

LAMPIRAN

PENGARUH PUASA RAMADAN TERHADAP NILAI LIMFOSIT

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ABSTRAK

Setiap tahun umat Islam diharuskan berpuasa selama bulan Ramadan. Puasa ramadan ini dipercaya memiliki berbagai efek medis dan fisiologis yang menguntungkan. Ada juga hipotesis yang mengatakan bahwa puasa ramadan dapat mempengaruhi sistem kekebalan tubuh. Penelitian terdahulu mengatakan bahwa puasa ramadan dapat memengaruhi sel-sel imunitas. Limfosit merupakan sel spesifik dalam pertahanan utama imunitas. Oleh karena itu, limfosit juga dapat dipengaruhi oleh puasa ramadan. Tujuan penelitian ini adalah mengetahui bagaimana pengaruh puasa ramadan terhadap nilai limfosit. Jenis penelitian ini adalah penelitian kepustakaan. Hasil penelitian menunjukkan bahwa: Dari 10 jurnal yang telah dikaji nilai limfosit pada subjek yang melakukan puasa ramadan berada pada rentang $2.06 \pm 0.52 \times 10^9/L$ – $2.61 \pm 0.52 \times 10^9/L$, atau 26.23% - $60.80 \pm 7.10\%$. dan didapatkan rata-rata 2023 ± 486 mcL atau 2661.94 ± 617.53 mm³ Didapatkan enam jurnal yang menyatakan adanya pengaruh yang signifikan terhadap nilai limfosit pada sampel yang melakukan puasa ramadan dengan $p=0.042$ dan $p<0.001$ dan empat jurnal menyatakan tidak adanya pengaruh yang signifikan terhadap nilai limfosit pada sampel yang melakukan puasa ramadan dengan $p=0.06$ dan $p>0.05$. Perbedaan hasil penelitian dapat terjadi akibat adanya faktor-faktor lain yang tidak bisa dikontrol seperti faktor nutrisi, perbedaan aktivitas fisik dan kondisi imunologi.

Kata Kunci : Ramadan, Puasa, Limfosit.

EFFECTS OF RAMADAN FASTING ON LYMPHOCYTE COUNT

ABSTRACT

Every year Muslims are required to fast during the month of Ramadan. Ramadan fasting is believed to have various beneficial medical and physiological effects. There is also a hypothesis that says Ramadan fasting can affect the immune system. Previous research has shown that fasting during Ramadan can affect immune cells. Lymphocytes are specific cells in the main defense of immunity. Therefore, lymphocytes can also be affected by Ramadan fasting. The purpose of this study was to determine how the effect of Ramadan fasting on lymphocyte count. The type of research is library research. The results showed that: From 10 journals that have been studied the lymphocyte count in subjects fasting during Ramadan are in the range of $2.06 \pm 0.52 \times 10^9/L$ – $2.61 \pm 0.52 \times 10^9/L$, or 26.23 % - $60.80 \pm 7.10\%$ and get the average 2023 ± 486 mcL or 2661.94 ± 617.53 mm³. Six journals stated that there was a significant effect on the lymphocyte count in the samples that were fasting during Ramadan with $p=0.042$ and $p<0.001$ and four journals stated that there was no significant effect on the lymphocyte count in the samples performing Ramadan fasting with $p=0.06$ and $p>0.05$. Differences in research results may occur due to other factors that cannot be controlled such as nutritional factors, differences in physical activity, and immunological conditions.

Keywords : Ramadan, Fasting, Lymphocyte

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Pendahuluan

Umat muslim berpuasa selama bulan ramadan. Puasa diartikan sebagai menahan dari makanan dan minuman, dan dapat dikaitkan dengan pembatasan asupan kalori, makanan tertentu, terutama makronutrien (Trepanowski and Bloomer, 2010).

Puasa ramadan bukanlah puasa yang dilakukan secara terus menerus atau berkepanjangan, melainkan *re-feeding* atau berpuasa, dan dilanjutkan berbuka yang dilakukan secara bergantian. Durasi puasa ramadan bervariasi (29-30 hari), rata-rata durasi puasa biasanya 12-14 jam, tetapi tergantung pada tempat dan tahun. Puasa juga dapat mencapai 18 jam atau bahkan 22 jam, di daerah garis lintang yang ekstrim (Berbari, Daouk and Jurjus, 2012). Anak-anak yang belum *baligh*, wanita menstruasi, wanita hamil dan menyusui, orang sakit, orang tua yang lemah dan musafir diperbolehkan tidak berpuasa (QS. Al-Baqarah: 185-186).

Beberapa penelitian telah dilakukan untuk menunjukkan pengaruh puasa terhadap sistem kekebalan tubuh puasa Islam satu bulan dapat menyebabkan peningkatan fungsi sel-T, penurunan inflamasi, dan dapat mempengaruhi reaksi imunologi imunitas humoral.

Pada hasil penelitian terhadap kesepuluh artikel yang telah ditelaah, didapatkan kesamaan hasil dari enam artikel yang menunjukkan adanya hubungan yang signifikan dari nilai limfosit pada sampel yang melakukan puasa ramadan, empat artikel yang menunjukkan kesamaan hasil yang menunjukkan tidak adanya hubungan yang signifikan dari nilai limfosit pada sampel yang melakukan puasa ramadan.

Secara umum metode yang digunakan dalam artikel-artikel yang ditelaah adalah studi komparasi. Studi komparasi adalah metode perbandingan yang membandingkan persamaan dan perbedaan atau situasi lain sebagai fenomena dari dua atau beberapa kelompok sampel sehingga diketahui ada tidaknya perbedaan suatu variabel. (Notoatmodjo, 2010). Artikel-artikel yang ditelaah ini memiliki kesamaan dalam membandingkan nilai limfosit sebelum berpuasa ramadan dan setelah melakukan puasa ramadan sehingga diketahui ada tidaknya perbedaan pada variabelnya.

Dilihat dari kesepuluh artikel yang telah dikaji didapatkan pada sembilan artikel

walaupun nilai limfosit mengalami kenaikan ataupun penurunan, nyatanya nilai limfosit orang yang berpuasa masih berada pada rentang normal.

Tujuan penelitian ini adalah mengetahui bagaimana pengaruh puasa ramadan terhadap nilai limfosit yang dikaji dari studi pustaka.

Metode

Jenis penelitian yang digunakan adalah penelitian kepustakaan. Penelitian ini dilakukan pada bulan April-Juni 2021.

Pencarian *literature* diambil dari artikel yang dipublikasi pada *ScinceDirect*, *Elsevier*, *SAGE*, *Zahedan Journal of Research in Medical Sciences Irak (ZJRMS.Ir)*, *Journal of Nutrition Fasting and Health (JNFH)*, dan *ResearchGate*.

Pencarian *literature* menggunakan mesin pencari google di internet dengan kata kunci: *Ramadan Fasting*, *Immune*, *Lymphocyte*, *Effect Ramadan Fasting*, *Different White Blood Cells*, Pengaruh Puasa Ramadan, dan Puasa Terhadap Imunitas yang didapatkan dari rentang tahun 2010-2020 yang berjumlah 50 *literature*. Namun yang sesuai dengan topik penelitian hanya terdapat 10 artikel yang dapat digunakan.

Teknik analisis data yang digunakan dalam penelitian berupa metode analisis isi (*Content Analysis*).

Hasil

Pada hasil penelitian terhadap sepuluh artikel yang telah ditelaah, didapatkan kesamaan hasil dari enam artikel yang menunjukkan adanya hubungan yang signifikan dari nilai limfosit pada sampel yang melakukan puasa ramadan, empat artikel yang menunjukkan kesamaan hasil yang menunjukkan tidak adanya hubungan yang signifikan dari nilai limfosit pada sampel yang melakukan puasa ramadan.

Dilihat dari sepuluh artikel yang telah dikaji didapatkan pada sembilan artikel nilai limfosit mengalami kenaikan ataupun penurunan. Walaupun terjadi kenaikan dan penurunan jumlah ini tidak berdampak negatif bagi tubuh. Ini dilihat dari masing-masing artikel yang menyatakan nilai limfosit orang yang berpuasa masih berada pada rentang normal. Untuk lebih jelasnya, ringkasan artikel bisa dilihat pada **Tabel 1**.

Tabel 1. Perbandingan nilai limfosit sebelum dan sesudah puasa ramadan pada artikel yang ditelaah.

Nama penulis, Tahun	Sampel	Nilai limfosit		p-value
		T ₁	T ₂	
Fararjeh, et al (2011)	Pria Sehat	35.79 ± 7.95%	38.18 ± 7.11%	p = 0.51
	Wanita Sehat	35.04 ± 10.9%	34.30 ± 9.99 %	p = 0.45
Faris, et al (2012)	Subjek Sehat (Pria dan Wanita)	2.32 ± 0.71 10 ⁹ /L	2.06 ± 0.52 10 ⁹ /L	*p < 0.01
Trabelsi, Khaled et al (2012)	Pria Binaragawan	2.61 ± 0.55 10 ⁹ /L	2.61 ± 0.52 10 ⁹ /L.	p > 0.05
Develioglu, Omer Necati et al (2013)	Pria Sehat	2377.94 ± 554.88 sel/mm ³	2661.94 ± 617.53 sel/mm ³	*p < 0.001
Khazaei, et al (2014)	Atlet	37.81 ± 4.14%	36.50 ± 5.98%	*p = 0.005
Siadat, Zahra et al (2014)	Subjek Sehat (Pria dan Wanita)	25,82%	26,23%	p = 0.06
Askaria, VR, et al (2015)	Subjek Asma	33.18 ± 7.72 %	31.30 ± 5.55 %	p > 0.05
Fawzi, Mounir H et al (2015)	Pria Skizofrenia dengan <i>Metabolic syndrome</i> (MetS)	2.2 ± 70.4 10 ⁹ /L	2.4 ± 70.33 10 ⁹ /L	*p = 0.019
Nasiri, Jafar et al (2017)	Pria Sehat	2292 ± 520 mcL	2023 ± 486 mcL	*p = 0.003
		40,69 ± 9,57 %	36,3 ± 6,45 %.	*p = 0.014
Awad Ahmed, Osamah (2019)	Wanita Sehat	60.77 ± 7.86%	60.80 ± 7.10%	*p = 0.042

Keterangan : T₁ menunjukan nilai limfosit sebelum berpuasa ramadan; T₂ nilai limfosit selama puasa ramadan. *p menunjukan adanya perbedaan yang signifikan (p < 0.001; p = 0.003; p = 0.005; p = 0.014; p = 0.019; p < 0.01; p = 0.042)

Pembahasan

1. Jumlah Limfosit Pada Sampel Yang Melakukan Puasa Ramadan

Pada penelitian Faris et al (2012) yang meneliti sampel sehat jumlah limfosit menurun sebelum puasa ramadan 2.32 ± 0.71 x 10⁹/L menjadi 2.06 ± 0.52 x 10⁹/L selama puasa berlangsung. Penurunan ini dikarenakan sukarelawan yang diteliti selama berpuasa ramadan memiliki pola makan yang buruk, ini dilihat dari asupan beta karoten dan likopen yang menurun secara signifikan dengan p < 0.05 selama ramadan. Berkurangnya asupan beta karoten dan likopen yang merupakan sumber vitamin A dapat menurunkan jumlah total limfosit pada darah peripheral (Azrimaidaliza, 2007; Semba, 1998). Penelitian lainnya pada pria sehat jumlah rata-rata limfosit menurun dari 2292 ± 520 mcL menjadi 2023 ± 486 mcL setelahnya ramadan (Nasiri, 2017). Berbeda dengan hasil penelitian oleh Fararjeh et al (2011) persentase limfosit pada sampel pria sehat mengalami peningkatan dari 35.79 ± 7.95% menjadi 38.18 ± 7.11% selama melakukan puasa ramadan dan juga menyatakan adanya penurunan pada persentase limfosit

pada wanita sehat yaitu dari 35.04 ± 10.9% menjadi 34.30 ± 9.99 % selama melakukan puasa ramadan.. Pada satu artikel penelitian oleh Awad Ahmed (2019) persentase limfosit pada subjek wanita sehat tergolong tinggi yaitu saat periode sebelum puasa ramadan 60.80 ± 7.10%, dan saat periode puasa ramadan 60.77 ± 7.86%. Namun peneliti tidak menjelaskan penyebab terhadap tingginya limfosit. Pada penelitian Siadat et al (2014) yang meneliti subjek sehat menunjukan persentase total limfosit mengalami peningkatan yaitu 25,82% menjadi 26,23% pada periode sebelum dan akhir ramadan. Pada penelitian Develioglu et al (2013) jumlah limfosit meningkat dari sebelum berpuasa 2377.94 ± 554.88 sel/mm³ menjadi 2661.94 ± 617.53 sel/mm³ ketika berpuasa. Peningkatan ini dapat berkaitan dengan sampel yang diberikan pola makan yang sama sehingga tercukupinya kebutuhan nutrisi. Nutrisi yang dimonitor tidak akan berimbas negatif pada nilai limfosit (Sanif; Raissa, 2017).

Pada penelitian Trabelsi et al (2012) pada sampel pria binaragawan jumlah limfosit mengalami penurunan dari 2 hari sebelum memulai puasa 2.61 ± 0.55 x 10⁹/L menjadi 2.61 ± 0.52 x 10⁹/L. Dalam

penelitian inipun menunjukkan asupan air pada atlet yang melakukan puasa ramadan berkurang 13%. Perubahan ini dinilai signifikan dengan $p=0.021$. Berkurangnya asupan mineral yang terdapat dalam air yang diminum seperti *zinc* (Siswanto, Budisetyawati, Fitrah, 2013), dan magnesium (Flynn, 1984) dapat mempengaruhi proliferasi limfosit. Pada penelitian Khazaei et al (2014) yang meneliti subjek atlet, persentase limfosit juga mengalami penurunan dari $37.81 \pm 4.14\%$ sebelum berpuasa ramadan menjadi $36.50 \pm 5.98\%$ saat berpuasa ramadan.

Pada penelitian Askari et al (2015) pada subjek asma, persentase limfosit menurun dengan persentase $33.18 \pm 7.72\%$ saat periode sebelum puasa menjadi $31.30 \pm 5.55\%$ setelah melakukan puasa ramadan. Penurunan ini tidak memiliki efek negatif pada pasien asma.

Pada pria skizofrenia dengan *Metabolic Syndrome* (MetS) terjadi kenaikan jumlah limfosit $2.2 \pm 70.4 \times 10^9/L$ sebelum puasa ramadan menjadi $2.4 \pm 70.33 \times 10^9/L$ setelah puasa pekan ke-4 ramadan (Fawzi et al, 2015).

Dari hasil penelitian yang telah dikaji subjek sehat yang melakukan puasa ramadan didapatkan jumlah limfosit $38.18 \pm 7.11\%$ dan $34.30 \pm 9.99\%$ (Fararjeh et al, 2011), $2.06 \pm 0.52 \times 10^9/L$ (Faris et al, 2012), $2661.94 \pm 617.53 \text{ sel/mm}^3$ (Develioglu, Omer Necati et al, 2013), $26,23\%$ (Siadat, Zahra et al, 2014), $2023 \pm 486 \text{ mL}$ $36,3 \pm 6,45\%$. (Nasiri, Jafar et al, 2017) $60.80 \pm 7.10\%$ (Awad Ahmed, 2019). Pada subjek Asma $31.30 \pm 5.55\%$ (Askaria, VR, et al 2015) dan pada pasien skizofrenia $2.4 \pm 70.33 \times 10^9/L$ (Fawzi et al, 2015)

Pada keadaan normal, jumlah limfosit dalam tubuh adalah 20-40%, (Shirlyn B, 2014), menurut Harald, Heinz, Torsten (2004) jumlah limfosit 1,5 sampai $3,5 \times 10^9/L$ atau 1500-4000/mL dan 1000-4000 permm³ (Medscape, 2019).

Dapat disimpulkan dari 10 jurnal yang telah dikaji, 9 jurnal menyatakan nilai limfosit pada subjek yang melakukan puasa ramadan berada pada rentang normal. Adapun nilai limfosit pada hasil penelitian yang telah dikaji yaitu $2.06 \pm 0.52 \times 10^9/L$ – $2.61 \pm 0.52 \times 10^9/L$, atau $26,23\%$ – $60.80 \pm 7.10\%$ atau $2023 \pm 486 \text{ mL}$ atau $2661.94 \pm 617.53 \text{ mm}^3$.

2. Pengaruh Antara Puasa Ramadan dan Nilai Limfosit

Hasil penelitian Develioglu, et al (2013) yang menyelidiki pengaruh puasa ramadan pada pria sehat, sampel diberikan pola makan serupa menunjukkan jumlah limfosit meningkat secara signifikan $p<0.001$. Pada penelitian lain Awad Ahmed (2019) juga menyatakan terjadinya peningkatan secara signifikan ($p=0.042$) pada nilai limfosit saat periode puasa ramadan. Penelitian yang dilakukan oleh Faris, et al (2012) didapatkan terjadinya penurunan secara signifikan selama ramadan dengan $p<0.01$ pada subjek sehat yang melakukan puasa ramadan. Hasil penelitian serupa juga dilakukan oleh Nasiri, et al (2017) terjadi penurunan secara signifikan dengan $p=0.014$ pada persentase limfosit pada subjek sehat yang berpuasa ramadan. Berbeda dengan penelitian Siadat, et al (2014) menyatakan bahwa perbedaan yang diamati tidak signifikan ($p=0.06$) pada subjek sehat yang melakukan puasa ramadan. Penelitian Fararjeh et al (2011) juga menyatakan bahwa tidak adanya perbedaan yang signifikan dari sampel yang melakukan puasa ramadan dengan $p=0.51$ pada sampel pria sehat dan $p=0.45$ pada sampel wanita sehat.

Pada penelitian lainnya oleh Fawzi, et al (2015) dilakukan penelitian pada pasien pria yang menderita skizofrenia. Terjadi kenaikan jumlah limfosit secara signifikan ($p=0,019$) pada pria skizofrenia dengan *Metabolic Syndrome* (MetS). Peneliti mengungkapkan puasa ramadan dapat berdampak negatif pada pasien skizofrenia. Naiknya limfosit pada pasien skizofrenia berkaitan dengan penanda imunogis sehingga perlunya perhatian khusus pada manajemen psiko-edukasi dan edukasi nutrisi pada pasien skizofrenia (Fawzi et al, 2015).

Penelitian lain yang dilakukan oleh Ali Khazaei (2014) pada atlet yang melakukan puasa ramadan dengan melakukan latihan berat didapatkan terjadi penurunan secara signifikan dengan $p=0.005$. Penurunan ini dapat terjadi akibat meningkatnya kadar kortisol akibat latihan berat yang dilakukan. Naiknya hormon kortisol yang dipicu faktor stress dapat mengakibatkan penurunan limfosit (Rudolph; McAuley, 1998).

Pada penelitian lainnya oleh Trabelsi et al (2012) terhadap pria binaragawan yang diberikan pola makan yang baik didapatkan hasil tidak ada perbedaan yang signifikan pada jumlah limfosit ($p>0.05$). Dengan demikian, binaragawan yang menjalani program pelatihan aman berpuasa selama ramadan.

Pada penelitian Askari, et al. (2015) Terjadi penurunan nilai limfosit namun tidak signifikan ($p>0.05$) penurunan ini tidak memiliki efek negatif pada pasien asma. Normalnya pada pasien asma jumlah limfosit T CD4+ pada saluran nafas tinggi sehingga terjadi penanda imunologis (Buc M et al, 2009). Hal ini berbeda pada penelitian Askari (2015) yang menunjukkan terjadinya penurunan limfosit dan menurunnya gejala inflamasi pada pasien asma yang melakukan puasa ramadan.

Sehingga didapatkan bahwa terdapat 6 jurnal yang menyatakan adanya pengaruh yang signifikan terhadap nilai limfosit pada sampel yang melakukan puasa ramadan dengan $p=0.042$ (Awad Ahmed, 2019), $p=0.005$ (Khazaei et al, 2014), $p<0.01$ (Faris et al, 2012), $p=0.019$ (Fawzi et al, 2015), $p=0.003$ dan $p=0.014$ (Nasiri et al, 2017), $p<0.001$ (Develioglu et al, 2013). Terdapat 3 jurnal yang menyatakan tidak adanya pengaruh yang signifikan terhadap nilai limfosit pada sampel yang melakukan puasa ramadan dengan $p=0.06$ (Siadat et al, 2014) dan $p>0.05$ (Trabelsi et al, 2012; Askari et al, 2015), $p=0.51$ dan $p=0.45$ (Fararjeh et al, 2011).

3. Perbedaan Hasil Penelitian Pada Masing-Masing Peneliti

Dari 10 jurnal yang telah dikaji tentunya terdapat perbedaan. Perbedaan ini terletak pada sampel yang digunakan. Pada penelitian Faris et al (2012) dan Siadat et al (2014) menggunakan sampel subjek sehat. Pada penelitian Develioglu et al (2013), Nasiri et al (2017), menggunakan sampel pria sehat. Penelitian oleh Awad Ahmed (2019) menggunakan sampel wanita sehat. Pada penelitian Fararjeh et al (2011) menggunakan sampel pria sehat dan wanita sehat yang diteliti secara terpisah. Pada penelitian Fawzi et al (2015) menggunakan sampel penderita skizofrenia. Pada penelitian Askari et al (2015) menggunakan sampel subjek asma. Pada penelitian Trabelsi et al (2012) menggunakan sampel binaragawan dan Khazaei et al (2014)

menggunakan sampel atlet.

Perbedaan hasil penelitian yang telah ditelaah ini dapat dilihat pula dari jumlah limfosit pada sampel yang melakukan puasa ramadan. Pada penelitian Develioglu et al (2013), Siadat et al (2014), Fawzi et al (2015), Fararjeh et al (2011) dan Awad Ahmed (2019) menyatakan adanya peningkatan nilai limfosit. Berbeda dengan penelitian Faris et al (2012), Khazaei et al (2014), Askari et al (2015) yang menunjukkan terjadinya penurunan pada jumlah limfosit. Dan terdapat perbedaan hasil lainnya dari penelitian Trabelsi et al (2012) yang menunjukkan tidak adanya perbedaan pada jumlah limfosit.

Perlu disebutkan bahwa limfosit dapat dengan mudah dipengaruhi oleh beberapa faktor seperti rokok dan alkohol (Idris dan Hadi, 2006; Nair, Zaid, Stanley, 1990), infeksi (Sigit, 2020), kondisi stress (Oswald et al, 2006; Rudolph and McAuley, 1998), serta faktor lainnya dan masalah ini mungkin menyebabkan perbedaan antara hasil penelitian. Selain itu, penelitian yang telah ditelaah tidak dapat dengan mudah dibandingkan karena karakteristik sampel yang berbeda, termasuk status imunologi, dan kondisi aktivitas fisik. Selain itu, fakta bahwa tidak dapat dikontrolnya makanan yang dimakan oleh subjek puasa dalam artikel-artikel penelitian yang telah dikaji juga dapat berperan dalam ketidakkonsistenan antara temuan penelitian ini (Nasiri, 2017).

Didapatkan kesimpulan dari 10 jurnal yang telah nilai limfosit pada subjek yang melakukan puasa ramadan berada pada rentang $2.06 \pm 0.52 \times 10^9/L$ – $2.61 \pm 0.52 \times 10^9/L$, atau $26.23\% - 60.80 \pm 7.10\%$ dan didapatkan rata-rata 2023 ± 486 mcL atau 2661.94 ± 617.53 mm³. Didapatkan enam jurnal yang menyatakan adanya pengaruh yang signifikan terhadap nilai limfosit pada sampel yang melakukan puasa ramadan dengan $p=0.042$ dan $p<0.001$ dan empat jurnal menyatakan tidak adanya pengaruh yang signifikan terhadap nilai limfosit pada sampel yang melakukan puasa ramadan dengan $p=0.06$ dan $p>0.05$. Perbedaan hasil penelitian dapat terjadi akibat adanya faktor-faktor lain yang tidak bisa dikontrol seperti faktor nutrisi, perbedaan aktivitas fisik dan kondisi imunologi.

Daftar Pustaka

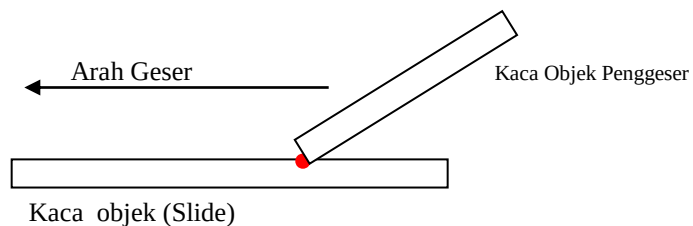
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Lampiran 2:

PEMERIKSAAN SEDIAAN HAPUS DARAH

1. Prinsip : Setetes darah dibuat hapusannya pada slide dari kaca, kemudian di cat dan dilihat hapusannya dibawah mikroskop. Dengan jalan ini dapat menggambarkan morfologi eritrosit, lekosit dan trombosit dan menaksirkan presentasi jumlah lekosit dan trombosit.
2. Bahan : Darah kapiler /darah vena
3. Alat : a. Obyek glass
c. Pipet
4. Reagent : a. Cat Giemsa
(Perbandingan 4 tetes Giemsa : 1 mL Buffer pH 6,4)
b. Methanol absolut
5. Prosedur : a. Membuat Apusan darah
 - 1) Pilihlah objek gelas yang tepinya rata dan halus sebagai kaca penggeser
 - 2) Letakkan satu tetes kecil darah pada ± 2 cm dari ujung objek gelas
 - 3) Letakkan kaca geser ke belakang hingga menyentuh tetes darah tadi
 - 4) Tarik kaca penggeser ke belakang hingga menyentuh tetes darah tadi dan biarkan menyebar pada tepinya
 - 5) Dengan gerakan yang mantap doronglah kaca penggeser ke depan sehingga terbentuk hapusan darah
 - 6) Biarkan sediaan kering di udara terbuka, jangan terkena cahaya matahari
 - 7) Tulis nama pasien dan tanggal pada bagian sediaan yang tebal



Gambar: Cara membuat sediaan hapus darah tepi

b. Pulasan Giemsa :

- 1) Preparat yang sudah kering diletakkan diatas rak pengecatan
- 2) Tetesan sekian banyak methanol absolut diatas sediaan itu sampai tertutup seluruh permukaan obyek glass / preparat biarkan selama 2-5 menit
- 3) Liput sediaan dengan cat giemsa,biarkan selama 10-15 menit sisa cat dibuang
- 4) Bilas dengan air suling
- 5) Letakkan sediaan dalam sikap vertikal dan biarkan mengering
- 6) Lihat dengan mikroskop

d. Cara penilaian sediaan hapus darah :

- 1) Letakkan 1 tetes minyak emersi pada bagian sediaan hapus darah yang baik untuk diperiksa
- 2) Periksa dengan mikroskop dengan perbesaran 100 kali
- 3) Lakukan perhitungan jenis leukosit dengan bantuan kolom di bawah ini dan baca pada 100 sel leukosit.

Tabel 1. Pemeriksaan Sediaan Apus Darah.

Jenis Sel	1	2	3	4	5	6	7	8	9	10	%
Basofil											
Eosinofil											
Netrofil batang											
Netrofil segmen											
Limfosit											
Monosit											
Jumlah											

Nilai normal :

Basofil	0-1%	Netrofil segmen	40-60%
Eosinofil	1-3 %	Limfosit	20-40%
Netrofil batang	2-6 %	Monosit	2-6 %

Lampiran 3:

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Full Length Research Paper

Effect of intermittent fasting on lipid profile and hematological parameters in healthy volunteers in Jordan

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The Purpose of this study is to show the effects of fasting on lipid profiles and hematological parameters in healthy volunteers. Eighty Healthy subjects (50 male and 30 female) volunteered to participate in all of three stages of the study. Volunteers aged from 18 to 60 were included. Blood samples were collected as follows, each volunteer at each visit gives 5 ml blood placed in EDTA tube and 10 ml in a plain tube, from all healthy volunteers one week before Ramadan, on the third week of Ramadan, and one month after the end of Ramadan. All participants were chosen from the same living community, Rusaifa city, Jordan, so that the socioeconomic levels were highly similar. Anthropometric measurements that are measured for volunteers showed no significant differences between results before and after Ramadan except for the body fat (%) in males ($P=0.051$). The packed cell volume shows significant reduction in males and females ($P=0.052$, $P=0.04$) respectively, while RBCs showed significant reduction in females only ($P=0.01$). White blood cells and the differential count showed no significant effect of Ramadan fasting except for the monocytes absolute count as well as percentage in males which show significant increase ($P<0.001$). The results of the lipid profile showed an important significant increase in the concentration of high density lipoprotein cholesterol ($P=0.006$).

Keywords: Ramadan fasting , Hematological parameters, HDL-Cholesterol, lipids profile.

INTRODUCTION

Ramadan is a religious month during which all Muslims refrain from eating, drinking, and smoking during the daylight hours for a month. The duration of restricted food and beverage intake is approximately 12 h/day and changes depending on the geographical location (Aksungar, *et al.*, 2005). During the Ramadan fast, Muslims eat two meals a day, one before dawn and the other shortly after sunset (Haghdoust, and PoorRanjbar, 2009). The Ramadan fasting is considered as a unique model of intermittent fasting (Aksungar, *et al.*, 2005). As food and fluid intake became exclusive at nocturnal time without restriction on the type or amount of food intake.

Ramadan fasting as associated with alteration in meal frequency, sleep duration and reduction in physical activity during the day (El Ati, *et al.*, 1995).

Intermittent is considered an alternative to caloric restriction regimen (Varady and Hellerstein, 2007), while other considered as a type of caloric restriction (Anson, *et al.*, 2002). In general, caloric restriction is define as restricting food intake to a level below that would be consumed voluntarily (Anson, *et al.*, 2002). Studies have shown that caloric restriction can increase life span, reduce the incidence of various age-related diseases and reduce oxidative stress and inflammation in rodents and non-human primates (Wan, *et al.*, 2003).

The effect of intermittent fasting on oxidative stress in humans has been demonstrated in limited number of studies. Johnson, *et al.* (2007) has shown a significant decreases in serum level of 15-F_{2t}-IsoP in asthmatic over

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Intermittent fasting during Ramadan attenuates proinflammatory cytokines and immune cells in healthy subjects

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ABSTRACT

Intermittent fasting and caloric restriction have been shown to extend life expectancy and reduce inflammation and cancer promotion in animal models. It was hypothesized that intermittent prolonged fasting practiced during the month of Ramadan (RIF) could positively affect the inflammatory state. To investigate this hypothesis, a cross-sectional study was designed to investigate the impact of RIF on selected inflammatory cytokines and immune biomarkers in healthy subjects. Fifty (21 men and 29 women) healthy volunteers who practiced Ramadan fasting were recruited for the investigation of circulating proinflammatory cytokines (interleukin [IL]-1 β , IL-6, and tumor necrosis factor α), immune cells (total leukocytes, monocytes, granulocytes, and lymphocytes), and anthropometric and dietary assessments. The investigations were conducted 1 week before Ramadan fasting, at the end of the third week of Ramadan, and 1 month after the cessation of Ramadan month. The proinflammatory cytokines IL-1 β , IL-6, and tumor necrosis factor α ; systolic and diastolic blood pressures; body weight; and body fat percentage were significantly lower ($P < .05$) during Ramadan as compared with before Ramadan or after the cessation of Ramadan fasting. Immune cells significantly decreased during Ramadan but still remained within the reference ranges. These results indicate that RIF attenuates inflammatory status of the body by suppressing proinflammatory cytokine expression and decreasing body fat and circulating levels of leukocytes.

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Abbreviations: BMI, body mass index; CR, caloric restriction; DBP, diastolic blood pressure; HC, hip circumference; HDL, high-density lipoprotein; IF, intermittent fasting; IL-1 β , interleukin-1 β ; IL-6, interleukin-6; LPL, lipoprotein lipase; RIF, Ramadan intermittent fasting; SBP, systolic blood pressure; TG, triglycerides; TNF- α , tumor necrosis factor α ; WBC, white blood cells; WC, waist circumference.

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Effect of Resistance Training During Ramadan on Body Composition and Markers of Renal Function, Metabolism, Inflammation, and Immunity in Recreational Bodybuilders

Khaled Trabelsi, Stephen R. Stannard, Ronald J. Maughan,
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The aim of this study was to evaluate the effects of a hypertrophic training program during Ramadan on body composition and selected metabolic markers in trained bodybuilders. Sixteen male recreational bodybuilders (9 Ramadan fasters and 7 nonfasters) participated in the study. All visited the laboratory 2 d before the start of Ramadan (Bef-R) and on the 29th day of Ramadan (End-R). In the morning of each session, subjects underwent anthropometric measurement, completed a dietary questionnaire, and provided fasting blood and urine samples. Body mass and body-mass index in nonfasters increased by 2.4% ($p = .05$ and $p = .04$, respectively) from Bef-R to End-R but remained unchanged in fasters over the period of the investigation. Fasters experienced an increase in the following parameters from Bef-R to End-R: urine specific gravity (1%, $p = .022$) and serum concentrations of urea (5%, $p = .008$), creatinine (5%, $p = .007$), uric acid (17%, $p < .001$), sodium (2%, $p = .019$), potassium (6%, $p = .006$), chloride (2%, $p = .028$), and high-density lipoprotein cholesterol (10%, $p = .005$). However, only serum creatinine and low-density lipoprotein cholesterol increased in nonfasters (3%, $p < .001$ and 14%, $p = .007$, respectively) during the same period. Creatinine clearance values of fasters decreased by 3% ($p = .03$) from Bef-R to End-R. Continuance of hypertrophic training through Ramadan had no effect on body mass and body composition of bodybuilders, but a state of dehydration and reduced renal function were apparent, perhaps because of the restricted opportunity for fluid intake imposed by the study design.

Keywords: dehydration, percent body fat, Islamic fasting

The festival of Ramadan occurs during the ninth lunar month of the Islamic calendar and lasts 29–30 days (Stannard, 2011). Because its timing depends on the lunar cycle, Ramadan month occurs 11 days earlier every year and therefore may occur in any of the four seasons, making the length of fasting hours variable from 11 to 18 hr in tropical countries (Sakr, 1975). This month is spent by Muslims fasting during the daylight hours from dawn to sunset. Typically, two meals are eaten each day: one just before dawn and one after sunset (Chaouachi, Leiper, Souissi, Coutts, & Chamari, 2009). As a consequence of the 1 month of intermittent (daily) fasting, reductions in caloric intake (Bouhlef et al., 2006; Trabelsi et al., 2011) and losses in body weight (Bouhlef et al., 2006; Chaouachi et al., 2008; Trabelsi et al., 2012; Trabelsi et al., 2011) have been reported.

During Ramadan, some Muslims maintain physical activity for recreation and health purposes. This is well tolerated, although there are conflicting reports regarding the effects of Ramadan fasting on the hydration status of sportsmen. For example, while plasma osmolality increased during Ramadan in rugby sevens players, indicating a state of dehydration (Trabelsi et al., 2011), the absence of change in urine specific gravity has been reported in football players (Güvenç, 2011; Shirreffs & Maughan, 2008).

Several markers of renal function have also been studied during Ramadan to investigate possible effects of periodic fluid restriction. Physically active men practicing aerobic exercise before breaking the daily fast experienced a decrease in creatinine clearance, indicating impairment in renal function (Trabelsi et al., 2012). In contrast, Tunisian youth football players experienced no change in serum creatinine or uric acid values, but serum urea increased toward the end of Ramadan compared with nonfasting players (Maughan, Leiper, et al., 2008).

Several studies have also examined the combined effects of physical activity and Ramadan fasting on serum electrolytes. Trabelsi et al. (2012) reported an increase in serum sodium and chloride concentrations and no change

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Effects of Ramadan fasting on serum immunoglobulin G and M, and salivary immunoglobulin A concentrations

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and Mehmet Kulekci¹

Abstract

Objective: To investigate the effects of Ramadan fasting on serum concentrations of immunoglobulin (Ig)G and IgM, and salivary IgA concentrations.

Methods: Blood and saliva samples were collected one week before and during the last week of Ramadan from healthy male volunteers. Albumin, total lymphocyte count, electrolytes, and IgG and IgM concentrations were determined in serum; salivary IgA concentrations were measured. Anthropometric measurements were also recorded.

Results: Samples were collected from 35 subjects (mean age 35.86 years, range 20–59 years). Weight, body mass index, albumin levels and the nutritional risk index decreased significantly during Ramadan fasting compared with before fasting. In addition, Na⁺ and Cl[−] electrolyte levels were significantly decreased during Ramadan. Serum IgG concentrations decreased significantly during Ramadan compared with before fasting, but were still within the normal range. Salivary IgA concentrations also decreased significantly, whereas serum IgM levels did not change. Lymphocyte numbers increased significantly, but there was no correlation between Ig levels and lymphocyte count.

Conclusion: Ramadan fasting did not result in severe immunological disturbances.

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The Effect of Fasting on the Immune System of Athletes during Holly Ramadan

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Article information	Abstract
Article history: Received: 9 Jan 2013 Accepted: 6 Feb 2013 Available online: 28 May 2013 ZJRMS 2014; 16(6): 44-46 Keywords: Immune system Athletes Immunoglobulins Complements Fasting *Corresponding author: Department of Immunology and Hematology, Children and Adolescents Health Research Center, Zahedan University of Medical Sciences, Zahedan, Iran. E-mail: hkhazaei118@yahoo.com	Background: Holly Ramadan is the ninth month of the Islamic calendar in which millions of mature and obligated Muslims fast many hours during a day in all over the world. This study was performed to evaluate some immune factors in fasting athletes during the month. Materials and Methods: This cross sectional study was performed in 90 athletes with physical activity of 2-3 hours per day, age ranged of 16-36 years old, during holly Ramadan. Serum immunoglobulin levels of IgG, IgM, IgA and IgE, as well as serum complement components of C3, C4 and blood count cells with differential evaluation were measured at the beginning and end of holy Ramadan. Results: Mean serum IgA level has significantly increased from 239.2±98.2 mg/dL before Ramadan to 262.8±88.6 mg/dL at the end of this month ($p=0.008$). Mean serum C4 level was 258.2±150.6 g/L and 330.7±127.6 g/L before and after Ramadan, respectively ($p<0.001$). However, the percentage of lymphocytes was decreased from 37.81±4.14% before Ramadan to 36.50±5.98% at the end ($p=0.005$) and neutrophils was decreased from 60.0±4.2% before this month to 56.2±8.3% at the end of the month ($p=0.003$). Conclusion: Fasting seems to have positive effects on increasing the serum levels of C4, IgA levels, which could have protective effect on the athletes' immune system against infection during exercise. Copyright © 2014 Zahedan University of Medical Sciences. All rights reserved.

Introduction

Millions of mature and obligated Muslims around the world fast, during the ninth months of the Islamic calendar (Hejri), named holly Ramadan. Fasting means avoiding from eating and drinking from sunrise to sunset per day [1]. Fasting in Islam has multi-disciplined and regular identity and is over emphasized, while various studies have been published on the physical and sanitarian utilities of fasting [2, 3]. In recent decades, several researchers showed that low calorie diets have useful effects on prolonging the length and decreasing autoimmune diseases and avoiding malignancies in laboratory animals [4-6]. Although the exact mechanism is not clear, it seems that changes in the immune system, cytoplasm, nucleic acids, endocrine glands and decrease in free radicals could be involved in this regard [7]. Mutual effects of the immune system with nutrition and nervous system are currently considered as one of important subjects in immunology and disease treatment. Immune system reactions to stress-inducing factors such as exercise and physical activities could affect the immune system function. Evaluation of extremely exhausting activities and their effects on the immune system may provide useful and valuable information on planning methods and performing physical activities for researchers, trainers and athletes [8]. Therefore some studies have been done to show the effects of fasting on public's immune system [9-11],

which showed that one-month Islamic fasting may cause augmentation of T-cells functions, decrease in inflammation, and may affect immunological reaction of humoral immunity [12], but such investigations have not been performed in special groups; e.g., athletes.

This study was performed to evaluate the effect of fasting on some immunological factors of athletes before and after a month fasting.

Materials and Methods

This cross sectional analytical-descriptive study has been done on 90 athletes during Ramadan month (August 2011). These athletes were consequently selected from those who had regularly heavy exercise in different fields such as running, volleyball, basketball, karate, Judo, boxing, wrestling, gymnastic, and king boxing; all had heavy exercise before breaking fast. The inclusion criteria were as follow: 1) Athletes with average age of 16 to 40 years, who fast in Ramadan; 2) Athletes who have at least one year history of physical activity, and those who regularly exercised three or more times a week and at least have one hour heavy exercise per day; 3) Athletes who have no history of any cardiovascular, pulmonary, nephrotic, and immunodeficiency disease; indeed those who had no injury caused by physical activities (muscular spasm, tendon tearing, muscular injuries).

Evaluation of the Effects of Ramadan Fasting on Lymphocyte subpopulations in a Two-year Follow-up

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ARTICLE INFO	ABSTRACT
<i>Article type:</i> Original article <i>Article History:</i> Received: 26 Dec 2013 Revised: 01 Feb 2014 Accepted: 23 Jan 2014 Published: 11 Mar 2014 <i>Keywords:</i> Lymphocyte subpopulations Ramadan fasting Immune system	Today, the interactions of the immune system of the immune system, nutrition, and nervous system are one of the main research areas of interest in immunology and disease treatment. Due to changes in the mood, behavior, and diet of an individual during fasting period, the body's internal homeostasis is affected. The aim of the present study was to evaluate the effects of Ramadan fasting on lymphocyte subgroups, which are the main specific immune cells in the body. For this purpose, in years 1999 and 2000, thirty-eight healthy Muslims (9 females and 29 males), within the age range of 17 to 51 years (mean age=35.4 years), were assessed before the start and one day before the end of Ramadan. The pre-Lymphocytic subpopulations analysis was conducted using flow cytometry. The results showed that the percentage of total lymphocytes was 25.82% and 26.23% in the pre- and late-Ramadan periods, respectively; the observed difference was insignificant. However, the absolute lymphocyte counts were 2.3×10^3 and $2.1 \times 10^3 \text{ mm}^3$ before and late Ramadan, respectively, and the difference was considered significant (P-value=0.06). The percentage of CD3⁺ cells (T cells) was 70.12% before Ramadan and 70.25% late Ramadan, and the absolute lymphocyte counts were 1.6×10^3 and $1.5 \times 10^3 \text{ mm}^3$, respectively; therefore, the differences were not significant. Regarding the subgroups of CD4⁺ cells (T_H), the percentage ratios of the cells were 53.46% and 52.8% in the pre- and late Ramadan periods, and the absolute counts were 0.087×10^3 and $0.081 \times 10^3 \text{ mm}^3$, respectively; however, the differences were not significant in this cell subgroup. The percentage of CD8⁺ (T_C) cells was 37.7% before Ramadan and 37.8% late Ramadan, and the absolute counts were 0.6×10^3 and $0.54 \times 10^3 \text{ mm}^3$ in the pre- and late-Ramadan periods, respectively; therefore, the differences were considered insignificant. In addition, the percentage ratios of B-lymphocytes cells were 14.56 % and 14.74% in the pre- and late-Ramadan periods, and the absolute count changed from 0.35×10^3 to $0.3 \times 10^3 \text{ mm}^3$. According to the results, the differences were not significant, therefore, it seems Ramadan fasting does not affect these cells. Moreover, the percentage of activated T cells or T_{DR}⁺, which are involved in specific immune responses, has not been affected by fasting. In fact, the percentage ratios were reported as 11.14% and 10.54% in the pre- and late-Ramadan periods, and the absolute count changed from 0.14×10^3 to $0.11 \times 10^3 \text{ mm}^3$; the differences were not considered significant. Finally, the ratio of CD4⁺/CD8⁺ cells or T_H/T_C changed from 1.48% before Ramadan to 1.5% late this month; however, this difference was insignificant. Thus, the overall results indicate that Ramadan fasting during winter does not affect the lymphocyte count, percentage ratio, and the main lymphocyte subpopulations.

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Introduction

In recent years, the scientific methodology of detail-based studies, or the evaluation of molecular components without considering the holistic review of the results, has been a matter of great controversy. Thus, more attention has

been paid to the relationship between molecules, cells, and systems, and their interaction effects on one another.

The immune system with its set of cells and molecules plays an essential role in maintaining

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Lampiran 9:

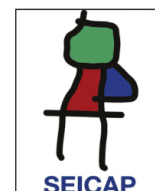
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ORIGINAL ARTICLE

The impact of “*Ramadan fasting period*” on total and differential white blood cells, haematological indices, inflammatory biomarker, respiratory symptoms and pulmonary function tests of healthy and asthmatic patients

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KEYWORDS

Ramadan fasting;
Asthma;
Respiratory
symptoms;
Pulmonary function
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Inflammatory
mediator

Abstract

Background: There is no conclusive evidence regarding the effect of fasting on different features in asthmatic patients. In the present study, the effect of Ramadan fasting in asthmatic patients and healthy control was studied.

Methods: Haematological indices, inflammatory mediators, pulmonary function tests (PFT) and respiratory symptoms were evaluated in 15 asthmatic patients compared to 14 healthy matched control group before and after the one-month fasting period in Ramadan. The change in each parameter from the beginning to the end of Ramadan was calculated and referred to as “variation during Ramadan”.

Results: The values of MCH, MCHC in both groups and monocyte counts in asthmatic patients, were significantly increased but platelet count was reduced in asthmatic and controls respectively compared to pre-Ramadan fasting period ($P < 0.05$ to 0.001). Serum hs-CRP level in control and asthmatic groups was significantly reduced after Ramadan fasting month ($P < 0.001$ for both groups). PFT values after Ramadan fasting month in both groups were non-significantly higher compared to pre-fasting values except FVC. Respiratory symptoms in asthmatic patients were non-significantly but wheeze-o was significantly reduced after Ramadan fasting period in asthma group ($P < 0.05$). There was no significant difference in variations of different parameters during Ramadan fasting period between two groups, although reduction of hs-CRP in asthmatic group was non-significantly higher than control group.

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Effect of Ramadan fasting on anthropometric, metabolic, inflammatory and psychopathology status of Egyptian male patients with schizophrenia

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Body mass index

Brain-derived neurotrophic factor

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High-sensitivity C-reactive protein

Metabolic syndrome

Positive and negative symptoms

ABSTRACT

Ramadan fasting is believed to be beneficial. We assessed a random sample of 100 Egyptian male schizophrenia outpatients using the Positive and Negative Syndrome Scale (PANSS) and dietary, anthropometric, clinical, and laboratory measures at baseline (T1) before Ramadan of 2014 and during the fourth week of Ramadan (T2). The metabolic syndrome was identified in 31 patients and these showed a reduction of high-density lipoprotein cholesterol (HDLc) and brain-derived neurotrophic factor (BDNF) concentrations and increase in the levels of dietary intakes, body mass index (BMI), waste circumference, systolic and diastolic blood pressure, all PANSS subscales, glucose, insulin, HOMA-IR, total cholesterol, triglycerides, low-density lipoprotein-cholesterol (LDL-c), white blood cells, granulocytes, lymphocytes, monocytes, fibrinogen and high-sensitivity C-reactive protein (hs-CRP). In a multiple regression analysis, total energy intake and body mass index (BMI) emerged as the main independent predictors of deterioration in most inflammatory and psychopathology parameters. These findings did not support our hypothesis but suggested that Ramadan fasting has a negative impact on schizophrenia patients, especially those with metabolic syndrome. This could draw attention to the need in the psycho-education management of such patients to focus more on nutrition education for safe fasting.

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1. Introduction

Islam is the second largest religion in the world, with about 1.7 billion followers. Muslims in Egypt and other Middle East-North Africa countries, however, constitute an overwhelming majority of about 90% of the population in the region (Butler, 2006). All adult Muslims, anywhere in the world, have a religious obligation to fast daily for the 29 or 30 days of Ramadan month every lunar year. Fasting is diurnal. No food, drink, smoking, sex, oral medications, inhalations or intravenous nutritional fluids are permitted from dawn to sunset, but these are allowed at night. Typically, two main meals a night are consumed during Ramadan, *Iftar* (=breakfast) which is served immediately after sunset, and *Sohour* which must be finished before dawn. The exact timings of the beginning and end of the fast each day vary according to date and geographical location. On 1st Ramadan, 2014, in Egypt, *Fajr* (dawn) prayer time

which determines the beginning of *Imsak* (fasting) was at 3:10 a.m. (Local Time), and *Maghrib* (Sunset) prayer which determines the end of fasting was at 19:00 (7:00 p.m.) (Local Time). People fasted exactly 15 h and 50 min.

Muslims do not perceive fasting as a corporal punishment but a blessing with many rewards, especially spiritual. Fasting, however, is not exclusive for Islamic culture. It has been practiced in other religions and cultures around the globe for millennia. Moreover, because of its possible beneficial effects, including increased vigilance and mood enhancement, fasting has been advocated as a form of therapy with various specified procedures and with recently revealed mechanisms (Michalsen and Li, 2013). A comprehensive review of the neurobiological mechanisms of fasting with particular focus on mood was given by Fond et al. (2013). Therapeutic fasting is claimed to be generally safe and well tolerated, though there are some contraindications. Rather surprisingly, psychotic disorders have been considered among indications presenting a risk (Wilhelmi de Toledo et al., 2013).

Although the Quran exempts sick people from fasting, many Muslim patients prefer to fast (Salti et al., 2004). This is a situation

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The Effect of Ramadan Fasting on Tuberculin Skin Test and Leukocyte Count

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ARTICLE INFO	ABSTRACT
Article type: Original article	Background & Objectives: Annually, many Muslims fast during the month of Ramadan worldwide. This practice has different favorable medical and physiological effects, such as improved serum lipid profile and blood glucose level due to changes in diet and sleep patterns. It has also been hypothesized that Ramadan fasting may affect the immune system. As reported, Ramadan fasting can influence the immunoglobulin and cytokine levels. Accordingly, tuberculin skin test or purified protein derivative (PPD) test, which is a delayed-type hypersensitivity of cellular immune response, may also be affected by Ramadan fasting. Regarding this, the present study aimed to investigate the alteration of PPD test during and after Ramadan. Materials & Methods: A total of 42 males (seminary students) who fasted during Ramadan in 2006 were included in the study; however, only 28 cases completed the study. For data collection, the participants underwent blood and tuberculin tests at the fourth week of Ramadan and three months after this month. The white blood cell (WBC) count and the tuberculin induration were recorded and compared between the two intervals to evaluate the changes. Results: According to the results of the study, the mean age of the participants was 19.21 ± 3.83 years. Furthermore, the mean tuberculin induration was 9.3 ± 5.4 mm (size range: 2-22 mm) on the fourth week of Ramadan, which increased to 9.79 ± 6.8 mm (size range: 3-35 mm) three months after this month ($P=0.501$). The mean count of WBC decreased insignificantly from 5907 ± 1879 μL to 5601 ± 1362 μL after Ramadan ($P=0.334$). Additionally, the mean lymphocytes count decreased significantly from 2292 ± 520 μL to 2023 ± 486 μL after this month ($P=0.003$). Likewise, the lymphocyte ($P=0.014$) and mean neutrophil percentage also reduced significantly ($P<0.001$). However, there was no association between PPD test and WBC, lymphocyte, or neutrophil count ($P>0.05$). Conclusion: As the findings of the present study indicated, Ramadan fasting induce some changes in the immune status, including lymphocyte and neutrophil percentage and count; however, it does not affect the PPD results.
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Keywords: Fasting Leukocytes Tuberculin test	

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Introduction

Ramadan is a holy month, when millions of Muslims around the world abstain from eating and drinking from dawn to dusk. This practice induces changes in the diet and sleep pattern of the individuals and has significant medical and physiological effects on their body (1). During the month of Ramadan fasting (i.e, a type of intermittent fasting), some changes occur in the cytokines and circadian rhythms of hormones. Regarding this, the evaluation of leukocyte count and tuberculin skin test, which are closely

related to immune system, can render interesting and helpful results (2, 3, 4).

There are few, if any, studies investigating the aspects of immune system, especially the tuberculin skin test, in Ramadan. Therefore, the present study aimed to assess the leukocyte count and tuberculin skin test during the Ramadan fasting to provide the physicians with a broader view over the impacts of the Ramadan fasting on these variables and improve their interpretation in this regard.

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Lampiran 12:

1 Original Investigation / Özgün Araştırma

Effect of Ramadan Fasting on Red and White Blood Cell Parameters in Healthy Females

Ramazan Orucunun Sağlıklı Kadınlarda Kırmızı ve Beyaz Kan Hücresi Parametrelerine Etkisi

Osamah Awad Ahmed

Department of Fundamental, College of Nursing, Raprin University Ranya, Iraq

ABSTRACT

Objective: The point of present review is investigation of Red Blood Cell Parameters and white Blood Cell Parameters among fasted females during Ramadan month.

Methods: Thirty female subjects participated in current study. Estimation Red Blood Cell Parameters, Total and differential leucocytes counts were before 3 days and 28th day of the Ramadan month that Estimation was using fully automatic hematological analyzer.

Results: Hemoglobin, Hematocrit, Mean corpuscular volume (MCV), Mean corpuscular hemoglobin concentration (MCHC), Mean corpuscular hemoglobin concentration (MCHC), Red Cell Density Width -coefficient of variation (RDW-CV), Red Cell Density Width -standard deviation (RDW-SD), Lymphocytes percent and Neutrophils percent were significantly increased during the Ramadan fasting period as compared to pre-Ramadan fasting period .White blood cells (WBC) count decreased significantly in end of the Ramadan month as compared to pre-Ramadan fasting.

Conclusions: This study shows in females' student graduate that fasting in the Ramadan month had effect on red blood cell indices and Total and differential leukocytes counts except RBC count and MXD.

Key Words: Ramadan Fasting, total white blood count, differential leukocytes counts, erythrocyte's parameters

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Accepted:02.21.2018

ÖZET

Amaç: Bu çalışmanın amacı, Ramazan ayı boyunca oruç tutan kadınlarda kırmızı kan hücresi parametreleri ve beyaz kan hücresi parametrelerinin araştırılmasıdır. **Yöntem:** Çalışmaya 30 sağlıklı kadın katılmıştır. Kırmızı Kan Hücresi Parametreleri, lökosit sayıları, Ramazan ayından 3 gün önce ve 28'inci günlerinde tam otomatik hematolojik analiz cihazı kullanılarak yapılmıştır.

Bulgular: Hemoglobin, Hematokrit, Ortalama korpusküler hacim (MCV), Ortalama korpusküler hemoglobin konsantrasyonu (MCHC), Ortalama korpusküler hemoglobin konsantrasyonu (MCHC), Kırmızı Hücre Yoğunluk Genişliği-varyasyon katsayısı (RDW-CV), Kırmızı Hücre Yoğunluk Genişliği-standart sapma (RDW-SD) değerleri, Lenfosit yüzdesi ve Nötrofil yüzdesi Ramazan öncesine göre oruç döneminde, anlamlı olarak arttı. Beyaz kan hücrelerinin (WBC) sayısı ise Ramazan öncesine göre anlamlı şekilde azaldı.

Sonuç: Bu çalışmada, Ramazan ayında oruç tutmanın kırmızı kan hücresi indeksleri üzerinde etkili olduğunu ve RBC sayısı ve MXD hariç Toplam ve diferansiyel lökosit sayımları üzerine etkisini göstermektedir.

Anahtar Sözcükler: Ramazan orucu, toplam beyaz kan sayımı, diferansiyel lökosit sayımı, eritrosit parametreleri

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Lampiran 13:

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No.	Hari, Tanggal	Materi	Keterangan	Paraf
1.	Ahad, 03 Januari 2021	Penulisan	Revisi	
2.	Senin, 04 Januari 2021	Bab I, II, III	Revisi	
3.	Selasa, 12 Januari 2021	Bab I, II, III	Revisi	
4.	Jum'at, 15 Januari 2021	Bab I, II, III	Revisi	
5.	Selasa, 19 Januari 2021	Bab II	Revisi	
6.	Jum'at, 22 Januari 2021	Bab II	ACC Seminar Proposal	
7.	Selasa, 02 Februari 2021	Bab I, III	Revisi	
8.	Kamis, 15 April 2021	Bab I	ACC Proposal	
9.	Jum'at, 30 April 2021	Abstrak, Bab I - V	Revisi	
10.	Selasa, 04 Mei 2021	Abstrak, Bab IV, V	Revisi	
11.	Selasa, 08 Juni 2021	Abstrak, Bab IV, V	Revisi	
12.	Jum'at, 18 Juni 2021	Abstrak, Bab V	ACC Seminar Hasil	
13.	Senin, 05 Juli 2021	Bab IV, V	Revisi	
14.	Rabu, 21 Juli 2021	Konsultasi Lengkap	Revisi	
15.	Sabtu, 24 Juli 2021	Muskaah Publikasi	ACC Cetak Hard Cover	

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Lampiran 14:

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No.	Hari, Tanggal	Materi	Keterangan	Paraf
1.	Senin, 11 Januari 2021	Cover, Bab I - III	Revisi	
2.	Senin, 19 Januari 2021	Bab I - III	Revisi	
3.	Senin, 25 Januari 2021	Bab I, III	ACC Seminar Proposal	
4.	Rabu, 03 Februari 2021	Bab I, III	Revisi	
5.	Jumat, 16 April 2021	Bab I, III	ACC Proposal	
6.	Selasa, 08 Juni 2021	Bab I - V	Revisi	
7.	Senin, 21 Juni 2021	Bab IV, V, Abstrak	ACC Seminar Hasil	
8.	Selasa, 27 Juli 2021	Konsultasi KTI Lengkap	ACC Cetak Hard Cover	

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