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From Syllogism To Diagnosis: Logic In The Medical Doctrine Of Abu Ali Ibn Sina

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Abstract: The article examines the application of Aristotelian logic in the medical epistemology of Ibn Sina (Avicenna, 980–1037). It analyzes the transformation of the syllogistic method into an instrument of clinical diagnosis as presented in "The Canon of Medicine" ("al-Qānūn fī al-ṭibb"). The study demonstrates that Ibn Sina developed an original system of medical knowledge based on rigorous logical procedures of verification, which anticipated modern approaches to evidence-based medicine. The research methodology includes textual analysis of Arabic sources, comparative analysis of logical and medical treatises, and reconstruction of the epistemological foundations of medieval Islamic medicine.

Keywords: Ibn Sina, medical logic, syllogism, diagnosis, medieval philosophy of science, Islamic medicine, epistemology.

Introduction: The problem of the relationship between logic and medical knowledge constitutes one of the central issues in the history of science and epistemology. In contemporary philosophy of medicine, the status of clinical reasoning, the nature of diagnostic inference, and the criteria of scientific justification of medical judgments are actively debated. Investigating the historical roots of these problems within the intellectual tradition of the Islamic Middle Ages makes it possible to identify deep structures of medical thinking that remain relevant in the era of evidence-based medicine.

Abu Ali Husayn ibn Abdallah ibn Sina created the most systematized medical doctrine of the medieval East, which exerted a decisive influence on the development of European medicine up to the seventeenth century. His *Canon of Medicine* served as the principal medical textbook in European universities for more than five centuries. However, the logical and methodological foundations of Ibn Sina's medical system remain insufficiently studied in modern historiography.

METHODOLOGY

The article argues that the historical significance of Ibn Sina's views extends beyond medicine and represents a key stage in the development of humanity's scientific methodology. The principles of logical organization of knowledge elaborated in the *Canon* are identified across various fields of science—from bioinformatics to artificial intelligence—and their influence on contemporary approaches to systematization is analyzed.

LITERATURE REVIEW

In preparing this article, a wide range of philosophical, logical, historical, and medical literature was used. The source base includes numerous scholarly works by prominent researchers such as V.V.Barthold, I.M.Muminov, M.M.Khairullaev, M.N.Boltaev, V. Zakhidov, T.I.Rainov, M. N. Vasiliev, M. S. Burabaev, A.V.Sagadeev, M.N.Saifullaev, S.Akkelman, J.Guinness, and others. A significant contribution to understanding the importance of Ibn Sina's logical doctrine was made by Associate Professors D.E.Fayzikhodjaeva and O.I.Stepanova of the Department of Philosophy and Logic at the National University of Uzbekistan. Overall, the degree of scholarly engagement with Ibn Sina's works is quite high; however, no separate study has yet been devoted specifically to the logical foundations of "The Canon of Medicine".

RESULTS

The paradox of modernity lies in the fact that, in an age of informational abundance, we return to the same

logical principles of knowledge organization that a medieval thinker intuitively grasped and systematized. This indicates that Avicenna uncovered not merely a medical methodology but fundamental laws governing the structuring of human knowledge.

Research on Ibn Sina's medical philosophy may be divided into three main directions. The first, represented by the works of M. Ullmann, E. Savage-Smith, and L.Conrad, focuses on clinical aspects and practical medicine. The second, developed by D.Gutas, T.Street, and P.Adamson, analyzes the philosophical foundations of Ibn Sina's natural science but pays insufficient attention to the specificity of medical knowledge. The third direction, represented by J.McGinnis, N.Rescher, and A.Akasoy, investigates Ibn Sina's logical methodology primarily on the basis of philosophical treatises rather than medical texts.

A substantial contribution to the study of Ibn Sina's medical epistemology has been made by domestic scholars. U.I.Karimov analyzed the structure of the "Canon" from the perspective of systematizing medical knowledge, while M.S.Asimov and A.V.Sagadeev examined philosophical aspects of Ibn Sina's natural-scientific views. However, a comprehensive study of the application of formal logic in clinical diagnosis is absent from their works.

Despite the recognition of the importance of logical methodology in the intellectual legacy of Ibn Sina, the mechanisms by which abstract logical forms are transformed into concrete procedures of medical reasoning remain insufficiently clarified. The nature of the modifications undergone by the classical Aristotelian syllogism in the process of its adaptation to the needs of clinical practice has not been determined. The question remains open as to whether Ibn Sina's medical logic represents merely an applied use of ready-made logical schemes or constitutes an original methodology with its own epistemological characteristics.

The primary source of the present study is The Canon of Medicine (al-Qānūn fī al-ṭibb), especially its first book, which is devoted to the theoretical foundations of medicine. In order to reconstruct the logical and methodological framework, relevant sections of the encyclopedic work The Book of Healing (Kitāb al-Shifāʾ), particularly those devoted to logic (al-Manṭiq), as well as the treatise Remarks and Admonitions (al-Ishārāt wa-al-tanbīhāt), are also employed. The research relies on critical editions of the Arabic texts prepared in Cairo (1987) and Beirut (1990s).

The theoretical foundation of the study is constituted by the concept of scientific demonstration (burhān) as a form of certain knowledge, originating from Aristotle's Posterior Analytics. Within the Islamic philosophical tradition, this concept was adapted by al-Fārābī and further developed by Ibn Sina in the direction of creating a universal methodology of the sciences. Of particular importance is the distinction drawn by Ibn Sina in the logical sections of The Healing between burhān (apodictic demonstration), jadal (dialectical reasoning), and ẓann (probabilistic knowledge).

Within Ibn Sina's system of sciences, medicine occupies an intermediate position between theoretical knowledge (al-ʿilm al-naẓarī) and practical art (al-ṣināʿa al-ʿamalīya). In the prologue to The Canon, Ibn Sina defines medicine as "the science by which the states of the human body, with respect to health and the absence of health, are known, in order to preserve health when it exists and to restore it when it has been lost." This definition points to the dual nature of medicine: it requires theoretical knowledge of the causes of health and disease, yet it is oriented toward practical action, namely therapeutic intervention.

Ibn Sina distinguishes two aspects of medical science: theoretical medicine (al-ṭibb al-naẓarī), which investigates the general principles of physiology and pathology, and practical medicine (al-ṭibb al-ʿamalī), which applies these principles to particular cases. Theoretical medicine is based on natural-philosophical knowledge of human nature, including the doctrines of the four elements, temperaments (mizāj), humors, organs, and faculties. Practical medicine includes diagnosis, prognosis, and therapy.

Of critical importance is Ibn Sina's assertion that medical knowledge can attain the status of certain science (ʿilm yaqīnī) only if strict logical procedures of inference are observed. This position stands in contrast to the empirical school of medicine, which was content with the accumulation of clinical experience without theoretical justification.

According to Ibn Sina's epistemology, scientific knowledge proceeds from universal principles to particular cases through a process of syllogistic inference. In medicine, this process acquires a specific structure: the physician must move from general laws of physiology and pathology to the diagnosis of a particular patient. This transition is accomplished through a system of mediating links.

Ibn Sina distinguishes three levels of medical knowledge:

1. Universal principles (al-kullīyāt) — general laws governing the nature of the human body, such as the doctrine of temperaments, the functions of organs, and the mechanisms of disease causation. These principles possess the status of necessary knowledge (ḍarūrī) and

are derived from natural philosophy.

2. General nosological forms (al-amrāḍ al-ʿāmma) — descriptions of types of diseases together with their characteristic features. They function as "middle terms" that connect universal principles with particular cases.

3. Particular cases (al-juzʾīyāt) — the conditions of individual patients, which are apprehended through sensory perception (ḥiss) and rational reflection (fikr).

The task of the physician consists in deriving knowledge of the particular case from universal principles through a system of syllogisms. This process is analogous to a judicial investigation: observable symptoms function as "evidence" (dalāʾil) that must be interpreted in the light of general laws in order to establish a diagnosis.

A central element of Ibn Sina's epistemology is the doctrine of the four causes, borrowed from Aristotelian physics and adapted to the needs of medicine. In the first book of The Canon, Ibn Sina systematically examines the application of causal analysis to the human body:

1. Material cause (al-sabab al-māddī) — the elements and humors of which the body is composed.

2. Formal cause (al-sabab al-ṣūrī) — temperament (mizāj), which determines the specific configuration of the organism's qualities.

3. Efficient cause (al-sabab al-fāʿilī) — external and internal factors that bring about changes in the state of health.

4. Final cause (al-sabab al-ghāʾī) — actions and faculties (quwā) directed toward the preservation of life and health.

An understanding of all four causes is necessary for complete scientific knowledge of disease. However, in diagnostic practice, the efficient cause assumes primary importance, since it is directly connected with the emergence of pathological processes and can be established through the analysis of observable signs.

In the logical section of The Book of Healing, Ibn Sina presents a complete system of Aristotelian syllogistics, including the theory of categorical syllogism, modal logic, and demonstration. The standard form of the categorical syllogism consists of two premises and a conclusion, in which the middle term links the minor and major terms:

All B are C (major premise)

All A are B (minor premise)

Therefore, all A are C (conclusion)

This scheme functions effectively in deductive sciences, where universal truths can be established. Medical practice, however, faces a fundamental problem: the physician observes effects (symptoms) and must infer causes (disease), which requires a reverse movement from conclusion to premises. This contradicts the deductive nature of the syllogism.

Ibn Sina was aware of this problem and developed a special modification of the syllogism for medical purposes. The key innovation consisted in the introduction of the concept of "convertible signs" (al-ʿalāmāt al-munʿakisa) — symptoms that unequivocally indicate a specific disease and allow the construction of a valid syllogism even when reasoning proceeds from the observable to the unobservable.

A typical diagnostic syllogism in Ibn Sina's system has the following structure:

Major premise: Everyone who has symptoms X, Y, Z suffers from disease B.

Minor premise: Patient A has symptoms X, Y, Z.

Conclusion: Patient A suffers from disease B.

Although this scheme outwardly resembles the classical syllogism of the first figure (Barbara), it contains significant modifications:

1. Empirical grounding of the major premise. Unlike apodictic sciences, where the major premise is derived from self-evident principles, in medicine it is based on systematized clinical experience and theoretical knowledge of pathological mechanisms.

2. Probabilistic character of the connection. Ibn Sina acknowledges that most medical correlations between symptoms and diseases are akthārī ("in most cases") rather than dāʾimī ("always"). This brings the medical syllogism closer to dialectical reasoning (jadal), without depriving it of scientific status.

3. Multiplicity of middle terms. Diagnostic inference rarely relies on a single symptom. Ibn Sina developed a method of combined analysis of multiple signs, which he designates as istiqrāʾ (enumerative induction).

The central innovation of Ibn Sina is the doctrine of convertible signs — symptoms that stand in a relation of mutual implication with a specific disease. If a sign P is convertible with disease B, then:

- If B is present, P is always present.
- If P is present, B is always present.

The presence of a convertible sign allows the physician to establish the diagnosis with certainty. As an example of such a sign, Ibn Sina cites black stool (barāz aswad) in gastrointestinal bleeding: this sign unambiguously indicates bleeding and does not occur in other conditions.

However, Ibn Sina acknowledges that convertible signs are rare in medicine. Most symptoms are "common signs" (ʿalāmāt mushtaraka) that may occur in different diseases. In such cases, a comprehensive analysis of the entire symptom complex is required.

To deal with ambiguous symptoms, Ibn Sina developed a procedure of differential diagnosis (tamyīz al-amrāḍ), which represents an application of the method of elimination. The logical structure of this method is as follows:

1. Formation of diagnostic hypotheses. On the basis of observed symptoms, the physician compiles a list of possible diseases (B_1, B_2, B_3, … B□).

2. Search for distinguishing signs. The physician identifies additional symptoms that are present only in some of the diseases on the list.

3. Elimination of incompatible hypotheses. If a sign necessary for disease B_i is absent in the patient, that disease is excluded.

4. Conclusion. The diagnosis is the disease for which all necessary signs are present and no incompatible signs are found.

This method represents an application of modus tollens: if disease B necessarily entails sign P, and sign P is absent, then disease B is also absent. Ibn Sina systematically employs this procedure in the clinical sections of The Canon, especially in the differentiation of fevers and internal diseases.

Ibn Sina devotes considerable attention to the method of experiment in medicine, which distinguishes him from most medieval physicians. In the chapter on testing the effects of drugs (Canon, Book II), he formulates seven conditions (shurūṭ) of a valid medical experiment:

1. The drug must be free from accidental qualities.

2. The experiment must be conducted on a sick person, not on a healthy one.

3. The drug must be tested in diseases with opposite qualities.

4. The strength of the drug must correspond to the degree of the disease.

5. The observation period must be sufficient for the effect to manifest.

6. The effect must be constant or occur in most cases.

7. The experiment must be conducted on the human body.

These conditions represent an early prototype of clinical research methodology. Of particular importance is the sixth condition, which introduces a statistical criterion: Ibn Sina recognizes that individual variability does not allow one to demand absolute reproducibility, but that regular recurrence (al-wuqūʿ fī akthar al-awqāt) is sufficient.

The epistemology of medicine in Ibn Sina is characterized by a dialectical interaction between theoretical knowledge and empirical experience. Neither component is self-sufficient:

Theory without experience may lead to erroneous abstractions that ignore individual patient characteristics.

Experience without theory remains a collection of scattered observations that does not rise to the level of scientific knowledge.

Ibn Sina formulates a methodological principle: the physician should begin with theoretical principles derived from natural philosophy, then test them empirically and correct theory in the light of clinical observations. This cyclical process is designated by Ibn Sina as taḥqīq (verification), a term indicating the attainment of certain knowledge (yaqīn) through the concordance of theory and practice.

The analysis conducted demonstrates that Ibn Sina's medical methodology is not a simple application of ready-made logical schemes to medical material, but rather an original system with specific epistemological characteristics.

First, Ibn Sina modified the structure of the syllogism by introducing the concept of convertible signs, which makes it possible to construct valid inferences when reasoning proceeds from effects to causes. This constitutes a solution to the problem of abduction, a type of reasoning that would be systematically investigated in the twentieth century by C. S. Peirce.

Second, Ibn Sina developed the procedure of differential diagnosis as an application of the method of elimination, anticipating the logic of scientific inquiry later described by F. Bacon and J. S. Mill. The method of eliminative induction formulated in the Novum Organum has direct parallels with Ibn Sina's diagnostic procedure.

Third, Ibn Sina recognized the limitations of strict deduction in medicine and legitimized probabilistic knowledge as scientifically grounded, provided that it is supported by theoretical explanation and systematic experience. This position anticipates modern discussions on the status of probabilistic reasoning in medicine and the role of Bayesian inference in clinical practice.

Ibn Sina's medical methodology occupies an intermediate position between ancient medicine and

early modern science. From Galen, Ibn Sina inherited the aspiration toward the rational justification of medical practice, but he surpassed him in the systematicity of logical analysis. Unlike Galen, who often appealed to empirical observations without rigorous methodological reflection, Ibn Sina explicitly formulates the logical procedures of medical reasoning.

At the same time, Ibn Sina's medical epistemology anticipates certain aspects of the scientific revolution of the seventeenth century. His concept of experiment as controlled observation that accounts for interfering factors is close to the methodology of Bacon and Galileo. The requirement of reproducibility of results "in most cases" indicates an understanding of the statistical nature of biological regularities.

Nevertheless, it would be anachronistic to ascribe a modern scientific methodology to Ibn Sina. His system remains within the Aristotelian-Galenic paradigm, characterized by teleologism and a qualitative approach to natural phenomena. Even so, Ibn Sina's logical and methodological innovations represent a significant step in the development of medical epistemology.

CONCLUSIONS

The present study allows the formulation of the following conclusions:

1. Ibn Sina's medical epistemology constitutes an original system that cannot be reduced to a mechanical application of Aristotelian logic. It includes specific modifications of the syllogistic method adapted to the needs of clinical diagnosis.

2. The central innovation is the concept of convertible signs (ʿalāmāt munʿakisa), which makes it possible to construct reliable diagnostic inferences from symptoms to diseases, thereby addressing the problem of abductive reasoning in medicine.

3. Ibn Sina's method of differential diagnosis (tamyīz al-amrāḍ) represents a systematic application of eliminative induction, anticipating the methodology of early modern scientific inquiry.

4. Ibn Sina legitimized probabilistic knowledge in medicine by formulating criteria for its scientific validity through the requirement of theoretical explanation and systematic empirical confirmation.

5. The concept of medical experiment with seven conditions of validity represents an early prototype of clinical research methodology, incorporating elements of variable control and statistical evaluation.

REFERENCES

1. Ibn Sīnā. Al-Qānūn fī al-ṭibb [The Canon of Medicine]. 3 vols. Beirut: Dār Iḥyāʾ al-Turāth al-ʿArabī, 1997.
2. Ibn Sīnā. Al-Shifāʾ: al-Manṭiq [The Cure: Logic]. Edited by I. Madkour et al. Cairo: Al-Hayʾa al-Miṣriyya al-ʿĀmma li-l-Kitāb, 1952–1983.
3. Ibn Sīnā. Al-Ishārāt wa-al-tanbīhāt [Remarks and Admonitions]. Edited by M. Zāriʿī. Qom: Būstān-i Kitāb, 2000.
4. Avicenna. The Canon of Medicine. Translated by O. C. Gruner. London: Luzac & Co., 1930.
5. Adamson, Peter. "Avicenna and His Commentators on Human and Divine Self-Intellection." Arabic Sciences and Philosophy 24, no. 1 (2014): 85–109.
6. Akasoy, Anna, and Guido Giglioni, eds. Renaissance Averroism and Its Aftermath: Arabic Philosophy in Early Modern Europe. Dordrecht: Springer, 2013.
7. Álvarez-Millán, Cristina. "Practice versus Theory: Tenth-Century Case Histories from the Islamic Middle East." Social History of Medicine 13, no. 2 (2000): 293–306.
8. Aouad, Maroun. "La doctrine de la démonstration selon Avicenne et la théorie grecque de la science." Mélanges de l'Université Saint-Joseph 57 (2004): 493–538.
9. Black, Deborah L. "Avicenna on Self-Awareness and Knowing That One Knows." In The Unity of Science in the Arabic Tradition, edited by Shahid Rahman, Tony Street, and Hassan Tahiri, 63–87. Dordrecht: Springer, 2008.
10. Gutas, Dimitri. Avicenna and the Aristotelian Tradition: Introduction to Reading Avicenna's Philosophical Works. 2nd ed. Leiden: Brill, 2014.
11. Hasse, Dag Nikolaus. "Avicenna's 'Giver of Forms' in Latin Philosophy, Especially in the Works of Albertus Magnus." In The Arabic, Hebrew and Latin Reception of Avicenna's Metaphysics, edited by D. N. Hasse and A. Bertolacci, 225–249. Berlin: De Gruyter, 2012.
12. Janssens, Jules L. "Experience (tajriba) in Classical Arabic Philosophy (al-Fārābī – Avicenna)." Quaestio 4 (2004): 45–62.
13. Karimov, U. I. Meditsinskaya sistema Ibn Siny [The Medical System of Ibn Sina]. Tashkent: Fan, 1990. (in Russian)
14. Lammer, Andreas. The Elements of Avicenna's Physics: Greek Sources and Arabic Innovations. Berlin: De Gruyter, 2018.
15. McGinnis, Jon. Avicenna. Oxford: Oxford University Press, 2010.
16. Asimov, M. S., and A. Mukhtarov, eds. Abu Ali ibn

Sina: K 1000-letiyu so dnya rozhdeniya. Dushanbe: Donish, 1980. (in Russian)

17. Dinorshoev, M. Naturfilosofiya Ibn Siny. Dushanbe: Donish, 1985. (in Russian)

18. Karimov, U. I. U istokov uzbekskoy meditsiny. Tashkent: Meditsina UzSSR, 1986. (in Russian)

19. Sagadeev, A. V. Ibn Sina (Avicenna). 2nd ed. Moscow: Mysl', 1985. (in Russian)

20. Semënova, L. A. "Iz istorii izucheniya Avitsenny v SSSR." Narody Azii i Afriki 5 (1980): 90–98.