Study of Effects on Physiological Parameters Due To Ramadan Fasting and Its Impacts on Public Health.

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Abstract: It has been observed that since two decades there have seen a rise in the number of investigations examining the health-related effects of Ramadan fasting on public health. Islamic Ramadan is a 28-30 day fast in which food and drink are prohibited during the daytime hours. Most health-specific findings related to Ramadan fasting are mixed. Ramadan fasting causes many physiological changes like biochemical, metabolic and spiritual changes in the human body. Ramadan Fasting increases the White Blood Cells (WBCs), Red Blood Cells (RBCs), Blood platelets (PLT) count, High Density Lipoprotein Cholesterol (HDL-c), and decreases the blood cholesterol, triglycerides, Low Density Lipoprotein Cholesterol (LDL-c) and Very Low Density Lipoprotein Cholesterol (VLDL-c). During Ramadan fasting there are reductions in body mass index, body weight, waist circumference, body fat, blood glucose, diastolic and systolic blood pressure and on levels of anxieties. Among healthy adults, there are no adverse effects of Ramadan fasting on the brain, heart, lung, liver, kidney and endocrine profile. Ramadan fasting is a healthy non-pharmacological means for minimizing the risk factors and improving health. Although Ramadan fasting is safe for all healthy individuals, but those with various illnesses such as diabetes mellitus, coronary artery disease, renal and eye illness should consult their physicians and firmly follow the scientific recommendations.

Keywords: Fasting, Ramadan, Physiological Changes.

Introduction
It has been observed that since two decades there have seen a rise in the number of investigations examining the health-related effects of Ramadan fasting. Globally, over one billion Muslims fast during the month of Ramadan. Muslim world covers a vast geographic area, comprising of 57 countries with 2.02 billion people. [1]

Fasting during the month of Ramadan is one of the five fundamental pillars of Islamic religion, mandatory for all healthy adult Muslims. In Ramadan, Muslim adults fast from sunrise to sunset and are required to refrain from oral intake of water, food, beverages, smoking and sexual intercourse. This type of fasting is defined as periodic food and water deprivation during day light hours with free access during the night for the duration of one month causing physiological changes. [2]

Changes of fasting hours during Ramadan: Fasting hours in Ramadan varies between 29 and 30 days, the fasting month is brought forward by about 10 days in a year in Gregorian calendar, it means over time the season in which Ramadan falls changes. Based on the season and geographical settings, the time and duration of the every fast can range from 12 to 18 hours. During fasting, the physiology of the body changes occurs from normal to fasting routines and then vice versa.

Changes in diet routines and changes in physical activity: During the Ramadan fasting, there is a change in number, timing, composition and calorie content of meals. As generally, people take three main meals in daily routine and some snacks. During Ramadan, the frequency reduces to two, one large meal at sunset and one light meal before dawn. There are also changes in the timings of meals. This is mainly due to fasting during the
daytime. The distribution of non-Ramadan meals changes to dinner at sunset (Iftar) and breakfast (Suhur) before sunrise. Along with changes in number, timing and calorie content of the meals the composition of the meal is changed as well. During Ramadan, there is more consumption of carbohydrates in the form of fruits, dates and especially varieties of juices. Changes in the timings and composition of food have a direct effect on the calorie intake. There is generally reduced calorie intake during the first week of Ramadan, but from then onward there is a progressive increase. It has been noted that total energy intake remained unchanged whereas qualitative components of nutrients are markedly affected. [3] In addition to the food habits, the physical activity generally reduces during the daytime because of fasting and increases during the night time especially for people who perform Tarawih (prayer).

Consumption of energy: Fasting person consumes on an average of 1220 Kcal/day during Ramadan and lose a significant body weight of about 2.0kg. [4] Males and females experienced a decrease in body mass index with reduction in food, water, energy intake during fasting however, females tend to lose more weight than males. [5]

Physiological Changes: Physiological changes during Ramadan are not very well known and reports in the literature concerning the effects of Ramadan are very few. Ramadan fasting causes many physiological, biochemical, metabolic, and spiritual changes in the body. In this review, we have highlighted the various haematological parameters, bio chemical and physiological changes on the different systems of the human body of the public health.

Hydration and ion dissociation in the body: Electrolytes control the fluid balance of the body and are important for contraction, energy generation, and almost every major biochemical reaction in the body. Salts and minerals that can conduct electrical impulses in the body during Ramadan.

Common human electrolytes are sodium chloride, potassium, calcium, and sodium bicarbonate. Water and electrolytes are essential for life. In humans, an exquisitely sensitive network of physiological control is involved to maintain body water and fluid intake. The mechanism of thirst is quite clear and the reason for non-regulatory drinking is often encountered, related to the capacity of renal physiology in association to anti-diuretic hormone (ADH) to rapidly eliminate excesses of water or reduce urine secretion to temporarily economize on water. [6] During Ramadan fasting, over the morning and afternoon, urine volume, sodium, potassium and total solute excretion were lower, and urinary osmolality was higher. The osmolality of the urine samples, collected in the afternoon was very high, indicating effective water conservation both by maximum urinary concentration and a decreased obligatory urine output. [7]

Trabelsi et al.[8] determined the effect of Ramadan fasting on body water status. They found that the total body water before Ramadan did not differ significantly from after one month Ramadan fasting. However, during Ramadan the signs of dehydration have been identified by increased measures of haematocrit, haemoglobin and plasma osmolarity. This state of dehydration has been attributed to the reduction of fluid intake. [9] Azwany et al.[10] examined the effects of one month Ramadan fasting, they reported a significant increase in urinary osmolarity after four weeks of fasting. Azizi and Rasouli[11] mentioned that fasting in Ramadan does not bring about a considerable change in serum sodium and potassium. However, Morilla et al. [12] found that potassium was reduced mainly in the mornings and its amount increases in the afternoons. In another study, Hosseini et al. [13] demonstrated that, the mineral and total water showed no difference in both groups who fast and exercise and subjects who fast without exercise. Blood cell count and haemoglobin percentage: The haematological parameters show slight variations during the month of Ramadan specially the Red Blood Cells (RBC) count and haemoglobin (Hb %). The RBCs count and Hb percentage decrease initially but return to normal after the end of Ramadan fasting month. Hosseini et al. [14] reported a significant reduction of RBCs count, while Hb percentage and haematocrit (Hct) values decreased significantly after Ramadan compared to before Ramadan. Although no significant changes were found in WBCs and platelets. Sarraf-Zadegan et al. and Argani etal.[15,16] showed no changes in WBC count or any other haematological parameters throughout Ramadan; Boughel et al.[17] showed a significant increase in Hb and Hct. Moreover, Nematy et al. [18] reported a significant increase in WBC, RBC and platelet (PLT) counts after fasting in Ramadan.

Lipid profile-Bio-chemical changes: Controversy exists in literature about the lipid profile during Ramadan fasting. Adlouni et al. [19] reported that fasting during Ramadan led to a significant decrease in serum total cholesterol, triglyceride and LDL-C, while a significant increase in the serum HDL-cholesterol during the fasting month. On the other hand, Maislos et al. [20] noted that LDL-C, very-low-density
Effects on Eye: Human tear is an important biological fluid similar to blood in many aspects. Tear film is composed of basic layers of lipid, aqueous and mucin. The tear film covering the ocular surface, presents a mechanical and antimicrobial barrier, and endures an optical refractive surface. Sariri et al. [25] compared the tear protein content of sixty male and female volunteers one month before Ramadan and during fasting in the month of Ramadan. Their results showed that tear proteins decreased during fasting. On the other hand, the activity of enzymes such as lysozyme, lactoferrin and alpha amylase decreased. Kerimoglu et al. [26] determined the effect of Ramadan fasting on intraocular pressure (IOP), basal tear secretion (BTS), reflex tear secretion (RTS), and corneal and anterior chamber parameters.

Conclusions:
Fasting during Ramadan is beneficial in many ways that it causes significant reduction in body weight, waist circumference, basal metabolic rate, body mass index, body fat, blood glucose, systolic and diastolic blood pressure and anxiety levels. Ramadan fasting significantly increases HDL-c, and decreases the plasma cholesterol, triglycerides, LDL-c and VLDL-c. Furthermore, Ramadan fasting decreases the inflammation, pro-inflammatory cytokines IL-1β, IL-6, tumour necrosis factor α and cancer promotion. Among healthy adults, there are no adverse effects of Ramadan fasting on the heart, lung, liver, kidney, eyes, hematologic profile, endocrine and neuropsychiatric and cognitive functions. It is important to educate the humans who fast during Ramadan, that they must take a suitable nutritious diet and consume sufficient water during Ramadan. It is not only spiritually beneficial, but it has physical, psychological, social and health benefits.

Recommendations:
However, many Muslim patients with chronic illnesses insist on fasting despite Islamic rules that permit exemption in case of illness. It is important for physicians to have decision-making guidelines when consulted about patient insisting on fasting. Ramadan fasting is a healthy non-pharmacological means for improving the cardiovascular and overall health of the individuals. Although it is safe for all healthy individuals, however, those with diseases should consult their physicians and follow the scientific recommendations.

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