



## Obesity-Related Female Infertility in Medieval Persian Manuscripts

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Dear Editor,

Obesity and its related disorders are becoming a worldwide public health concern contributing to increased morbidity and mortality rates [1]. Obese women, in addition to their similar comorbidities to men, have fertility-related disorders, which is a less emphasized aspect of obesity [2]. Hypotheses on association between obesity and female infertility entered the medical literature in the early twentieth century [3]. However, recognition of this association dates back to the earlier centuries. In a recent historical note, Levi ben Gershon (1288–1344 CE), a French rabbi, was suggested as the first to have described the relation between obesity and female infertility [4]. Based on the historical evidence, we believe that the association between obesity and female infertility was known to the Greek and Persian physicians much earlier than thought.

Hippocrates (ca. 460–370 BCE) seems to be the first to understand that obesity might lead to infertility [5]. Although obesity and related complications were subjects of interest in the Greek and Byzantine eras, the association between obesity and female infertility was not clearly described in the medical manuscripts of these periods [6, 7].

The Islamic Golden Age (ca. 750–1257 CE), through which European science during the Middle Ages developed, coincided with the appearance of prominent physicians such as Rhazes (ca. 865–925 CE), Haly Abbas (930–994 CE), Albucasis (936–1013 CE), and Avicenna (981–1037 CE) [8, 9]. Despite the Arabic language sovereignty over the scientific literature of this era, some renowned scholars of this period, e.g., Akhawayni Bukhari (?–983 CE) and Hakim Jorjani (1042–1137 CE), compiled their medical treatises in Persian. Likewise, more well-known medical books of the medieval Persia such as Rhazes' *Liber Continens*, Avicenna's *The Canon of Medicine*, and Haly Abbas' *The Royal Book*, which were all written in Persian language, were not neglected in subsequent centuries. Particular emphasis of their descendants to make numerous copies of their extant manuscripts as well as treasuring the medical curricula of the medieval Persian and European schools with these masterpieces might highlight tremendous influence of the Persian medical compilations on the medicine of their times [9–11].

Akhawayni Bukhari (Fig. 1) lived and practiced medicine in Bukhara (now in Uzbekistan). Being the student of a student of Rhazes, Akhawayni collected his 20-year medical experiences in the *Hidayat al-Mutaallemin fi al-Tibb (Learner's Guide to Medicine)* [11]. Written in new Persian before 983–984 CE, the *Hidayat* was compiled in a “light and simple” style for Akhawayni's son and other students of medicine at the Samanid period (819–999 CE) [12]. The second part of the book on different medical issues roughly *a pedibus usque ad caput* contains a chapter on the “uterus pains” in which Akhawayni describes female obesity as a predisposing factor to infertility: “...each organ in the body

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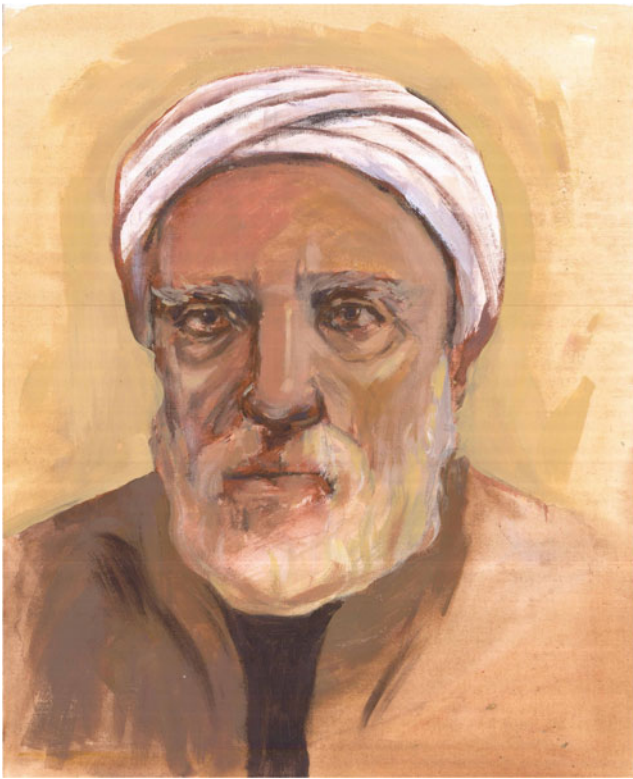
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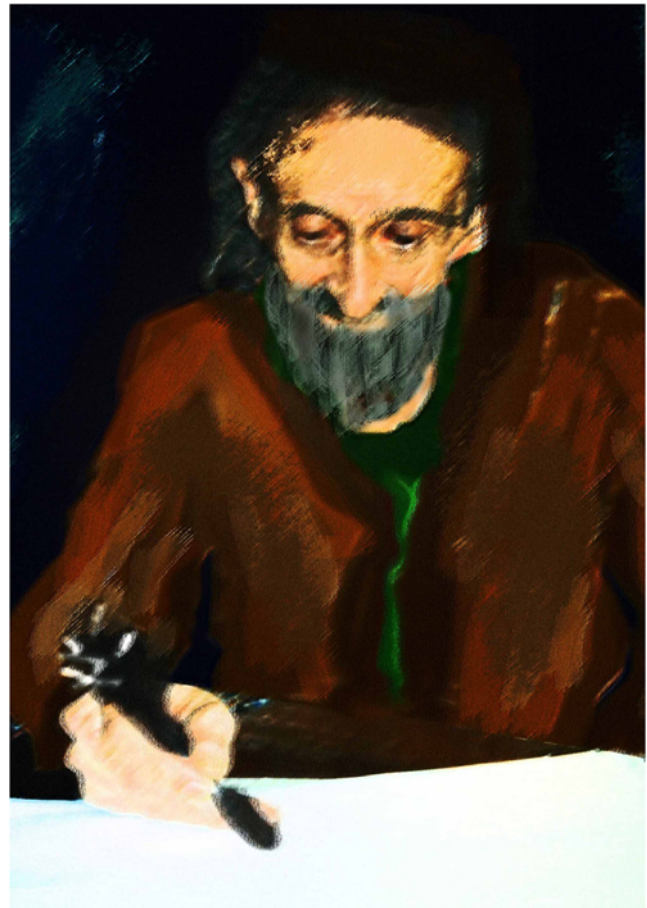
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**Fig. 1** An imaginary portrait of Akhawayni Bukhari (?–983 CE) (by an artist, Ramin Abdollahzadeh)

has particular function and the function of the womb is to become pregnant. If the woman does not become pregnant, it is due to the hot temperament of the womb which burns the semen... or when the woman is fat, this [fatness] compresses the womb and the semen is expelled or the womb fat is excessive and its sign is that the woman's abdomen is very obese..." [13].

Hakim Esmail Jorjani (Fig. 2) studied jurisprudence and medicine in Neishabour (now in Iran). Later, Jorjani directed a hospital in Khwarazm (now common to Uzbekistan, Kazakhstan, and Turkmenistan) and served as a physician to Qutb al-Din Muhammad ibn Anush Tigin and Atsiz, governors of the Persian province of Khwarazm [14]. Jorjani compiled his comprehensive textbook of medicine, *Zakhireyei Khwarazmshahi (The Treasure of Khwarazm Shah)* at 70 years of age in ca. 1112 CE [15]. Being considered as the oldest medical encyclopedia written in Persian, the *Treasure* is composed of ten books. In the 20th chapter of the sixth volume of his *Treasure*, Jorjani devoted a section on female infertility. The chapter discusses seven major different etiologies of female infertility, among which the fifth entitled "obesity and excess of body fat" is noteworthy. In spite of his detailed account of other female infertility etiologies such as womb temperament abnormalities, Jorjani speaks briefly of the association between obesity and female infertility [16].



**Fig. 2** A portrait of Hakim Esmail Jorjani (1042–1137 CE)

The historical background on obesity and related female infertility has been less studied. Obese women depicted in prehistoric statuettes such as the Venus of Willendorf have been regarded as symbols illustrating the obesity and related female infertility [17, 18]. Later in the Greek and Byzantine eras, the subject of obesity and associated diseases was of great interest [6, 7, 19]. However, to the best of our knowledge, Hippocrates was the only physician to mention the obesity-related female infertility in the pre-Islamic Golden Age period [5]. Nevertheless, studies on the medieval Persian medical writings reveal that detailed description of this clinical association is more evident in the Persian medical *magnum opus* of the tenth century, Akhawayni's the *Hidayat*. Further accounts of the obesity-related female infertility could be found in Avicenna's *The Canon of Medicine* and Jorjani's the *Treasure* thereafter [20].

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**Conflict of interest** Feridoon Abbasnejad, Samad EJ Golzari, Kamyar Ghabili, Saeid Aslanabadi, Reza Rikhtegar, and Younes Ranjbar declare that they have no conflicts of interest.

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