

Contributions of Muhadhdhab Al-Deen Al-Baghdadi to the progress of medicine and urology

A study and translations from his book Al-Mukhtar

Rabie E. Abdel-Halim, FRCS Ed.

ABSTRACT

This study of the Arabic 4-volume book of Al-Mukhtar Fi Al-Tibb (Choice Book on Medicine) written by the Muslim physician Muhadhdhab al-Deen Al-Baghdadi (515-610 H, 1117-1213 AD) aimed at evaluating his contributions to the progress of medicine and urology along with providing English translations of relevant excerpts. Al-Baghdadi laid emphasis on the morals of medical practice and the principles of medical education describing how to select medical students and how to evaluate graduates. He stressed on the need for a long training program directly supervised by skilled expert doctors both in hospitals (Al-Bimaristanat) and during home visits. A good part of volume 1 was allocated to preventive medicine and the whole of volume 2 was devoted to the pharmacy section, which he restricted to what was proven by the experience of his teacher and by his own experiments. Same as all his predecessors in the Islamic era, Al-Baghdadi stressed the importance of clinical medicine and gave more details related to history taking, physical examination, differential diagnosis and prognosis. Similar to them, he also, emphasized that a doctor should be quite knowledgeable in anatomy. Furthermore, the presence of anatomical drawings in Kitab Al-Mukhtar Fi Al-Tibb is a further step forward in illustrating medical text books; a trend that flourished in the Islamic era reflecting the role of direct observations and experience. The detailed description of the functional anatomy of the uretero-vesical junction and the antireflux and micturition mechanisms given by Al-Baghdadi is contrary to that of Galen (130-200 AD) but conforms well to our contemporary understanding. In the conservative management of urinary stones, he described 70 simple and 13 compound drugs while those described by Pulus of Aegina (625-690 AD) were only 20 simple and 3 compound drugs. Furthermore, Al-Baghdadi's description of the instruments and techniques of urethral catheterization, perineal cystolithotomy and perineal cystolithotripsy using Al-Zahrawi's lithotrite is meticulous and reveals originality, dexterity and experience.

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From the Division of Urology, Department of Surgery, King Saud University, College of Medicine and King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Prof. Rabie E. Abdel-Halim, Professor of Urology, Division of Urology, Department of Surgery 37, King Khalid University Hospital, PO Box 7805, Riyadh, 11472, Kingdom of Saudi Arabia. Tel. +966 (1) 4672541 / 4671836, +966 507215186. Fax. +966 (1) 4679493. E-mail: rabie@doctors.org.uk

According to Sarton,¹ Cumston,² Rosenthal³ and Sedillot⁴; with the spread of Islam in the seventh century AD, a great revival of the sciences took place in the Islamic empire; knowledge of medicine flourished and acquired a truly scientific spirit and doctors were highly esteemed.

Muhadhdhab Deen Al-Baghdadi, a prominent physician of this era is not yet widely known in the current medical and surgical literature. This study therefore, aims at evaluating his contribution to the progress of medicine and urology.

Who is Muhadhdhabul Deen Al-Baghdadi?

Muhadhdhabul Deen Al-Baghdadi is the twelfth century Muslim learned physician: Abu-Al-Hasan Ali ibn Ahmad ibn Ali who lived and practiced in Baghdad where he was born in the year 515 AH (1117 AD). He spent his early life in Baghdad where he studied Arts and Medicine.^{5,9} He also perfected memorizing, by heart, the whole of the Holy Quran. Moreover, he learnt the Hadith of the Prophet peace be upon him and became an authentic narrator.^{5,6,8,10} Then he became so famous in his practice of medicine where he outclassed most of the physicians of his time and was described by the historian Al-Dhahaby as one of the most intelligent persons in the world.⁶ He practiced medicine, first in Baghdad then in Mosul then in Khilat (modern-day Ahlat in Turkey) as the court physician of Shah Arman. Upon retirement to his home at Mosul, at the age of 75, he passed the rest of his life running teaching classes in Hadith and in Medicine until he died in the year 610 H (1213 AD) at the age of 95.^{5,9} It is after those 3 cities; Baghdad, Khilat and Mosul, that he was given the names Al-Baghdadi, Al-Khilati

and less commonly Al-Mosuli.^{5,6,10-12} However, his most commonly used name: Al-Baghdadi has to be combined with the Laqab (nickname) Muhadhdhabul Deen in order to distinguish him from his son Shamsul Deen Al-Baghdadi (born 548 H) who was also such a skilled physician that his fame spread to the Eastern Roman Empire where he was invited and greatly honored as a court doctor by the Roman King Kikau son of Keikhsosro.⁵ This is in confirmation of Cumston's¹³ statement that; "history does not mention a single Greek physician worth of the name during the entire Islamic period, while the sovereigns at Constantinople were obliged during this period to seek Arabian physicians for their medical advisers."

The laqab Muhadhabul Deen also distinguishes our author from the celebrated physician scholar Muwaffaql Deen Al-Baghdadi born 45 years later (1162 AD) and famous for his detailed study of more than 2000 human skeletons, which led him to criticize Galen's anatomical dogma.^{14,15} Less commonly, Muhadhdhabul Deen Al-Baghdadi, is also known by his Arabic tribe name and by his occupation as Ibn Habal Al-Tabeeb^{6,16} that is Ibn Habal the physician (Ibn Habal not Ibn Hubal as erroneously stated in some modern references). However, this name will, similarly, lead to mixing him up with his son Shamsul Deen also known as Ibn Habal Al-Tabeeb.¹⁶ Therefore, Muhadhdhabul Deen Al-Baghdadi is the most appropriate and least confusing name for Al-Baghdadi, the subject of this study.

Figure 1 shows the timeline (AD) of Al-Baghdadi in relation to some of his predecessors who pioneered the original contributions of the Islamic School of Medicine starting from: Al-Razi (Rhazes, 854-925),

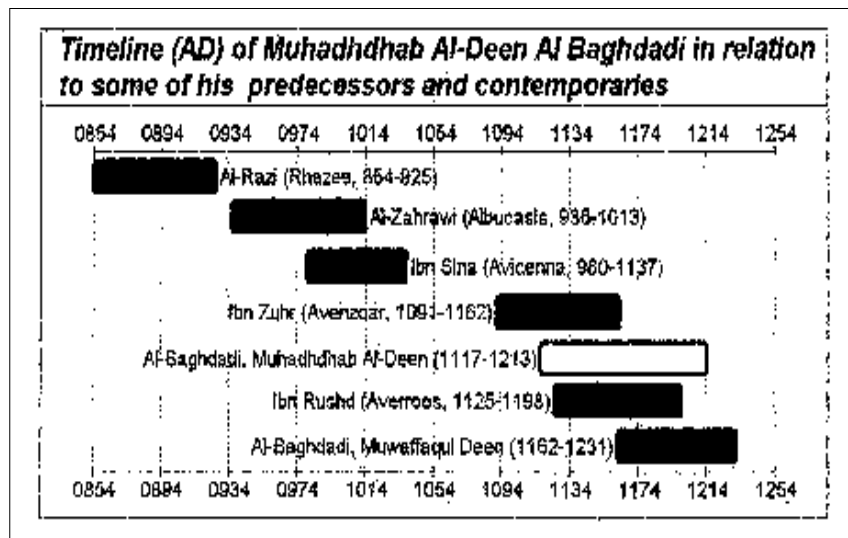


Figure 1 - Timeline (AD) of Muhadhdhab Al-Deen Al-Baghdadi in relation to some of his predecessors and contemporaries.

the father of clinical and experimental medicine and author of the well-known books *Al-Mansouri* and *Al-Hawi* and the less-commonly known book the “*Ma Al-Fariq Aw Al-Furuq Aw Kalamun Fi Al-Furuq Bain Al-Amradd*” (“What is the difference or differences: a discourse on the differentiation between diseases”) the first ever separate text book on differential diagnosis;¹⁷⁻²⁰ Ibn Sina (Avicenna, 980-1137) the author of the encyclopedic rigorously-planned *Canon of Medicine* that had a tremendous influence both in the orient and among the European nations²¹ and universities;²² *Al-Zahrawi* (Albucasis, 936-1013) who developed surgery into a respected branch of science integrated into the medical profession and wrote the first ever illustrated work on operative surgery.^{17,23}

The timeline shown in **Figure 1** also relates to some of Al-Baghdadi’s famous contemporaries in Andalusia: Ibn Zuhr (Avenzoar, 1091-1162), the father of experimental surgery¹⁸ and Ibn Rushd (Averroes, 1125-1198) the Islamic jurisprudence scholar, philosopher and physician who initiated the currently well established trend of joint authorship of medical text-books.¹⁸

There are many other original contributors to the progress of medicine, surgery and pharmacy during the Islamic period covered by this timeline (**Figure 1**). Ibn Abi-Usaybia, the famous 13th century medical historian provided 197 biographies for distinguished physician scholars who lived and practiced in the 250 years interval between Al-Razi and Muhadhdhabul Deen Al-Baghdadi.²⁴ Almost all of those doctors were creative, often prolific medical authors and many of them were physicians in royal courts, professors and chiefs of staff in teaching hospitals.²⁴

According to Ibn Abi-Usaybia,⁵ Al-Dhahaby,⁶ Ibn Katheer,²⁵ Ibn Al-Ghazzi,¹² Al-Zarkaly²⁶ and Sarton,⁷ Muhadhdhabul Deen Al-Baghdadi was the best among his contemporaries and the most distinguished scholar of his time in medical profession and in Islamic philosophy. He was also distinguished in the arts of literature; himself a fine poet. He wrote a treatise on logic but his chief and most famous work is a medical one entitled *Kitab al-Mukhtar fi Al-tibb* (The Choice Book on Medicine) which he wrote in Mosul in the year 560 H (1165 AD) when he was 45 years old.⁵

The book *Al-Mukhtar Fi Al-Tibb*. Historians agreed that the reputation which Al-Baghdadi has enjoyed in the East and West is founded on his *Al-Mukhtar* book described by Ibn Abi-Usaybia⁵ as a great book consisting of theory and practice of medicine. Others described it as all-embracing, comprehensive,⁶ excellent,¹⁰ encyclopedic²⁷ and as a complete system of medicine.²⁸

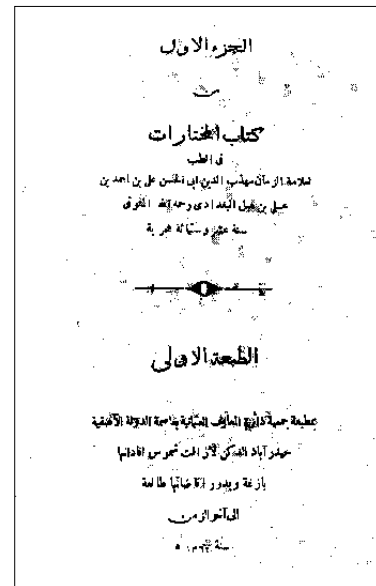


Figure 2 - Title page of Vol. I of the Hyderabad edition of *Kitab Al-Mukhtar fi Al-Tibb* (Choice book on medicine) by Muhadhdhab Al-Deen Al-Baghdadi.

This encyclopedia of Muhadhdhabul Deen Al-Baghdadi, *Kitab Al-Mukhtar fi Al-Tibb*, has been published in 4 volumes by Da’irat al-Ma’arif al-Uthmaniyah, 1943-4/1362-3 in Hyderabad, India. In all the 3 manuscripts utilized to publish this edition, the title of the book is: “*Kitab Al-Mukhtar Fi Al-Tibb*”²⁹ (the selected or choice book in medicine) not “*Al-Mukhtarat Fi Al-Tibb*” (the selections in medicine) shown on the title page of the printed book. Therefore and in agreement with Ibn Abi-Usaybia,⁵ Ibn Al-Ghazzi,¹² Al-Babani,¹¹ Al-Zarkaly,²⁶ Iskander,³⁰ Essa⁸ and Sarton,⁷ the correct original title of the book is *Kitab Al-Mukhtar fi Al-Tibb*. A reprint of this edition was published in 1996 by the Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University, Frankfurt A.M. Furthermore, the chapters on kidney and bladder stones has been edited and translated into French by De Koning³¹ in 1896 in Leiden, Other chapters have also, been translated into German by Thies³² in 1968 in Bonn.

Method of the study. In order to evaluate the contribution of Muhadhdhabul-Deen Al-Baghdadi to the progress of Medicine and Urology, the original Arabic edition of his Book *Al-Mukhtar*, published in Hyderabad (1943-45) by Da’irat al-Ma’arif al-Uthmaniyah (**Figure 2**), was carefully studied. Relevant excerpts from various sections of the book were translated into English and pertinent references including books, periodicals and online history-of-medicine resources have been reviewed.

Al-Baghdadi's Contributions to the Progress of Medicine and Urology: I. Objectives of medical writing. As translated from the preface of Al-Mukhtar book, Al-Baghdadi was aiming to: “clarify for medical students and practitioners what may be impossible to understand in the ancient books and may take a protracted course in the voluminous books” of his time.³³

In line with other authors of the Islamic era, he was also keen to critically evaluate the available literature, in the light of his own experience, accepting what is the truth, rejecting what is superfluous and documenting his own discoveries; thus he said: “I will also avoid including anything mentioned which is not proven by experiment as narrated to me by my teacher and through my own experience [obtained] by experimenting and testing”.³³

Al-Baghdadi's introduction to his book also shows that he was aiming for the benefit of not only the medical students and trainees, but also the public who will read it for health education; an objective which was shared by the other authors of the Islamic era.³⁴

II. Medical education, hospital training and medical ethics. In the selection of medical students, Al-Baghdadi agreed with Plato and Aristotle in condemning the ancient tradition of restricting medical education only to sons of doctors. Alternatively, he laid emphasis on the detection of natural talent, readiness and inclination in the applying candidate. Accordingly, he detailed how to detect this talent by looking for a long list of physical, moral, psychological and mental attributes indicating a healthy temperament, proportionate physique and pure manners.

He, also, stressed on the need for a long training program directly supervised by skilled expert doctors both in hospitals (Al-Bimaristanat) and during home visits. This is quite evident from the following translation from page 7 vol. I: “And among what assessment the physician should be subjected to, regarding credibility of his knowledge and his practical experience is to check on where did he spend his earlier period; if in continuing practice of the profession and remaining in service with its higher-ranking seniors for prolonged periods, studying under their guidance and treating patients under their supervision, training on domiciliary visits to treat patients at their homes; and continuing prolonged service in the Bimaristanat (hospitals) where plenty of skilled physicians practice paying a lot of attention to the patient management as practiced by his Ustaz (master, teacher, professor) - if so, he then deserves recognition and can be relied upon.

Furthermore, do people praise him for his good manners and religiousness?; and for his enthusiasm

when free at home to read books and study this profession?; and [praise him] for being not engaged in distractions, amusements, indulgences and drinking, or time after time getting drunk or in some of this blameworthy attributes that occupy time into waste and occupy mind into distortion? - so, if he is connected to anything of this kind, then he should not be trusted or relied upon in this profession”.³⁵

III. The art of writing a medical text-book. The first Volume of the book provides the Kulleyyat, the generalia, such as, the general principles of medicine divided in 2 primary divisions: “Elm” (knowledge, science) and ‘Amal’ (practice).

The classification skills of Al-Baghdadi, and his method of linking major portions of his text together to ensure clarity and continuity and to preserve the reader's constant attention are quite obvious. For the same reason, the author regularly starts a fresh subject by a general introduction before starting with the region-by-region details and then ends with a summarizing concluding remark. Moreover, at the end of volume I, Al-Baghdadi gave a comprehensive summary of the whole volume in a separate chapter titled: “A chapter like an epilogue for the first book”.³⁶

This skill of Al-Baghdadi in classifying his medical knowledge and writing it down according to a plan and a rigorous orderly method, in a lucid, concise but precise and up-to-the point style, represents another salient feature of medical text-books authored during the Islamic era and is in agreement with Cumston³⁷ and Leclerc³⁸ who admired the clarity of medical textbooks written by Islamic Physicians when compared with those of ancient authors.

IV. Prevention is better than cure. Al-Baghdadi, gave primary attention to preventive medicine (Hifz Al-Sehhah). This represents a continuation of the same emphasis laid by his predecessors in the Islamic era; a hallmark which was stimulated by the teaching of the Prophet (peace be upon him) in the fields of hygiene, diet, bodily health, spiritual health, personal and environmental cleanliness and avoidance of contagion.^{39,40}

The chapter on preserving health of the neonate, also, includes antenatal care and is followed by a general chapter on the treatment of disease of the children.⁴¹ This represents an attempt to deal with pediatrics as one independent entity; a tendency which started and rapidly progressed during the Islamic era which witnessed the writing of separate text books for antenatal, neonatal, postnatal care and pediatrics such as those written by Ibn Al-Jazzar, Abu Ja'far Ahmad ibn Abi Khalid (d. 369 H/979 AD)^{42,44} and Al-Balady (died around 380 H / 999 AD).⁴⁵

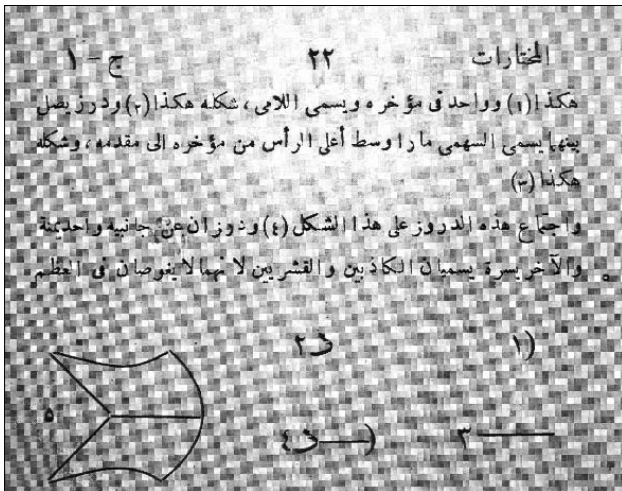


Figure 3



Figure 4

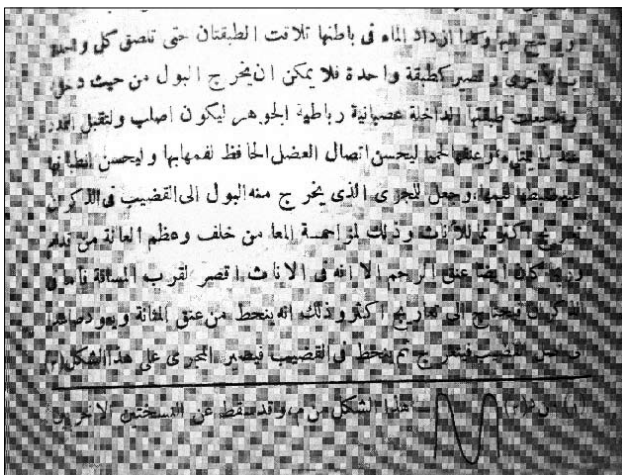


Figure 5

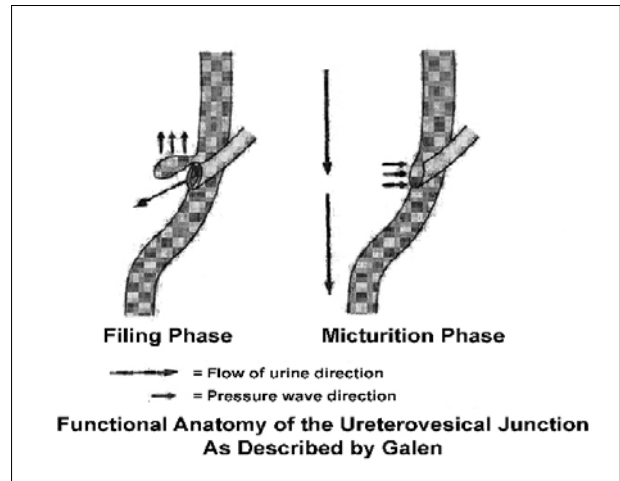


Figure 6

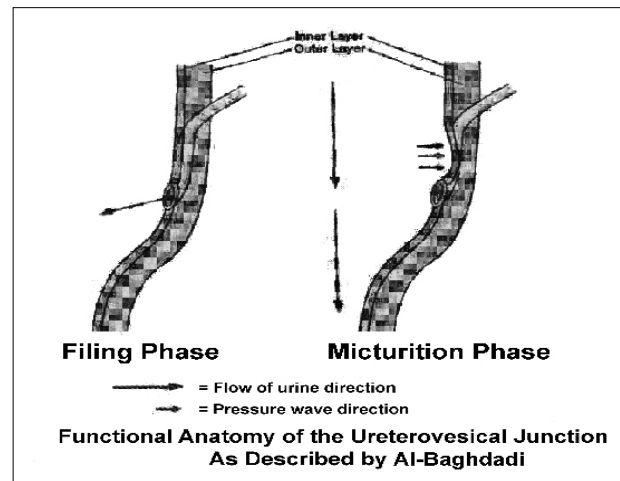


Figure 7

Figure 3 - Picture of page 22, Vol. I, of the Hyderabad edition of *Kitab Al-Mukhtar fi Al-Tib* (Choice book on medicine) by Muhaddhab Al-Deen Al-Baghdadi showing anatomical illustrations of the cranial sutures in the middle of the text.

Figure 4 - Picture of Folio 12 a, Manuscript No. A 53 of the *Canon of Medicine* of Ibn Sina (Avicenna) showing anatomical illustrations of the cranial sutures in the middle of the text. Courtesy of the National Library of Medicine, Washington. Available at URL: <http://www.nlm.nih.gov/hmd/arabic/E8.html#>

Figure 5 - Picture of page 97, Vol. I, of the Hyderabad edition of *Kitab Al-Mukhtar fi Al-Tib* (Choice book on medicine) by Muhaddhab Al-Deen Al-Baghdadi showing an illustration of the male urethra to demonstrate its tortuous course.

Figure 6 - An illustration of the functional anatomy of the ureterovesical junction as described by Galen. Courtesy of the Saudi Medical Journal.⁶¹

Figure 7 - An illustration of the functional anatomy of the ureterovesical junction as described by Muhaddhab Al-Deen Al-Baghdadi. Courtesy of the Saudi Medical Journal.⁶¹

Al-Baghdadi also included chapters on the care of persons from the ages of boyhood, youth, manhood and old age; the care of the convalescent; the care of healthy persons according to the air and environment. Moreover, he devoted chapters for preserving health by sports, bathing, proper dieting, and sleep regulation and, by moderating the psychological reactions such as worry, anger, envy, anxiety, and bad thoughts.⁴⁶ The latter chapter reflects the concept held by Al-Baghdadi, as well as his predecessors in the Islamic era that bodily health is closely linked to the health of the soul. According to Penelope Johnstone, this concept is derived, also from the “medicine of the Prophet”.⁴⁰

Among other topics on preserving health, are chapters on Siwak and maintenance of dental health, on preserving the health of the traveler and on grave prognostic signs and warnings of serious developments.⁴⁶

V. Emphasis on the study of anatomy for physicians. Like Al-Razi and all the other Muslim scholars before him, he also emphasized that the doctor should be quite knowledgeable in anatomy to be able to identify the state of the organs and how they are related to each other.⁴⁷ He devoted a chapter for general anatomy before going into the details for each region⁴⁸ and did the same with physiology, which he discussed in a separate section under the titles: the Gained Benefits of the Wisdom of Creation, first, of all organs collectively and then for each organ individually.⁴⁹ Similarly, the chapter on Embryology was titled the Creation of Human Being.⁵⁰

VI. Anatomical drawings in medical text books. Furthermore, the presence of anatomical drawings within the text in *Kitab Al-Mukhtar Fil-Tibb* is a further step forward in illustrating medical text books; a trend that started and flourished in the Islamic era reflecting the role of direct observations and experience. The illustrations of the cranial sutures in Al-Mukhtar book⁵¹ (**Figure 3**), are more numerous and more detailed than those in a manuscript of Ibn Sina (Avicenna)'s *Kitab Al-Qanun Fi Al-Tibb* (The Canon of Medicine)⁵² (**Figure 4**). Furthermore, Al-Baghdadi also made diagrams for the male urethra to demonstrate its tortuous course (**Figure 5**).⁵³

VII. Separation of pharmacy. The whole of the volume II of Al-Mukhtar was allocated to the pharmacy section of the book.⁵⁴ This in conformity with Hadzovic who documented the obvious contribution of Arabic science in the development of pharmacy, which according to him, began to separate from medicine and become an independent scientific discipline during the 12th century.⁵⁵

Furthermore, Lozano⁵⁶ in a recent study on the therapeutic uses of *Cannabis sativa* (L.) in Arabic

Medicine that included Al-Mukhtar book, came with the conclusion that Arab scientists were several centuries ahead of our current knowledge of the curative power of *Cannabis sativa* (L.). They knew and used its diuretic, anti-emetic, anti-epileptic, anti-inflammatory and pain-killing virtues, among others. For this reason, he even suggested that the data to be found in Arabic literature could be considered as a possible basis for future research in this field.⁵⁶

VIII. Emphasis on clinical medicine. Volumes III and IV of Al-Mukhtar book cover the rest of the particularia, the special-medicine sections, starting with diseases of the brain and nervous system then the state and diseases of the rest of the body. In both the general (Kulliyat) and special sections of the book, same as all his predecessors in the Islamic era, he stressed the importance of clinical medicine and gave more details related to history taking (asking for the Aarad) and physical examination (looking for the Dalalat) listing the differential diagnosis and prognosis before discussing the details of treatment for each disease. This is in agreement with Cumston who described the Arabian Physicians as keen observers who excelled in diagnosis and prognosis with their description of symptoms showing a precision and an originality that could be only obtained by direct study of the disease.⁵⁷

IX. Contributions to progress of urology. 1. Functional Anatomy of the Urinary Tract: Contrary to Galen (130-200 AD) who described the bladder wall as formed only of one layer^{58,59} (**Figure 6**), Al-Baghdadi described the bladder wall as consisting of 2 layers⁶⁰ (**Figure 7**). Carrying on with this original observation made by Al-Razi, Ibn Sina, and Al-Zahrawi,⁶¹ Al-Baghdadi's description of the anti-reflux and micturition mechanisms,^{60,62} translated in the following paragraphs, was also contrary to Galen^{58,59} but conformed well with our contemporary understanding.⁶³⁻⁶⁵

“(The ureter), first, pierces its (the bladder) external layer and independently passes in between the 2 layers until it reaches its neck then pierces through the internal layer to its (the bladder) lumen. Therefore the more urine is contained in it, the more the internal layer comes closer to the external until the maximum amount of urine is reached causing tight adjoining (abutting) of the 2 layers and the 2 holes lying in the external and internal layers become, thus, blocked.”

“Then there is no remaining chance for the urine to return back to where it came from, but then it stimulates the volition to let it out.”^{60,62}

And on its neck (around the bladder neck) there is a muscle that contracts and keeps the urine retained

until it is let go by volition when it opens up for the urine to come out."^{60,62}

2. *Urological practice.* Al-Baghdadi described a comprehensive classification of urological diseases based on etiology; discussing, in details, the pathological changes and the clinical picture of each disease highlighting the symptoms and signs of importance in diagnosis, prognosis and differential diagnosis.⁶⁶ He distinguished between kidney stones and bladder stones with regard to their pathogenesis and clinical picture reporting his own experience both in pediatric and in various adult age groups. He also described the symptoms of the stone transit down to the bladder and how to diagnose impaction.⁶⁷ Moreover, he discussed in details how to differentiate between renal and intestinal pain classifying the latter into several varieties according to the underlying cause.^{67,68} Excerpts from this section of Al-Mukhtar book on urinary stone disease are, hereby, translated in the following paragraphs: "*Stones in the kidney arise, more commonly, in aged men while those in the bladder occur more in boys...*".

"It may even form in children who are still breast fed; that is because of the excessive curdling effect of their mothers' milk; and the stones reach a large size in their bladder. We have seen some of those stones which are comparable to a medium sized truffle..."

*"Most of those with kidney stones are obese and most of those with bladder stones are slim. And it is infrequent for stones, particularly those in the bladder to occur in women or girls..."*⁶⁹

*"The pain from a kidney stone may be suspected by unskilled physicians as being of colonic origin (Qawalang) and we shall mention how to differentiate in-between..."*⁷⁰

In the conservative management of kidney stones, Al-Baghdadi started with the advice to get rid of the "*viscid khalt (humour) that caused the stone and to follow a mild dietary regimen*".⁷¹ According to him, "*this management will benefit the person whose stone is small and has a smoothness that help its fast movement*".⁷¹ He then added the following advice: "*...If this is not enough then use the medicaments that crumble and disintegrate the stone together with those that help extruding it out. And here are some simple drugs that can be used to achieve stone passage. Some of them act by: crumbling (disintegrating); some by lubricating; some by enhancing the effect of the used medicament; some by conveying the medicament to the organ; some by strengthening the organ and some by nullifying the pain...*"⁷²

For this conservative management of urinary stone disease, Al-Baghdadi described 70 simple and 13 compound drugs⁶⁷ while the seventh century Paulus

of Aegina described only 20 simple and 3 compound drugs in his book the Seven Books of Paulus of Aeginata⁷³ which is known to have embodied a comprehensive summary of the medicine of the Greco-Roman era. Paulus,⁷³ also, did not classify his stone drugs according to its mode of action as carried out by Al-Baghdadi. Moreover unlike Paulus, Al-Baghdadi did not recommend venesection in the management of patients presenting with impaction and acute pain.⁶⁷

In addition to the oral route of his prescribed stone-medication recipes, Al-Baghdadi also recommend their local application to the site of pain as fomentations using a sponge soaked in the cooked medications and, in case of bladder stones, as intravesical instillation through a urethral catheter.⁶⁷

He believed in starting a prophylactic medicinal and dietary regimen whenever a person who had a kidney stone experiences the passage of gravel or feels the slightest dysuria; before the aggravation of the state of the stone (its size and effect). Among this prophylactic dietary management, Al-Baghdadi advised the intake of light meat such as that of birds (poultry) and the avoidance of different types of milk and soft cheese.⁶⁷

Although, Al-Baghdadi documented, in his book Al-Mukhtar, that in intolerable cases of renal stone some resorts to cutting on the stone in the back (the today lumbotomy approach) or in the loin (the today subcostal approach), he himself, condemned this line of management because of its great risk.⁷⁴ This is in agreement with his predecessors Al-Razi⁷⁵ and Ibn Sina⁷⁶ who also condemned the operation of cutting on kidney stones but approved it in bladder stones where it is safe in the majority of cases as stated by Al-Razi in his Kitab Al-Hawi Fi Al-Tibb (The Continents).⁷⁵

With regard to the technique of cutting on bladder stones, Al-Baghdadi differed from his predecessors in marking the incision in the perineum before starting and in trying to hook the stone out by finger not by forceps.⁷⁷ He stressed the importance of planning the incision so that it opens the bladder neck not the bladder wall because in the latter case healing is almost unlikely. He reported seeing perineal cystolithotomy wounds that quickly healed and others that never healed causing a lot of suffering to the patients because of persistent urinary leak.⁷⁷ If the stone was found too large to come out through the incision, he then, advised to introduce Al-Kalbatin, which is Al-Zahrawi's Kalaleeb Lithtrite to crush it in the bladder and remove all fragments out not leaving any; because with time any fragments left will enlarge to the original stone size.⁷⁷

Al-Baghdadi emphasized the importance of not trusting any one to cut on the stone except the one who have trained in this sort of surgery and practiced it himself as confirmed by the testimony of many people. He provided a case report of a child referred to him because of a complication of the operation due to failure of removing a large bladder stone.⁷⁷

With regard to catheterization technique, Al-Baghdadi preferred catheters made of silver more than those made from lead, the salve of white lead or from tanned skin of some marine or wild animals, which were in use from the time of Al-Razi⁷⁸ and Ibn Sina.⁷⁹ He found that silver combines the benefit of smoothness to yielding and malleability of the catheter. Furthermore, the bladder end of the catheter has to be smooth and contain many holes so that if some is blocked with gravel or pus the urine will make a way into the rest. Among the indications of catheterization other than the relief of acute retention that failed conservative management, he cited the use of the urethral catheter to dislodge a stone back into the bladder and also to inject lithontriptic or blood-clot lytic medications in the bladder.⁸⁰ His description of all the above techniques and instruments is meticulous and reveals originality, dexterity and experience.

It is evident from many places in Al Mukhtar book that Al-Baghdadi was both a talented physician as well as a gifted experienced surgeon. His reliance on his own clinical observations together with his consummate skill in differential diagnosis and his interest in clinicopathological correlations shines through in all sections of the book. Based on his own experience, he staged and classified diseases in a practical way relevant to their management and prognosis. This is in agreement with Cumston⁸¹ who stated that generally speaking the subjects dealt with by Islamic Physicians are specially dealt with from a clinical standpoint and reveal a personal experience which is often lacking in the works of the ancients.

The influence of Muhadhdhabul-Deen Al-Baghdadi on the generations of doctors and scholars who came after him is well documented up to the seventeenth century. His Kitab al Mukhtar was one of the books in the reading list of Sadid Addin al Kazaruni (8/14th century) the author of Al-Mughni, Sharh Mujaz ibn an Nafis.⁸² Moreover, the book Al-Mukhtar was enumerated by the physician Muhammad ibn Mahmoud ibn Hajji Al-Shirwani as one of 3 main sources he utilized in his massive 44-chapter Arabic Pharmacopoeia: "Rawdat Al-Itr" written around the year 1397 AD.⁸³ Furthermore, a recipe taken from Kitab Al-Mukhtar is given a marginal note on one of the folios of a manuscript of Kitab Al-Mansuri Fi Al-Tibb of Al-Razi (The Book on Medicine for Mansur by Rhazes) scribed by a physician copyist in the year 1078 H (1667-1678 AD).⁸⁴

Therefore, it is evident from this study of Al Mukhtar book that Al-Baghdadi was both a talented physician and a gifted experienced surgeon. His influence on the generations of doctors and scholars who came after him is well documented up to the seventeenth century. His book Al-Mukhtar, contributed to the progress of medical ethics, medical education, preservation of health, clinical medicine and pharmacy. It also led to significant advances in the practice of medicine, pediatrics and all surgical subspecialties including urology.

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