



# Ramadan fasting during Covid-19 pandemic

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The ritual of fasting, which includes complete refraining from food or drink, dates back to antiquity, and is observed in different religions such as Islam and Judaism. Islamic fasting is observed during the lunar month of Ramadan every year, and approximately 2 billion Muslims practice it all across the globe. [1] During Ramadan, all healthy Muslim adults (without any particular adverse health condition) need to fast from dawn to dusk and abstain from eating, drinking, smoking, intercourse, and several other activities. This can potentially last for more than 18 h a day depending on the latitude. [2] Nonetheless, there are several exemptions to this divine obligation, and travelers, menstruating women and those with certain diseases (or at increased risk for contracting a disease) can be exempted from the obligation. [3] For many Muslims, depending on the school of Islam they follow, these certain diseases or increased risks should be officially announced as Fatwas or religious edicts. Nonetheless, ultimately, these decisions need to be made on an individual basis according to the physicians' recommendations. In some schools of Islam, such Fatwas are issued through an intricate collaborations amongst high-ranking Islamic jurisprudence scholars, academics, and medical practitioners on a virtually annual basis prior to the commencement of the holy month. [1, 4, 5]

Health benefits of different patterns of fasting are very diverse and are described in details in the literature. [6] Initially, it was believed that reduction in the production of oxygen free radicals is the sole responsible mechanism of the wide range of health benefits observed in fasting. [6] Later, solid evidence emerged from comprehensive studies demonstrated that not all health benefits of different fasting regimens (such as

intermittent fasting) can be attributed to reduced free-radical production. [7] Recently, it was brought to light that fasting can activate certain adaptive cellular responses which can improve glucose regulation, increase resistance to stress, and suppress inflammatory reactions. [8] Today, it is demonstrated that fasting can activate different cellular pathways which foster intrinsic defense mechanisms against metabolic and oxidative stress, and this can lead to removal of damaged cells and molecules. [9]

Decisive evidence emerged from numerous in-depth studies have clearly demonstrated that fasting can produce therapeutic effects in many noncommunicable disorders such as obesity, diabetes, cardiovascular disease, cancers, and neurodegenerative diseases. [8] Fasting can also play a protective role against aging. A comprehensive meta-analysis study which was recently conducted has demonstrated that the average life expectancy can significantly increase by fasting. [10] Moreover, fasting can improve physical composition, function, and endurance. [11, 12] Fasting can also enhance cognitive functions in terms of spatial memory, associative memory and working memory, and can reverse neurotoxic effects of obesity, diabetes, and neuroinflammation. [13] This dietary intervention can even facilitate amelioration of cognitive deficits in traumatic brain injury. [14] Moreover, results of an study we conducted in 2012 demonstrated that fasting has a remarkable influence in promotion of psychological health and regulation of sleep pattern. [15] These evidence and similar findings indicate that the effects of Ramadan Fasting are not merely confined those related to refraining from eating and drinking, and they include a diverse range of physical, psychological, and spiritual health.

Considering diverse benefits of fasting, this ancient dietary alternation has been recently brought to light as a therapeutic clinical intervention. In clinical settings, caloric restriction and fasting has been documented to improve several cardiometabolic risk factors in nonobese humans. [16] This healing effect is mediated through a wide range of mechanisms such as modification of blood pressure, resting heart rate, levels of high-density and low-density lipoprotein (HDL and LDL) cholesterols, triglycerides, glucose, and insulin concentration,

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and insulin resistance. [16–18] Besides, atherosclerosis-associated systemic inflammation and oxidative stress markers can be significantly reduced in fasting. [19, 20] Fasting can also protect individuals against malignancies. Several detailed studies have demonstrated that different fasting regimens can decrease the rate of occurrence of spontaneous tumors in aged animals. Moreover, growth of induced tumors may be suppressed in fasting while their sensitivity to chemotherapy and radiotherapy is markedly increased. [21–23] It is also well-documented that excessive energy intake can increase the risks of stroke, Alzheimer's disease, and Parkinson's disease. Astonishingly, fasting can delay or even reverse development and progress of such neurological defects. [24] This can be attributed to several mechanisms such as strengthening mitochondrial function, stimulation of autophagy, increasing production of neurotrophic-factor, activation of antioxidant defense mechanisms, and acceleration of DNA repair processes. [25] By means of the aforementioned mechanisms, fasting can also alleviate symptoms of asthma, multiple sclerosis, and arthritis. [26–28]

Notwithstanding all documented health benefits of fasting, in this Ramadan, there has emerged some uncertainty as to whether fasting is safe during the current outbreak. Millions of people have contracted COVID-19, hundreds of thousands have develop severe illness, and tens of thousands have perished. [29] This time, arguably for the first time in the modern era, jurisprudence scholars, academics, and medical practitioners all seem perplexed as to whether temporary starvation and dehydration might increase the risk of contracting the circulating corona virus. Unfortunately, there is a paucity of academic literature on the effects of Ramadan Fasting. Although there exists a considerable body of literature on the benefits of intermittent fasting, [1] most such research have focused on mere calorie restriction, and have not taken the potential effects of simultaneous dehydration and dryness of airways into consideration. [30] This makes a substantial difference, and, therefore, the findings of studies on different patterns of intermittent fasting cannot be simply generalized to Ramadan Fasting. Moreover, it is sometimes claimed that dry mouth and throat caused by Ramadan Fasting may increase the risk of contracting the virus. Although this belief has been refuted by major health and religious authorities, the evidence produced in this regard are neither reliable nor incontrovertible. [30] Therefore, it appears that scientific studies exclusively carried on Ramadan Fasting constitute the only available source of information for jurisprudence scholars, academics, and medical practitioners.

As regards immunological changes, It is documented that Ramadan Fasting does not lead to any immunological malfunction. [31] On the contrary, there exist a considerable body of evidence that suggest Ramadan Fasting can strengthen the immune system against infections. This immunoprotective effect, in part, may be attributed to increased serum levels

certain immunoglobulins such as IgA. [32] Moreover, levels of some elements of the complement system (such as C4) are demonstrated to increase during Ramadan Fasting, thereby protecting individuals against a wide range of microorganisms. [33] Many such immunoprotective effects are also confirmed by clinical evidence. For instance, Lahdimawan et al. have demonstrated that Ramadan Fasting can play a protective role against tuberculosis, and can minimize the risk of the infection in healthy individuals. [34] Nonetheless, one should be very cautious in interpretation of such results. In fact, several studies have brought some unfavorable consequences of fasting into light. For instance there is some evidence suggesting that Ramadan Fasting can decrease IgG levels. [34] Moreover, in patients with diabetes, it is demonstrated that Ramadan Fasting can lead to an increased risk of infection. [35]

Notwithstanding all aforementioned evidence in favor or against the practice of Ramadan Fasting in terms of infection risk, there is no conclusive evidence to acknowledge or refute increased susceptibility of fasting individuals to contracting Covid-19 infection. Similarly, no evidence has emerged indicating that drinking water during daytime can prevent corona virus infection in healthy individuals. [30] Inconclusive as the situation may appear, the current pandemic has led to formation of a individual-based approach to jurisprudence dilemmas in some schools of Islam. Accordingly, many academics, physicians, and jurisprudence scholars have arrived at the conclusion that the risk of infection (and development of possible life-threatening consequences) should be considered on an individualized basis. Accordingly, the elderly and the frail should refrain from fasting lest potential deadly consequences. Nonetheless, old persons in quarantine who are confident that they are not exposed to the virus can fast provided that they consume a balanced diet and have adequate rest. [36] In terms of healthcare professionals, it is advised that they should assess their own situation on a daily basis, and they could break their fasting if they cannot perform their duties or perceive themselves at a great risk. All aforementioned recommendations and advises need to be taken into consideration by both the persons intending to fast and the physicians in charge.

In this regard, an official declaration has recently been published by the Academy of Medical Sciences (AMS) of Islamic Republic of Iran. In this official announcements, it is recommended that healthy individuals younger than 65 can observe Ramadan Fasting provided that they follow certain precautions. [37] These precautions include: strict adherence to all infection control guidelines and procedures, proper hydration in non-fasting hours, humidification of indoor air, consumption of a balanced diet rich in fruits and vegetables, and avoiding dry and hot environments. This assembly which was consisted of a great number of high-ranking physicians, scientists, theologians, and, jurisprudence scholars, has also recommended that considering high incidence of

hypertension, diabetes, and cardiovascular disease in persons older than 65, they should refrain from fasting lest possible dire consequences. However, ultimately, this decision should be made by any individual patient himself according to his physicians' advise. In regards with patients with diabetes who are younger than 65, according to this announcement, they can only observe fasting provided that their diabetes is perfectly controlled (with HbA1c <7) through proper lifestyle modifications and medications. This official document has also decided that fasting should be prohibited in patients with history of organ transplantation (with the exception of corneal transplantation). In regards with those infected with the virus, the assembly announced that they should refrain from fasting for several weeks after complete recovery. It is noteworthy that these recommendations are all in complete accordance with the highly credible scientific evidence AMS members had previously published on the subject. For instance, in a comprehensive research on the subject which was published by members on the assembly in 2010, authors had contended that although Ramadan fasting is generally safe and wholesome for healthy individuals, those with certain diseases and adverse health conditions should seek their physicians' advice in this regard. [38]

In conclusion, this year, it appears that there exists a widespread confusion surrounding the practice of Ramadan Fasting amid Covid-19 pandemic, and jurisprudence scholars, scientists, and physicians are all similarly perplexed as to whether or not fasting is safe. In some schools of Islam, it is even contended that fear and risk of contracting the infection does not justify non-adherence of followers to fasting which is considered as one of the four fundamental pillars of faith in Islam. [30] Accordingly, several different (and sometimes contradictory) guidelines, fatwas, and recommendations have emerged on the subject. Therefore, it would be feasible to contend that the ultimate decision in this regard should be made by each individual person (according to the fatwas) based on the recommendations of the physicians in charge.

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