

Editorial

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Medicine and nephro-urology in ancient Iran: Part II: Avicenna and His Art of Uroscopy

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Avicenna (980–1037 AD) was an Iranian polymath, who worked at the time of the flowering of Islamic medicine and science and wrote about 450 treatises on a wide range of scientific subjects in the medieval era (Islamic Golden Age). Some of his surviving treatises focus on philosophy and medicine. His most famous works are The Book of Shafa (Healing) which is a vast philosophical and scientific encyclopedia, and The Canon of Medicine (The Laws of Medicine), which was a known medical text at many medieval universities [1]. Avicenna wrote the "Canon of Medicine" which combined the ideas of Hippocrates, Galen and the Muslim's physicians with contemporary medical practice [2]. The

Canon of Medicine, which is a 14-volume book, was studied as a text-book in the Montpellier and Leuven universities as late as 1650 [3]. This book provides a complete system of medicine according to the principles of Galen and Hippocrates [4, 5]. Avicenna divides medicine into two parts: the theoretical and the practical. The theoretical part consists of the causes of health and diseases, the classification of diseases, discussion on the causes of diseases, illness and symptoms, the temperaments, the humours, anatomy, general physiology, the breath, psychology, the pulse, and the urine. Avicenna visited the sick and examined their appearance, pulse, and urine [6]. In the Middle Ages, urine was the first bodily fluid to

examine, which was explained in detail by Avicenna. He provided a large body of information about the functions of the kidneys. Avicenna was one of few pioneers who performed urinalysis in scientific methods very similar to what is customary in the 21st century. Avicenna suggested that the urine for examination should be the first voided urine sample in the morning, the patient should not eat or drink for a long time before examination (from the night prior to examination), and the patient should not take any foods or drugs that could change the color of the urine such as the beetroot or saffron. He pointed out some various artifacts and determined that external use of some coloring herbs like henna can change the color of the urine [7, 8]. According to Avicenna, the urine should be used for examination if the patient has diarrhea or vomiting. He suggested in his book that the urine should be examined as soon as possible after voiding as it would not be useful for examination after six hours. Avicenna insisted that urine should be examined in the first hour. He reported that if the urine was examined later, the color would change and the foam, if present, would disappear [6].

The proper method of urine examination

Avicenna believed the urine should be kept in a place, not too cold or hot, away from wind and sunlight. The urinal should be washed clean. He considered eight specifications of the urine: color, texture and consistency, clarity, sediment, volume, odor, foam, and taste.

Color

Avicenna explained that changes in the urine color could indicate the pathology in different parts of the body; the urine color might change in a patient with headache, insomnia, deafness, and abnormal mentality. He divided the urine color to light yellow (Straw), Citron, golden yellow, orange yellow, fiery yellow (the same color as Saffron or tincture) and bright red. Apart from the first two which are considered normal, the rest reveal a warm temperament as a result of hard exercise, painful stimuli, starvation, and dehydration. He insisted that if the urine color was dark red without any cause in the urinary tract, it could be the result of a blood disorder [7]. He also believed the red urine was very bad in the cases of renal disease because it indicated a "hot inflammatory process" [9].

Texture and consistency

Urine can be dilute, concentrated, or moderated. If a patient has diluted urine, we should consider one of these four: Immaturity (not ripened), occlusion of the vessels, renal failure in febrile children, and drinking too much fluid. Concentrated urine might be followed by high grade fever. Concentrated urine in severe illness indicates poor prognosis. In healthy people, concentrated urine can be due to dehydration, too. The third form is moderate urine which shows that the urine is mature and ripened.

Clarity

Avicenna believed that cloudy urine was usually due to renal failure. He said that if there was a foggy smoky appearance in the bottom of urine container, the patient's prognosis was poor and death would usually occur after long standing illness [6]. He mentioned a form of whitish scales in the urine which might be due to bladder ulcers (necrotic papillary particles in cauliflower bladder tumors). Other symptoms of these patients are red urine and pus in the urine [10].

Sediment

When the nature of the urinary dregs is good, it indicates maturity and ripening of the urine, the urinary dreg should be homogenous, white in color, and soft. In the presence of puss, the sediment is white in color, but not homogenous and soft. In Avicenna's point of view, when pus passes through urine, the bladder abscess should be considered [10]. The urine of thin people has fewer dregs.

Volume

Low urine output indicates failure of the forces. If the volume of the urine is much less than the amount of drinking, it indicates that either there is high fever or diarrhea and vomiting. Avicenna continued to say that in renal failure, if decreased urine volume is accompanied by headache, it may be due to increased blood pressure. Avicenna explained oliguria in his book. He mentioned that oliguria can be due to drinking inadequate liquids, body porosity, the effect of diarrhea on the body, disability of the kidneys, impaired absorption of fluids, and disability of the liver in separation of the fluid [11].

Odor

In Canon of Medicine, Avicenna mentioned that "If urine is black but has no odor, this is a sign of cold temperate; when the nature of the patient is depressed the urine has no odor, too" [6]. He described that malodorous urine accompanied by itching and pain around the bladder and purulent urine were the signs of bladder pustules [10].

Foam or Froth

Froth in urine is due to indigent large bubbles, which depending on the nature of the deposit. According to Avicenna, the urine is like pure foam or froth in renal failure [12].

Taste

At first the sweet taste was noticed in urine by Avicenna. Avicenna provided a detailed account on diabetes mellitus like abnormal appetite, declined sexual function and diabetic gangrene. Avicenna was also the first to describe diabetes insipidus.

The rest of the Avicenna's urinalysis treatise discussed ripening of the urine, the urine in the elderly, the differences between male and female urine and the urine of animals that is similar to heated oil, and how to distinguish it from the urine of humans [6]. Indeed, the discussion about urine examination is very lengthy and this was just a small sample of what Avicenna described in detail in his treatise. Apart from being a great teacher, philosopher, and clinician, Avicenna is known for his clinical researches. Sajadi in a recent article mentioned that: "Ibn Sina proposed applying logic to the testing of drugs, and in doing so; he wrote the earliest known treatise related to clinical trials" [13].

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