāla al Adwiyā al Qalbiyah* for their efficacy and safety. But, to the best of our knowledge, no critical descriptive study has ever been done so far to evaluate the scientific report on all 63 cardiac drugs mentioned in his famous work, *Risāla al Adwiyā al Qalbiyah*. There is a need to comment on the utility of these drugs on the basis of clinical and experimental study. Some of these drugs could be found safe without any reported adverse reactions. Such drugs with safe profile need to be further explored, to select promising and accessible drugs. If toxic effects are reported, then the flagging of such drugs and its present position in clinical utilization should be delineated. The project aims to discuss the cardiac drugs described by Ibn Sina in the contemporary research after extensive literature review and meta-analysis. It aims to profile Ibn Sina's Cardiac drugs having cardioprotective activity.

## 2 Abū 'Alī Ibn Sīnā

Abū-'Alī al-Ḥusayn ibn-'Abdallāh Ibn-Sīnā (980–1037CE) was a genius polymath of his times. He was regarded as most significant thinker and writer of medieval age and indeed of entire history. He wrote around 250 books, including 150 on philosophy and 40 on medicine. *The Canon of Medicine* was standard medical text at many Medieval European Universities and remained in use as late as 1650 CE. His another important booklet, *Risāla al*

*Adwiyā al Qalbiyah* (*A Tract on Cardiac Medicine*) was the first systematized book on individual cardiac drugs, in which he discussed simple (Table 1) and compound medicines claimed to be beneficial for heart ailment as well as for psychiatric ailments (Khan 1986).

The description of cardiac diseases and their psychiatric impact was logically presented by Ibn Sīnā in his *Risāla al Adwiyā al Qalbiyah* perhaps for the first time in the history of medicine. He was the first to describe carotid sinus hypersensitivity, which presents with vasovagal syncope. He was a pioneer in pulsology. He correctly explained the concept of pulsation and refined Galen's theory of pulse. Besides, he discussed the action of available drugs on the heart in details and mentioned their indications and contraindications. In conclusion, Ibn Sīnā made important contributions to cardiology (Chamsi-Pasha and Chamsi-Pasha 2014).

Cardiac diseases are the major cause of morbidity and mortality in the world. Despite of tremendous development in the field of cardiology, Ischaemic heart disease is still posing a challenge to medical fraternity. It is a general perception that concept of cardiac diseases did not exist in old literature. Contrary to it, concept of cardiac disease prevailed since ancient period. Most of the Greek Scholars enumerated the full description of cardiac diseases in their treatises. *Risāla al Adwiyā al Qalbiyah* is one of the important lexicons written by Ibn Sīnā which encompasses all the aspect of cardiac diseases including drugs and their pharmacological actions. The introductory part of the tract reveals that it was written at the request of Abū al-Hasan 'Alī bin al-Ḥusayn al-Ḥusayni in whose house Ibn Sīnā stayed after he was freed from the imprisonment in Fardjan Fort. According to Ibn al-Qifti and the writer of *Tatimma Siwan al-Hikma*, this treatise was composed when Ibn Sīnā came to Hamadan after the year 405AH/1014 CE (Perwaz 1986).

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**Table 1** 63 Cardiac Drugs mentioned by Ibn Sina in *Risāla al-Adwiyā al-Qalbiyah*.

S. No.	Vernacular / Unani Name	English Name (Source)	Scientific Name
01	<i>Abresham</i>	Silk Pod (Animal)	<i>Bombyx mori</i>
02	<i>Amla</i>	Indian goose berry (Plant)	<i>Emblica officinalis</i>
03	<i>Utruj</i>	Citron (Plant)	<i>Citrus medica</i> Linn
04	<i>Ās</i>	Myrtle (Plant)	<i>Myrtus communis</i> Linn
05	<i>Ushna</i>	Rockmoss (Lichen, Plant)	<i>Parmelia perlata</i>
06	<i>Ustokhudoos</i>	Lavender (Plant)	<i>Lavandula stoechas</i> Linn
07	<i>Armat</i>	Fragrant Screwpini (Plant)	<i>Pandanus odoratissimus</i> Roxb
08	<i>Azaryuna</i>	Sunflower (Plant)	<i>Helianthus annuus</i> Linn
09	<i>Anfaha</i>	Rennet (Animal)	Seriparium
10	<i>Badranjboya</i>	Balm Mint (Plant)	<i>Melissa officinalis</i> Linn
11	<i>Busd</i>	Coral (Animal)	<i>Corallium rubrum</i>
12	<i>Badrooj</i>	Sweet Basil (Plant)	<i>Ocimum basilicum</i> Linn
13	<i>Behman</i>	Behman (Plant)	<i>Centaurea behen</i> Linn
14	<i>Baiḍ or Baiḍa</i>	Egg (Animal)	<i>Gallus domesticus</i>
15	<i>Bisfajj</i>	Common Polypody (Plant)	<i>Polypodium vulgare</i>
16	<i>Jadvar</i>	Zedoary (Plant)	<i>Delphinium denudatum</i>
17	<i>Daroonaj</i>	Doronicum (Plant)	<i>Doronicum hookeri</i>
18	<i>Dārčini</i>	Cinnamon (Plant)	<i>Cinnamomun zeylanicum</i>
19	<i>Halaila Kabuli</i>	Chebulic Myrobalan (Plant)	<i>Terminalia chebula</i>
20	<i>Ward</i>	Rose (Plant)	<i>Rosa damascene</i>
21	<i>Za'frān</i>	Saffron (Plant)	<i>Crocus sativus</i>
22	<i>Dharnab</i>	Silver Fir (Plant)	<i>Abies alba</i> Linn
23	<i>Dharnabad</i>	Long Zedoary (Plant)	<i>Zinjiber zerumbet</i>
24	<i>Hijr-e-Armani</i>	Armenian Bole (Mineral/Stone)	<i>Lapis arminium</i>
25	<i>Ṭabāshīr</i>	Bamboo Manna (Plant)	<i>Bambusa arundinacea</i>
26	<i>Talakhshaqooq</i>	Chicori (Plant)	<i>Cichorium intybus</i>
27	<i>Gil-e-Makhtoom</i>	Sealing Clay (Mineral / Clay)	<i>Terra sigellata</i>
28	<i>Yāqūt</i>	Ruby (Mineral / Ore)	Corundum
29	<i>Kundur</i>	Fran Kincense (Plant)	<i>Boswellia serrata</i>
30	<i>Kehurba</i>	Yellow Amber (Plant)	<i>Vateria indica</i>
31	<i>Kāfūr</i>	Camphor (Plant)	<i>Camphora officinarum</i>
32	<i>Kishneez Khushk</i>	Coriander (Plant)	<i>Coriandrum sativum</i>
33	<i>Kummasra</i>	Pear (Plant)	<i>Pyrus communis</i>
34	<i>Gaozabāñ</i>	Bugloss (Plant)	<i>Borago officinalis</i>
35	<i>Lajward</i>	Lazuli (Mineral/Stone)	<i>Lapis lazuli</i>
36	<i>Lolu</i>	Pearl (Marine Animal)	<i>Mytilus margaritifera</i>
37	<i>Laḥm</i>	Meat (Animal)	
38	<i>Mushk</i>	Musk (Animal)	<i>Moschus moschiferus</i>
39	<i>Momiyai</i>	Mineral Pitch (Mineral)	Asphaltum
40	<i>Nimam</i>	Wild Thyme (Plant)	<i>Thymus serpyllum</i>
41	<i>Neelofar</i>	Water Lily (Plant)	<i>Nymphaea lotus</i>
42	<i>N'una</i>	Mint (Plant)	<i>Mentha arvensis</i>
43	<i>Sausan Azad</i>	Iris (Plant)	<i>Iris florentina</i>
44	<i>Saleekha</i>	Cassia bark (Plant)	<i>Cinnamomum cassia</i>

45	<i>Sumbul</i>	Nard (Plant)	<i>Nardostachys jatamansi</i>
46	<i>Saad Kufi</i>	Indian Cypress (Plant)	<i>Cyperus rotundus</i> (scariosus)
47	<i>Sazuj</i>	Cassia Leaves (Plant)	<i>Cinnamomum tamala</i>
48	<i>Ambar</i>	Ambergis (Plant)	<i>Ambra grasea</i>
49	<i>'Ood</i>	Aloe Wood (Plant)	<i>Aquilaria agallocha</i>
50	<i>Fizza</i>	Silver (Mineral / Metal)	Argentum
51	<i>Faranjmushk</i>	Basil (Plant)	<i>Ocimum gratissimum</i>
52	<i>Fawania</i>	Poeny (Plant)	<i>Paeonia officinalis</i>
53	<i>Fustaq</i>	Pistachio (Plant)	<i>Pistacia vera</i>
54	<i>Sandal</i>	Sandal Wood (Plant)	<i>Santalum album</i>
55	<i>Qāqla</i>	Greater Cardamom (Plant)	<i>Amomum subulatum</i>
56	<i>Reebas</i>	Ribes (Plant)	<i>Rheum emodi</i>
57	<i>Rumman Sheereen</i>	Pomegranate (Plant)	<i>Punica granatum</i>
58	<i>Shaqaqul</i>	Secacul (Plant)	<i>Asparagus racemosus</i>
59	<i>Tuffaah</i>	Apple (Plant)	<i>Pyrus malus</i>
60	<i>Tamar hindi</i>	Tamarind (Plant)	<i>Tamarindus indica</i>
61	<i>Khairbua</i>	Small Cardamom (Plant)	<i>Elettaria cardamomum</i>
62	<i>Dhahab</i>	Gold (Mineral / Metal)	Aurum
63	<i>Ghaareqoon</i>	White Agaric (Plant / Fungus)	<i>Polyporus officinalis</i>

### 3 The treatise on cardiac drugs

The treatise on cardiac drugs or *Risāla al Adwiyā al Qalbiyah*, is divided into 17 sections. In another words, Ibn Sīnā compiled this book in 17 chapters. First 13 chapters are dedicated to basic discussions about conditions related to heart and some cardiac disease. In these chapters, Ibn Sīnā described the physiological mainly cardiac causes of different emotional states and application of pharmacotherapy to manage them. Chapter 14 consists of 63 detailed monographs on simple cardio-active drugs and their therapeutic effects. Final chapters appertain to compound cardiac remedies (Ibn Sīnā 1984). Before Ibn Sīnā, no physician had dealt with drugs for heart ailments as an independent work. Ibn Sīnā had not only laid the foundation of arranging simple drugs by describing only cardiac medicines but had given the proof of his intellectual ingenuity and medico-technical creativity by selecting the most important organ, the heart and its novel association with psyche.

The treatise is not confined to medicine only. Nine of its chapters deal with psychology which give details about Pneuma (*Rūḥ*), its kinds, seat, and its extrovert and introvert states. The remaining eight chapters relate to

medicine. The book is of great value from the standpoint of therapeutics as it throws light on such drugs that are used to tone up heart and thereby treat maladies of mood and personality. Ibn Sīnā extended the list of cardiac drugs after observing his own experience and taking lead from Galenic Medicine. Ibn Sīnā had not only laid the foundation of Pharmacology of Cardiac system, but gave a lead to discuss Pharmacotherapy of Cardiac ailments. He provided proper understanding about the anatomy, physiology, mechanism of contraction and relaxation, the concept of pathophysiology of heart diseases, the parameters of diagnosis and its management. He also suggested various psychical states such as anger, anxiety, joy, grief, vindictiveness and other feelings governed by the structure of heart (as if it is a repository of divine potentialities), constituents of blood and other humours as well as Pneuma. He was probably the first physician, who correlated heart with psychological states.

In the fourteenth and fifteenth chapter of *Risāla al Adwiyā al Qalbiyah*, Ibn Sīnā described simple and compound drug remedies of heart diseases, but before that, he gave a general classification of drugs to indicate the group to which each of the described cardiac drugs belonged. These categories consist of stimulants, diuretics,

and cooling agents. In this *Risāla*, 63 simple and 17 compound drugs in the form of electuaries, crushed medications, pills, tonic and syrups derived from the vegetable, mineral and animal kingdoms are discussed explaining how they act on the heart among other things. Furthermore, he described the dosage and strength of each drug and application techniques (Faridi and Zarshenas 2010).

Among the diseases of the heart mentioned in this treatise are: difficult breathing or *Tawahhush*, palpitation or *Khafqan*, syncope or *Ghash*, (Zarshenas and Zargaran 2015) and heart weakness or *Zu'f al-qalb*. Moreover, he had described the relation of some psychological diseases like depression, stress, and anxiety to cardiovascular function. He adds that:

Because the heart is the chief and noble organ, it is necessary that the physician should treat it after careful consideration and with a firm will. It is necessary that he should have faith in the success of his course of treatment. The temperament of the patient is considered of fundamental importance in the treatment of heart diseases and if there is any disharmony or imbalance of any kind, it should be treated.

In the words of Ibn Sīnā, “the heart is the origin of vital spirit (Pneuma)” which “itself is the source of emotional states such as happiness, grief, fear and anger”. Therefore, the quantity and quality of vital spirit (Pneuma) plays an important role in existence of such mental states. In other words, large amounts of vital spirit (Pneuma), its moderate viscosity and excessive glitter can give rise to extreme happiness whereas small quantities of a viscose vital spirit (Pneuma) can cause grief and unhappiness. A large amount of vital spirit (Pneuma) itself originates from moderation in blood volume and viscosity and thus, happiness. Moreover, a viscose, turbid and very hot-tempered blood can result in grief while a thin and hot blood induces anger via their effect on the vital spirit (Pneuma) (Javadi and Emami 2015).

Ibn Sīnā also made a connection between the ability of remembrance and the heart. Accordingly, cardiac drugs mostly improve memory and mental function. As an example, in a monograph dedicated to emblic myrobalan he stated, “Since it is a beneficial cardiac drug due to its cleansing effects, emblic myrobalan strongly improves memory and mental ability” (Ibn Sina 1984).

Generally, drugs with following effects are beneficial for the treatment of heart diseases:

1. Exhilarants e.g. saffron (*Crocus sativus* L.)
2. Attenuant agents (drugs which decrease the viscosity of blood) e.g. common rue (*Ruta graveolens* L.)
3. Fragrant drugs e.g. cinnamon (*Cinnamomum zeylanicum* Blume.)
4. Antidotal agents e.g. zedoary (*Curcuma zedoaria* (Bergius) Roscoe)
5. De-obstruents e.g. white behen (*Centaurea behen* L.)
6. Astringents e.g. thorny bamboo (*Bambusa arundinacea* Retz.)
7. Anger-inducing drugs e.g. pot marigold (*Calendula officinalis* L.)
8. Drugs having specificity or “*khasiyat*” i.e. not acting because of a general property.

Exhilarants are important cardiac medicines that can equilibrate the viscosity, warmth and quantity of vital spirit in order to treat heart diseases. These drugs act with several mechanisms including increasing the amount of vital spirit and expanding its volume e.g. wine; increasing the glitter of vital spirit e.g. pearl and silk; preventing the consumption of vital spirit e.g. Chebulic myrobalan (*Terminalia chebula* Willd. ex Flem.); making the temperament of vital spirit well-balanced e.g. rose water; toning the vital spirit e.g. basil (*Ocimum basilicum* L.) and preventing gases originated from black bile to approach the vital spirit e.g. bogloss (*Anchusa italica* Retz.).

Another thought-provoking issue in this book is specificity or *khasiyyat*. It is a pharmacodynamical concept that describes a drug action that cannot be explained by four qualities of traditional medicine. In other words, it is a mechanism of drug action other than hotness, coldness, moistness and dryness. For example, scammony (*Convolvulus scammonia* L.) resin, has hot and dry temperament but it induces expulsion of the yellow bile, which itself is hot and dry, from the body and this is contradiction. Many cardiac exhilarants act in such way. Such specific action are due to the form (*Sūra Naviyāh*) as each object

is defined not only by its substance and substantial qualities of hot, cold, dry and wet (the Aristotelian “hyle”) but also by its form (cf. Aristotelian “hylomorphism”)

Accumulating excessive black bile in cardiovascular system is a major risk factor for heart diseases. So drugs like common polypody (*Polypodium vulgare* L.) and dodder (*Cuscuta epithymum* Mur.), which eliminate black bile from cardiovascular system are of value in management of such diseases. On the other hand, to improve blood flow in capillaries such as the small branches of coronary arteries, the body needs yellow bile. Yellow bile is hot and dry and has the ability to reduce the viscosity of blood. If the level of the yellow bile in the blood is lowered for any reason, the blood viscosity will increase, and as a result, blood flow will decrease. The molecular dimension of a good part of this holistic pathophysiology and therapeutics has been shown; the rest should be validated by empirical clinical study. The dictum of modern science is to follow the empirical evidence even where molecular explanations do not exist.

In some cases cardiac drugs act through inducing anger. These kinds of drugs tone the heart by abrupt warming of blood and make it thinner. Pot marigold is a typical example for this. The use of fragrant drugs such as lemon balm (*Melissa officinalis* L.) and cinnamon, as cardiac tonics to alleviate heart diseases is another interesting issue. In fact, aromas are intensely harmonious with the vital spirit and thereby, can tone it.

Ibn Sīnā’s book would be a precious source of novel hypotheses for further researches on psychosomatic aspects of cardiovascular diseases as well as phytopharmacological studies on cardioactive medicinal plants.

#### 4 Translations of *Risāla al Adwiyā al Qalbiyah*

Both empirical and theoretical work of all 63 listed drugs and itemized compound drugs are spread over in the form of clinical, experimental and theoretical research work for the last millenary. This includes *in vivo* / *in vitro* experiments, review articles, case-reports and propositions by many scholars, scientists, physicians and researchers. An attempt has been made here to assess the value of all drugs mentioned by Ibn Sīnā in his treatise on the basis of modern scientific investigations. This meta-analytic review is more reliable as it accessed all possible databases includ-

ing translation of classical manuscripts in different languages. The original work, *Risāla al Adwiyā al Qalbiyah* of Ibn Sīnā is in Arabic language and available at Āstān-e Qods-e Razavi, Mashhad (Iran); Suleymaniye Manuscript Library, Istanbul (Turkey); Leningrad (Russia); Leiden University Library, Leiden (The Netherlands); Escorial (Spain); British Museum Library (England); Raza Library, Rampur (India) and Khudā Baksh Oriental Public Library, Patna (India). The same work in Arabic was translated into many other languages. Many authors provided a list of translation of these original manuscripts in different languages (Perwaz 1986, Rahman 1996, Khan 1986) but not the complete list as given below:

1. *Muffarrah al-N'afs* (a treatise on cardiac drugs) was an important link of this chain. It was written in c 1247 CE by Badr al-Din bin Qadri of Balbak
2. *De viribus Cordis* (First translation in Latin) by Arnald of Villanova (c. 1240–1311) CE, Barcelona, 1312. The same (*De viribus Cordis* or *De Medicinis Cordialibus*) has been appended to the Canon, Padua, 1479 CE and to some of the later editions.
3. *De medicamentis Cordialibus* (Second translation in Latin) by Andreas Alpagus, 1520 CE. The same edition has been incorporated later on with other medical books of Ibn Sīnā in Latin text *Liber canonis, de medicines cordialibus, et cantica*. Copies of the same text-editions are extant in many libraries e.g. Bibliotheque Nationale, Paris (France); Forschungsbibliothek, Gotha (Germany); Berlin (Germany); Reynolds-Finley Library, Birmingham (USA), etc.
4. Two Hebrew translations around 1485CE (details not found). Baruch ibn Ya'ish ibn Isaac composed a commentary of the first one in 10 chapters, entitled “*Bi'ur la-Sammim ha-Libbiyyim*,” taken from a Latin translation “*Medicamenta Cordialia*”.
5. *Risāla al Adwiyā al Qalbiyah* by Abū Hamid Najib al-Din Muhammad bin Ali bin Umar Samarqandi (scribed in 1597CE; available in the Library of the Majlis-e Shura-i Islami in Iran).
6. *Fi al-Adwiyah al-Qalbiyah* by Najm al-Din Mahmud bin Ilyas Shirazi (manuscript treatise is extant in the Raza Library of Rampur (India).

7. *Adwiyā al Qalbiyah* by Unknown author (Arabic manuscript preserved in the National Library of Islamic Republic of Iran in Tehran)
8. *Risāla-i Qalbiyah* by Hakim Mir Muhammad Husayn Murshidabadi (18th century) wrote a treatise based on the anatomy of heart and blood circulation.
9. *De Viribus Cordis* (English version incorporated in “A Treatise on the Canon of Medicine”) by O. C. Gruner, Luzac & Co. London, 1930 (pages 123 to 125, and 534 to 552)
10. *Buyuk Filozof ve Tib Ustadi Ibni Sina, Sahsiyeti ve Eserleri Hakkinda Tetkikler* (Turkish translation) by Kilisli Rifat Bilge (Roman script), Published by Muallim Ahmet Halit Kitabelvi, Istanbul (Turkey), 1937CE. The collection includes the following three works of Ibn Sīnā: *Al-Adwiyah al- Qalbiyah*, *Ḥayy b. Yaqzān* and *al-Ishārāt wal-tanbīhāt*.
11. A facsimile reproduction of the Arabic text published by Āstān-e Qods-e Razavi, Mashhad, Iran
12. A facsimile reproduction of the Arabic text (preserved in Leningrad) with translation and commentary in Uzbek by H. Hikmatullaev, Tashkent, 1966 CE.
13. *Tafrih al-Qulūb* (Persian version) by Ḥakīm Ahmadullah Khan. The copies of these manuscripts (scribed c 1793 CE) are preserved in four libraries of India viz. Nizamia Tibbiya College (Hyderabad), Asafiya Library (State Government Manuscripts Library and Research Institute, Hyderabad), Salarjang Museum Library (Hyderabad) and Library of Osmania Medical College (Hyderabad). The manuscript extant at Nizamia Tibbiya College (Hyderabad) is now preserved in the Library of Hamdard University (Delhi).
14. *Daruḥa-yi qalbi* (Persian translation) by Ḥakīm Sayyid Muhammad Baqir Musavi (Physician of Sultan Husayn Safavi), Edited with Introduction and Notes by S. Hussein Razavi Burqa’i, Tehran, Iran 2004 by the Society for the Appreciation of Cultural Works and Dignitaries, Institute of Islamic Studies Tehran-McGill University, Tehran (Iran). It is based on the Persian manuscript *Adwiyā al Qalbiyah* written in 17th century extant in the library of Āstān-e Qods-e Razavi written in 17th century at the instruction of Shah Sulayman Safavi (1666–1694 CE).
15. In addition, there are two more copies of a book in Persian with the title *Adwiyā al Qalbiyah* in Iran, which could be the translation of the work of Ibn Sīnā. One copy is extant in the Library of Majlis (scribed in 1647 CE) and another in Malik Millī Library (scribed in 1660 CE), but the names of their translators are unknown.
16. *Kitabul Adwiyā Qalbiyah* (Urdu Translation) by Ḥakīm Abdul Latif, Iran Society Calcutta, 1956 CE. He translated the manuscript available (later burnt along with other books) in the library of Jamia Millia Islamia, Delhi at the suggestion of Dr. Zakir Hussain (former Vice President of India). The Arabic text was compared with the photocopies obtained from the British Museum, Raza Library Rampur, published volume from Istanbul and copy in possession of Shifaul Mulk Ḥakīm Mazhar Hussain of Patna.
17. *Avicenna’s Tract on Cardiac Drugs and Essays on Arab Cardiotherapy* (English) by Ḥakīm Abdul Hameed, Institute of History of Medicine and Medical Research, New Delhi and Institute of Health and Tibbi (Medical) Research, Karachi, 1983.
18. *Greco-Arab Concepts on Cardiovascular Diseases* (English) by Ḥakīm Mohammad Said, Hamdard Foundation, Karachi, 1983 (sister volume of the above book, “*Avicenna’s Tract on Cardiac Drugs and Essays on Arab Cardiotherapy*”)
19. *Risāla al Adwiyā al Qalbiyah* (Persian translation) by Ḥakīm Syed Zillur Rahman, Muslim University Press, Aligarh, 1995. It is critically edited text of Persian translation of *Tafrih al-Qulūb* by an Indian physician, Ḥakīm Ahmadullah Khan. The edition is based on three Indian extant manuscripts as mentioned above (item 13).
20. *Avicenna on Cardiac Drugs* (English) by Laleh Bakhtiar (Series: Great Books of the Islamic World). Kazi Publications, Inc., USA (October 1, 2013): 64 pages

21. *Pharmacology of Avicennian Cardiac Drugs* (English translation and metaanalysis of researches in Avicennian Cardiac Drugs) by Syed Ziaur Rahman, Ibn Sīnā Academy of Medieval Medicine and Sciences, Aligarh, India, 2020

Scholars like (Ahmad 2010, Naseer 2016 and Khurshid 2014) compiled a list of a few formulations based on Ibn Sīnā's cardiac drugs, but that needs to be extended as there are more publications based on scientific significance. A number of research papers on the scientific relevance of these formulations have been mentioned in the detailed Final report. From literature review, 6 theses of PhD, 14 theses of MD, 26 dissertation of M. Pharm, 2 scientific projects works and 7 conference papers by scholars were also found.

## 5 Cardiac drugs as single ingredient

As reported earlier in the text, the treatise, *Risāla al Adwiyā al Qalbiyah* has a description of 63 cardiac drugs. Among 63 drugs, 48 are of plant origin (76.19%), 8 are of animal origin (12.70%) and 7 (11.11%) are of the nature of minerals (including 2 metals) (Figure 1).

The present review of 63 cardiac drugs mentioned by Ibn Sīnā for the treatment of *Amraz-e-Qalb* consisted of drugs having either direct action on heart or on the whole cardiovascular system. These drugs were found to have their major action or role on heart or blood vessel, and on those used primarily for cardiovascular disorders as *Muqavvi-e-Qalb*, *Mufarreh-e-Qalb*, *Muharrik-e-Qalb*, *Musakkin-e-Qalb*, *Mufatteh-e-Urooq*, *Mudir*, etc. This includes the effect as anti-hypertensive and anti-hyperlipidemic. The above 2 properties *Muqavvi-e-Qalb* and *Mufarreh-e-Qalb* of 63 drugs could be correlated with the mechanism of action as cAMP modulators, Na/K-ATPase Enzyme Inhibitors, peripheral  $\beta$  blockers, calcium channel blockers, autacoids, nitric oxide donors, potassium channel openers, centrally acting  $\beta$  receptor agonists, diuretics, in various diseases of cardiovascular system.

We analysed thoroughly and critically each 63 single drugs individually, which is not possible to provide here because of space. It needs more than 100 pages, meaning thereby it is an exhaustive work prepared with notes, annotations and history. A total of 39 different plant parts

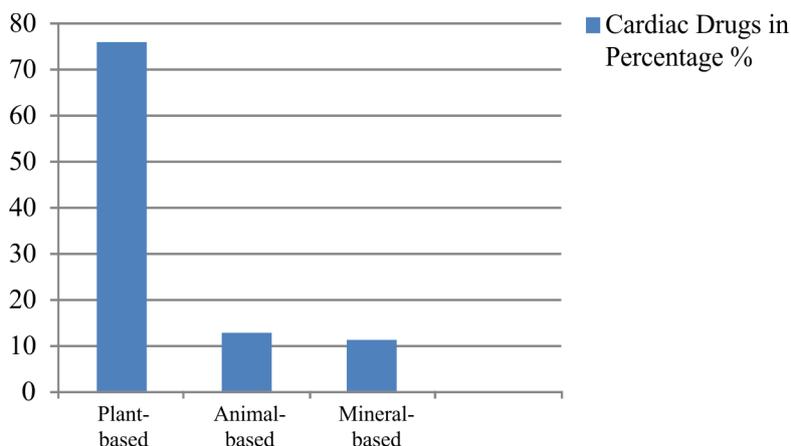
and their extracts have been published to possess cardio-protection against doxorubicin or isoproterenol-induced myocardial infarction. Isoproterenol a beta-adrenergic receptors agonist causes severe stress in myocardium resulting in the infarct-like lesion and produced cardiotoxic effects by elevating the levels of cardiac biomarkers and causing changes in ECG. Plant-based medicines with their antioxidant, antiapoptotic, antihyperlipidemic, platelet antiaggregatory, anti-lipid peroxidation property provide substantial evidence for the management of Ischemia induced by doxorubicin and isoproterenol.

## 6 Conclusion

There is little doubt that Traditional Medicines have been utilized since antiquity in the health care. However, with the advent of the pharmaceutical industry early in this century, the popularity of traditional/herbal medicine declined, in spite of the fact that twenty five percent of all prescription drugs still contain ingredients isolated from plants. The resources now do exist which can help and assist for greater understanding of the ways in which herbs can facilitate health and restore balance in disease. It may be said that the drugs mentioned by Ibn Sīnā as cardiotonics need a careful pharmacological and clinical evaluation in the light of modern methods of investigation. A possibility of errors in interpretation exists around research on such drugs mentioned in *Risāla al Adwiyā al Qalbiyah* and therefore these interpretation should be given due consideration while starting any modern research on these drugs. The active principles of these drugs should also be isolated for their structure and elucidation work. A possibility exists that these compounds, if interesting in character, may open new horizons for synthetic chemists and more useful drugs as synthetic analogues may be evolved such as the findings in this study could help in identifying many "lead drugs" that could work as a part of "reverse pharmacology" especially those that showed the effect as diuretic,  $\beta$  antagonist, Angiotensin II Blocker, Calcium Channel Blocker and digoxine like activities.

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**Figure 1** Classification of 63 cardiac drugs mentioned by Ibn Sina.

cardiac drugs described by Ibn Sina (980-1037) in the contemporary research” for the period 2017–2019. The authors are also grateful to the Ibn Sina Academy (Aligarh), for agreeing to publish the whole report as book.

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