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RESEARCH ARTICLE

The Effect of Ramadan Fasting and Sport Detraining on Complete Blood Count, Testosterone Hormone and Biochemistry Variables Among Soccer Players

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Abstract
Aim: The study aimed to identify if Ramadan fasting and sport detraining affect complete blood count (C.B.C), testosterone and biochemistry variables among soccer players. **Method:** The researchers used a quasi-experimental method in the pre- and post-measurements of the study's variables, and 15 male athletes from the Faraon football club in the Tulkarm region of the State of Palestine conducted the study. Athletes (age, 19.86±1.64 years, Height (cm) 172.06±5.71, Weight (kg) 66.93±6.86, index: 24.62 ±1.4 kg/m^2) was determined as. The measurements were applied on the first day of Ramadan and on the last day of it. Paired sample t-test was used to assess the differences. **Results:** There are statistically significant differences between pre and post-tests means of Blood (CBC) parameters (WBC: t=2.553, p=0.023* ; HGB: t=2.265, p=0.040*; RDW: t=-3.606, p=0.003*; MPV: t=-3.445, p=0.004*) but there are no statistically significant differences between pre and post-test for the rest of Blood (CBC) parameters. There are statistically significant differences between pre and post-tests means of Testosterone Hormone (TH: t=3.024, p=0.009*). There are statistically significantdifferences between pre and post-tests means for biochemistry parameters (CPK: t=4.169, p=0.001*; HDL: t=4.017, p=0.001*; LDL: t=-4.805, p=0.000*; cholesterol: t=-3.891, p=0.002* and triglyceride: t=-2.362, p=0.033*) in favor to post-test mean. But there are no statistically significant differences between for the rest of the biochemistry parameters. **Conclusion:** This indicates that Ramadan fasting and sport detraining completely has a negative impact on the study variables among soccer players.

Keywords
Ramadan Fasting; Sport Detraining; Testosterone; Biochemistry

INTRODUCTION

Ramadan fasting (RF) is a religious tradition in Islam that requires healthy Muslims to abstain from eating, drinking, smoking, and sexual intercourse between sunrise and sunset (Fashi et al., 2021). Adult Muslims generally eat two main meals; The first meal is early in the morning, just before sunrise, and the second meal is after sunset, at the end of the fasting day (Chtourou et al., 2018). This eating pattern and the length of time between meals leads to some changes in sleep and lifestyle rhythms. Many previous studies have shown that Ramadan fasting is associated with significant changes in body weight (Leiper et al., 2008), basic hematological parameters, blood glucose levels, lipids (Leiper et al., 2008), resting metabolic rate (Aziz et al., 2018), respiratory function (Aziz et al., 2012) and physical activity level The significant reduction in training

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loadallows athletes to delay fatigue caused by high-intensity training (Chtourou et al. 2011). While some studies have shown that strength and intense aerobic and anaerobic performance are negatively affected by RF (Graja et al., 2020), others have failed to observe significant performance decrements following RF (Chaouachi et al., 2008).

For example, Souissi et al., (2007) showed that peak power recorded in the afternoon during the Wingate cycling test decreased after two weeks of fasting. Similarly, Aziz et al., (2012) reported a significant reduction in total work during six Wingate tests, each followed by 4-minute recovery periods. Stated that RF would not have negative effects on body composition, anaerobic power or capacity, and lactate metabolism in power athletes during and after high-intensity exercise.

Detraining is the temporary interruption of regular physical training directed at developing or maintaining the elements of physical fitness, which often occurs after the end of the sports season and before the start of the new season (Mujiki & Padilla, 2000). Detraining is defined as an inactivity period that appears following an intense training period, this is occurrence of losses in sportive performance and physiological adaptations when the training is reduced or completely ceased (Masden et al, 1992).Vagner et al. indicated the impacts of the detraining period can be classified under two topics as physiological and physical (Vagner et al, 1998).Importantly, detraining effects may influence how players prepare during pre-competition and potentially affect their performance levels in the first matches of the competition period (Kraemer et al, 2004). In our study, sport detraining came in the month of Ramadan and the players were fasting and completely stopped training. So the study aimed to identify if Ramadan fasting and sport detraining during transitional period affect some blood (C.B.C), hormones and biochemistry variables among soccer players.

MATERIALS AND METHODS

Participants

Fifteen male athletes (Age: 19.86±1.64 years, Weight: 66.93±6.86, Height: 172.06±5.71) voluntarily participated in this study. The researchersused quasi-experimental method and conducted the study on a purposive sample (S) of (15) players from Faraon soccer club and Table (1) illustrate the characteristics of the study sample. The study was approved and supervised by the departmental research committee, Palestine technical university kadoorie (Ref: 2024/20), dated 24 November 2024). Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

Body composition

Subjects' body weight was measured to the nearest 100 g using a calibrated electronic scale, and their height was measured using a stadiometer. Body mass index (BMI) was calculated as weight (kg) divided by height (m) squared.

Table 1. Descriptive characteristics (mean ve standard deviation) of physically active men

Variables	M	SD	Skewness
Age (Year)	19.86	1.64	0.021
Height (Cm)	172.06	5.71	0.607
Weight (kg)	66.93	6.86	1.444
Body Mass Index ($kg \cdot m^2$)	22.58	1.62	-0.378

It is clear from the results of Table (1) that the values of the skewness coefficient are between (± 3)and this indicates that the study sample is subject to the normal distribution.

Study variables

The study consisted of the following variables:

The independent variables, which include Ramadan fasting and abstaining from training during the transitional period.

The dependent variables, which include the following:

Complete blood count tests which include (WBC, LYM, HGB, RBC, HCT, MCH, MCV, RDW, PLT, MPV).

Testosterone Hormone

Biochemistry tests, which include (S.G.P.T,CPK,HDL,LDL,Cholesterol,Triglyceride, Vitamin B12, Creatinine).

Study Procedures

Blood Samples

The researchers followed the following procedures in measuring the study variables:

The pre-measurement was performed on the first day of Ramadan (13/04/2021) at exactly eight o'clock morning in the laboratory by taking blood samples from the veins in the elbow according to the scientific principles followed by gently attaching the compressor around the upper arm and then cleaning the traction area by wiping it with a cotton swab moistened with ethylene alcohol 70 %, and then the blood was drawn using a sterile, dry syringe and used for one time, by holding the elbow with the left hand and placing the thumb on the vein and away from the place of the puncture, then holding the syringe with the right hand, inserting it into the vein, then withdrawing 5-10 ml of blood, and severing The compressive band, then put a piece of dry cotton, and put pressure on the place where the sample was drawn to prevent bleeding.

The blood samples were placed in a special refrigerator at a temperature between 2-8 °C.

The tests were carried out directly by using three devices (Medonic M-series for CBC test; TOSOH AIA-600II for hormones and vitamins testing; FUJIFILM DRI-CHEM NX500isa multi-purpose automatic dry-chemistry analyzer featuring remarkably short turnaround time, a touch screen interface and reliability).

The post-measurement was carried out on the last day of the month of Ramadan (12/05/2021) at exactly eight o'clock morning in the laboratory by following the steps of the pre-measurement.

Statistical analysis

The researchers used SPSS version 23 to analyze. General characteristics of the participants were presented as means and standard deviations. All data were assessed for normality by using the Shapiro–Wilk test. Paired sample t-test was used to assess the differences. Level of significance was accepted at $P<0.05$.

RESULTS

The changes in WBC,HGB,RDW and LYM, RBC, HCT, MCH, MCV and PLT are presented in Table 2.

There are statistically significant differences between pre and post-tests means of Blood (CBC) parameters (WBC: t=2.553, p=0.023* ; HGB: t=2.265, p=0.040*; RDW: t=-3.606, p=0.003*; MPV: t=-3.445, p=0.004*) but there are no statistically significant differences between pre and post-test for the rest of Blood (CBC) parameters (LYM: t=1.555, p=0.142; RBC: t=0.825, p=0.423; HCT: t=0.329, p=0.747; MCH: t=1.955, p=0.071, MCV: t=1.755, p=0.101 and PLT: t=1.417, p=0.178).

Table 2. The differences between pre and post tests means of (C.B.C)* variable

Variable	Parameters*	Pre-test		Post-test		T-value	P-value*
		M	SD	M	SD		
Complete Blood Count (C.B.C)*	WBC (10^9/1)	7.02	1.42	6.27	1.74	2.553	0.023*
	LYM (%)	40.25	8.20	38.28	8.92	1.555	0.142
	HGB (g/dl)	15.31	0.85	14.90	0.87	2.265	0.040*
	RBC (10^{12}/1)	5.42	0.22	5.38	0.30	0.825	0.423
	HCT (%)	46.32	2.01	46.15	2.52	0.329	0.747
	MCH (pg)	30.21	7.08	29.72	7.17	1.955	0.071
	MCV (f1)	85.39	2.31	85.10	2.24	1.755	0.101
	RDW (%)	15.03	0.50	15.44	0.36	-3.606	0.003*
	PLT (10^9/1)	220.53	32.83	209.53	26.33	1.417	0.178
	MPV (f1)	9.08	0.86	9.53	0.81	-3.445	0.004*

Note: M: Mean; SD: Standard deviation; * statistically significant at ($P \leq 0.05$); *Parameters: Explanation of the abbreviations for variables in Table (2).

There are statistically significant differences between pre and post-tests means of Testosterone Hormone (TH: t=3.024, p=0.009*) (Table 3).

Table 3. The differences between pre and post tests means ofhormone variable

Variable	Parameters*	Pre-test		Post-test		T-value	P-value*
		M	SD	M	SD		
Hormone	Testosterone (ng/dl)	868.66	274.29	668.13	178.94	3.024	0.009*

Note: M: Mean; SD: Standard deviation; * statistically significant at ($P \leq 0.05$).

There are statistically significantdifferences between pre and post-tests means for biochemistry parameters (CPK: t=4.169, p=0.001*; HDL: t=4.017, p=0.001*; LDL: t=-4.805, p=0.000*; cholesterol: t=-3.891, p=0.002* and triglyceride: t=-2.362, p=0.033*) in favor to post-test mean. But there are no statistically significant differences between pre and post-test for the rest of the biochemistry parameters (vitamin B12: t=-0.660, p=0.520 and Creatinine: t=-0.336, p=0.742) (Table 4).

Table 4. The differences between pre and post tests means ofbiochemistry variable

Variable	Parameters*	Pre-test		Post-test		T-value	P-value*
		M	SD	M	SD		
Biochemistry	CPK (U/L)	325.26	146.99	155.33	38.46	4.169	0.001*
	HDL (mg/dl)	49.46	17.72	41.86	11.78	4.017	0.001*
	LDL (mg/dl)	61.26	20.73	81.73	27.79	-4.805	0.000*
	Cholesterol (mg/dl)	122.06	30.11	147.86	36.22	-3.891	0.002*
	Triglyceride(mg/dl)	52.20	20.08	73.40	41.84	-2.362	0.033*
	Vitamin B12 (mg/dl)	231.86	102.93	235.60	84.90	-0.660	0.520
	Creatinine (mg/dl)	0.95	0.11	0.95	0.11	0.336	0.742

Note: M: Mean; SD: Standard deviation; * Statistically significant at ($P \leq 0.05$); *Parameters: Explanation of the abbreviations for variables in Table (2).

DISCUSSION

During the month of Ramadan, Muslims are obliged to fast during daylight hours and abstain from food and drinking after sunset, and this leads to an adjustment in the daily distribution of food, drink and sleep schedule, which in turn causes different changes in the metabolism process, in addition to stopping sport training completely, which prompted researchers to conduct this study, The results of table (2) showed that fasting Ramadan and sport detraininghad an effect on blood (CBC) variables, revealed an increase in the arithmetic averages as in the RDW and RDW variables, and decrease in the arithmetic means of blood (CBC) variables: WBC, LYM, HGB, RBC, HCT, MCH, MCV & PLT. This differed with the results of studies (**Trabelsi et al, 2011; Tayebi et al, 2010**), which showed no change in WBC, LYM, HCT, HGB, RBC, MCV, MCH, RDW, and PLT variables in the month of Ramadan. It also differed with the studies of (**Al Hourani et al, 2009; Azizi, 2002**) which the results showed no change in HCT, HGB & RBC. But the result of the study agreed with (**Ramadan et al, 1999; Al Hourani et al, 2009**) that PLT decreased in the month of Ramadan, This is due to a deficiency in micronutrients such as iron and vitamins. But the result of the study agreed with (**Ramadan et al., 1999; Hourani et al., 2009**) studies which revealed that PLT decreased in the month of Ramadan, and this may be due to a deficiency of micronutrients such as iron and vitamins. It was confirmed by (**Karakoc et al, 2005**) that RBC & HGB depend on the presence of iron. It also agreed with the study of (**Dewanti et al, 2006**) which showed a decrease in HCT & HGB, explaining this may be due to geographical, climatic, economic and nutritional differences. **Suzuki et al.,** (**2006**) indicated that well-trained athletes have high concentration of HGB and RBC than inactive people. Our study also agreed with the study of (**Farshidfar et al, 2006**) which showed a decrease in HGB when measured on the 28th day of Ramadan compared to its measurement a day before Ramadan. Also, our study results agreed with the results of (**Anindita & Amit, 2017**) study which showed a decrease in WBC, LYM, HGB, RBC at the end of Ramadan. It agreed with the study of (**Haq et al, 1997**) result in the decline of LYM at the end of Ramadan. The study of (**Bouhlel et al, 2006; Bigard et al, 1998**)

showed increase levels of HCT & HGB among fasters during Ramadan, which may be due to dehydration. On the contrary **Tayebi et al., (2010)** study revealed the reason of A reduction in HGB concentration and HCT might be due to the incomplete dehydration period which amplified by stop drinking and nutritional habits during the holy Ramadan.

The results of table (3) also showed that Ramadan fasting and sport detraining during transitional period had a statistically significant effect on the decrease in the level of testosterone hormone. This result differed with (**Koundourakis et al, 2014; Silva et al, 2014**) which revealed that sport detraining doesn't affect resting sex steroid levels. As **Mesbahzadah (2005)** reported in his study is the sex hormone in healthy adult males affected by fasting become reduced however, it is not reached to significant level. Testosterone is one of the anabolic hormones and it is the most important of them. Since it is a dominant factor of the influence on the increase of muscle mass, testosterone plays an important role when it comes to increasing muscle strength (**Rahimi et al, 2010; Zatsiorsky & Kraemer, 2009**). An increase in the concentration of testosterone is related to muscle strength and sports activity, it is known that its presence in the body is one of the most important conditions for muscle growth and strength training has the biggest influence on its secretion (**McCaulley et al., 2009; Linnamo et al., 2005**).From the foregoing, the researchers attributed the reason for the low testosterone hormone related to stopping sports training and low sexual habits during Ramadan month, which play an important role in its secretion, which reduces its functions. The functions of testosterone are: responsible for the expression of male secondary sexual characteristics, the effect on protein synthesis and muscle development, the effect on bone growth and retention of calcium and non-osseous minerals, the effect on the deposition of glycogen in the muscles, the effect on the formation of red blood cells & the effect on electrolytes and water balance (**Guyton & Hall, 2003; Nikolić, 2003; Wilmore & Costill, 2004**). Previous study of Iraki et al showed that abstinence from eating and drinking during Ramadan fast, which is accompanied by variations in the sleeping and waking pattern, and the psychological effects of fasting may bring about rhythmic changes in the secretion of most body`s hormones (**Iraki et al., 1997**).

The results of table (4) also showed that Ramadan fasting and sport detraining during transitional period had effect on biochemistry tests through decrease in CPK & HDL levels, and increase in LDL, Cholesterol, Triglyceride, Vitamin B12 levels, while Creatinine level wasn't changed, the researchers attribute this to eating a large amount of food meals that focus on fats, carbohydrates and sugars daily. It agreed with the result of (**Farshidfar et al., 2006**) study in the increase of Triglyceride & Cholesterol levels but differed in the decrease of HDL & LDL levels When measured on the 28th day of Ramadan. It also agreed with (**Khaled et al., 2006**) study which revealed a decrease in HDL level & an increase in LDL, Cholesterol,Triglyceride levels. **Chaouachi et al., (2008)** demonstrated that fasting during the month of Ramadan led to an increase in total cholesterol, HDL, LDL among judokas players.

CPK is the major enzyme that controls the ATP-PC system, an indicator that indirectly reflects metabolism in muscle cells and may be used as a marker that indicates the degree of body and muscle damage based on the increase in activation resulting from physical exercise (**Wallace, Mills & Browning, 1997**). The decrease in CPK in the study sample indicates the effect of stopping sports training completely because its concentration is high in the muscles when practicing sports activities (**Clarkson & Hubal, 2002**). There is a direct relationship between exercise, intensity, time, amount and CPK, Especially its increase is considered as a biochemical indicator of muscle damage (**Brancaccio et al., 2007**). CPK concentration increased significantly immediately after maximum exercise, this was confirmed by the study (**Kim et al., 2014**) that the concentration of CPK significantly increased after pilates exercise, indicating that the exercises affected the muscles and caused their damage. Also **Kim et al., (2006)** indicated that the concentration of CPK significantly increased after exercise when comparing the concentration before exercise with the concentration during the recovery period after intense running. **Yoon (1998)** also indicated that the concentration of CPK increased significantly after maximal exercise.

The results of our study showed that the level of Vitamin B12 increased slightly, but it is

considered low among the study sample, and the reasons for its deficiency need to be monitored by a nutritionist. Creatinine is an indicator of the health of athletes particularly in sporting competitions

where hydroelectrolytic balance is critical for success (**Banfi, 2010**) Our study findings revealed that Creatinine level had not affected by fasting and sport detraining, the researchers attributed this to stop soccer players playing completely, because the level of Creatinine is affected by muscle work and exercise, and this was confirmed by (**Kakadiya & Shah, 2010**) that creatinine is a waste product of creatine, which is an important energy storage substance in muscle metabolism. The researchers also attributed this to focus soccer players on food meals which are very rich in fats, carbohydrates, sugars, drink enough fluids and little proteins daily. **Trabelsi et al., (2011)** study indicated that increase levels of creatinine in the blood during Ramadan month is due to increased protein consumption and possibly dehydration due to lack of fluids. This finding of our study opposed the result of (**Farshidfar et al, 2006**) study which showed a decrease in creatinine level when measured on the 28th day of Ramadan.

Conclusion

According to the results of this study, which showed decrease in the means of post-measurements for most variables while showed increasing in the means of post- measurements of LDL, Cholesterol, triglyceride & vitamin B12 among soccer players. This indicates that Ramadan fasting and sport detraining completely during transitional period has a negative impact on the study variables among soccer players. This means that soccer players are Muslims who did not practice exercises during Ramadan and did not follow a balanced diet by eating sweets and many meals which rich in fat in a short period of time, in addition to their commitment with worship, social relations, staying up late at night and lack of sleep.

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Conflict of interest

Authors declared that there is no conflict of interest.

Ethics Committee

The study was approved and supervised by the departmental research committee, Palestine technical university kadoorie (Ref: 2024/20), dated 24 November 2024).

Author Contributions

Study conception and design: AQ, LH, HS ; Data Collection: AQ, MA; Analysis and Interpretation of results: AQ, GN, RK; Draft manuscript preparation: AQ, HS, GN; All authors reviewed the results and approved the final version of the manuscript.

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