

Total Antioxidant Capacity, Hematological and Coagulation Parameters after Orthodox Christian Fast

Kali G. Makedou^{1*}, Eleni Vagdatli², Evangelia Patziarela², Vasiliki Konstantinidou², Eirini Poimenidou², Evgenia Lympiraki²

¹Aristotle University of Thessaloniki, Faculty of Sciences, Laboratory of Biological Chemistry, Thessaloniki, Greece;
²Alexandron Technological Education Institute of Thessaloniki, Department of Medical Laboratory Studies, School of Health and Care Professions, Thessaloniki, Greece

Abstract

Citation: Makedou KG, Vagdatli E, Patziarela E, Konstantinidou V, Poimenidou E, Lympiraki E. Total Antioxidant Capacity, Hematological and Coagulation Parameters after Orthodox Christian Fast. Open Access Maced J Med Sci. <https://doi.org/10.3889/oamjms.2018.095>

Keywords: Orthodox Christian fast; Hematological parameters; Coagulation parameters; Antioxidant capacity

***Correspondence:** Kali G Makedou, Aristotle University of Thessaloniki, Faculty of Sciences - Laboratory of Biological Chemistry, Thessaloniki, Greece. E-mail: kmakedou@auth.gr

Received: 11-Nov-2017; **Revised:** 06-Jan-2018; **Accepted:** 07-Jan-2018; **Online first:** 14-Feb-2018

Copyright: © 2018 Kali G. Makedou, Eleni Vagdatli, Evangelia Patziarela, Vasiliki Konstantinidou, Eirini Poimenidou, Evgenia Lympiraki. This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0)

Funding: This research did not receive any financial support

Competing Interests: The authors have declared that no competing interests exist

BACKGROUND: Orthodox Christian believers fast abstaining from meat, eggs, dairy products or even fish and oil in certain days of the fasting period, three times a year.

AIM: The present study aimed to investigate the impact of a 48-day fast before Easter in blood count parameters, coagulation and antioxidant status.

MATERIAL AND METHODS: A total of 35 healthy volunteers, 19-66 years old, were included in the study. White blood cells (WBC), lymphocytes (Lymph), granulocytes (Gran), haemoglobin (Hb), hematocrit (Ht), red blood cells (RBC), mean erythrocyte volume (MCV), platelets (Plt), were measured. Blood coagulation parameters, such as PT, aPTT, fibrinogen concentration, factor VII activity were also determined, and INR (sample/control) and aPTT ratio (aPTT_{sample}/aPTT_{control}) were calculated. Total antioxidant capacity (TAC) was assayed.

RESULTS: Levels of all parameters remained within normal. By the end of the fasting period, lymphocytes and TAC levels were significantly increased ($p = 0.011$), whereas all the other parameters, except fibrinogen, were significantly decreased.

CONCLUSION: Orthodox Christian fast impairs all haematological and coagulation parameters and seems to be beneficial in the body antioxidant protection.

Introduction

Many religions, including Orthodox Christian religion, require fasting as part of the preparation of believers for certain periods of the year [1]. Greek Orthodox Christian believers fast abstaining from meat, eggs, dairy products, even from fish and oil in certain days of the fasting period; protein and fat intake decrease, saturated and trans-fat is eliminated. The main constituents of this fast include fruits, vegetables, grains, cereals and legumes.

Fasting periods for a Greek Orthodox Christian believer begin 40 days before Christmas, 48 days before Easter and 15 days before Assumption in August.

The present study aimed to investigate the

impact of Orthodox Christian fast during a 48 - day period before Easter in blood count parameters, coagulation and antioxidant status.

Methods

A total of 35 healthy volunteers, aged 19 - 66 years old, were included in the study. All of the participants were followers of the Orthodox Christian fast, and none of them was taking medication that could affect coagulation parameters or antioxidant status. All subjects signed a consent form for the participation in the study.

Blood samples (whole blood with EDTA,

serum and citrate plasma) were collected, after overnight fast, before and after the pre - Easter fasting period for those participants that followed the fast, whereas only one blood sample was collected from each non - fasting adult. For the purpose of the study, whole blood parameters, such as count of white blood cells (WBC), lymphocytes (Lymph), granulocytes (Gran), hemoglobin (Hb), hematocrit (Ht), red blood cells (RBC), mean erythrocyte volume (MCV), platelets (Plt), were measured by the analyzer Cell - Dyn 1800 (Abbott Laboratories, Chicago, Illinois, USA). Blood coagulation parameters, such as PT, aPTT, fibrinogen concentration, factor VII activity were also determined by the analyzer ACL Elite, (Instrumentation Laboratory, Milano, Italy – Beckman Coulter, Brea, California, USA), and INR (PTsample/PTcontrol) and aPTT ratio (aPTTsample/aPTTcontrol) were calculated. All these parameters were measured immediately after the blood collection, whereas serum was stored in - 80°C until total antioxidant capacity (TAC) was assayed by ELISA (Sigma - Aldrich Inc., PO Box 14508, St Louis, MO, USA).

Data were analysed with IBM SPSS Statistics 20 for Windows. The normality of distribution of values was investigated with Kolmogorov-Smirnov test. Within-group comparisons before and after fasting were performed with paired samples T-test, as long as the distribution of values was normal. Statistical significance was set at $P < 0.05$.

Results

Mean values of blood count parameters, coagulation parameters and TAC in the study group, before and after the fasting period, are shown in Table 1.

Table 1: Differences of blood count parameters, coagulation parameters and AC in the study group (n=35), before and after the fasting period

Parameter	Before fast	After fast	P
	Mean (SD)		
WBC ($\times 10^3/\mu\text{L}$)	5.685 (1.24)	4.876 (0.89)	<0.001
Lymphocytes	1.846 (0.45)	2.073 (0.57)	0.004
Granulocytes	3.485 (0.97)	2.439 (0.58)	<0.001
RBC ($\times 10^6/\mu\text{L}$)	4.64 (0.41)	4.56 (0.37)	0.036
Hemoglobin (g/dL)	13.4 (1.10)	12.9 (0.91)	<0.001
Hematocrit (%)	41.4 (3.20)	38.6 (2.62)	<0.001
MCV (fL)	89.14 (7.70)	85.05 (6.49)	<0.001
Platelets ($\times 10^9/\mu\text{L}$)	238.50 (41.80)	225.60 (34.30)	0.005
INR	0.94 (0.048)	0.95 (0.049)	0.028
aPTT ratio	1.07 (0.097)	0.91 (0.096)	<0.001
Fibrinogen (mg/dL)	355.23 (75.65)	341.06 (61.71)	0.135*
Factor VII (%)	104.8 (18.9)	97.7 (19.4)	0.003
TAC (mmol/L)	0.84 (0.28)	0.98 (0.04)	0.011

* Non - significant. Abbreviations: WBC, white blood cells; RBC, red blood cells; MCV: mean erythrocyte volume; INR: international normalised ratio; TAC, total antioxidant capacity.

All mean values were within normal range before the initiation of fast. Significant alterations,

within normal values, were observed after 48 days of fast in most of the parameters, except fibrinogen. In particular, the parameters that decreased significantly were WBC, granulocytes, haemoglobin, RBC, MCV, platelets, INR, aPTT and FVII activity, whereas lymphocytes presented significant elevation.

About TAC levels, there was statistically significant increase by the end of the fasting period ($P = 0.011$) (Table 1, Figure 1).

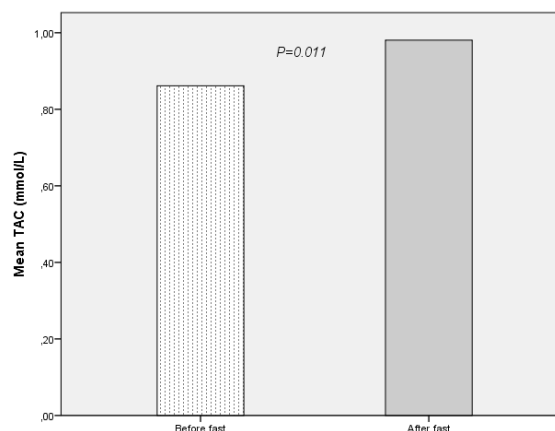


Figure 1: Changes in mean TAC values before and after fast

Discussion

Although many studies have investigated the impact of nutrition on the levels above-mentioned parameters, on coagulation [2][3][4] and, some, to the plasma TAC levels [5][6][7], very little evidence exists on the impact of Orthodox Christian fasting on the above mentioned parameters. The present study states that there is a significant modification of blood parameters after a 48 - day fasting period.

Orthodox Christian fast is very similar to the Mediterranean diet, with olive oil as the only oil used and with deprivation even of oil in certain days of the week. Milk and dairy products are excluded from this dietary pattern, as well as meat and eggs. A significant increase of INR and decrease of aPTT ratio shows an impact of the fast on both the exogenous and the endogenous coagulation pathway. This study shares some common findings with that of Liali et al. [8], but the mechanism of the activation of both pathways remains to be clarified. Moreover, there was a significant reduction in the platelets count after the fast in the study group. Fibrinogen levels were not altered significantly, in contrast to the study of Mezzano et al., who studied the impact of Mediterranean diet. The significant reduction of FVII activity after the fast can be attributed to the use of

olive oil, rich in monounsaturated fatty acids, then other oils and the abstinence from saturated fat, as shown by the study of Allman - Farinelli MA et al. [9]. Moreover, Orthodox Christian fast is enriched in nuts, vegetables and seeds, which have shown to exert beneficial effects on coagulation parameters [10], something that is stated by the results of the present study, as well.

About white blood cells, to our knowledge so far there is no other study investigating the impact of Orthodox Christian fast on white blood cell count. Nevertheless, the study of Latilynia et al., [11] showed that Ramadan has a beneficial effect on neutrophil phagocytic function. In contrast to these results, the present study showed a significant decrease in the count of granulocytes and total white blood cells, with a significant increase in lymphocytes' count, after the 48 - day pre - Easter fasting period. Nevertheless, the mechanism for these alterations is not yet known.

Furthermore, it seems that Ht, Hb and MCV are significantly decreased after a 48-day fast, within the normal range, in contrast to the study of Sarri et al., who showed non - significant reduction of Hb after a 40 - day pre - Christmas Orthodox Christian fast [12]. Another parameter investigated in the present study was antioxidant status, in the study group before and after fast. The findings, presented in Table 1 show that members of the study group had significantly higher TAC serum levels after the fast. This can be attributed to the constituents of the Orthodox Christian fast, such as olive oil, nuts, red wine, vegetables and seeds, all previously shown to be rich in flavonoids, carotenoids and other antioxidants [13].

In conclusion, the findings of the present study suggest that the Orthodox Christian fast, a vegetarian type of diet followed for three periods of time each year, has a significant impact on most parameters studied. In particular, blood count and coagulation parameters were significantly impaired by the fast, but within normal range. Hematocrit, haemoglobin, MCV and RBC were significantly decreased, as well. Endogenous and exogenous coagulation pathways were both significantly impaired, whereas there may not be an impact on blood coagulation due to contradictory effects on the two pathways. On the whole, the Orthodox Christian fast might not have a serious impact on the fasters' health, due to its short duration, that keeps the alterations within normal range. On the other hand, it seems that this fast enhances the antioxidant system and might have long-term health benefits. The results of the present study, in addition to the results of previous studies [12][14][15] show that Orthodox Christian fast might help in the prevention of cardiovascular diseases. Nevertheless, further studies are needed to establish the findings of the present study.

References

1. Trepanowski JF, Bloomer RJ. The impact of religious fasting on human health. *Nutr J.* 2010; 9:57. <https://doi.org/10.1186/1475-2891-9-57> PMID:21092212 PMCID:PMC2995774
2. Pieters M, de Maat MP. Diet and haemostasis — A comprehensive overview *Blood Rev.* 2015; 29(4):231-41. <https://doi.org/10.1016/j.blre.2014.12.005> PMID:25555324
3. Vorster HH, Cummings JH, Jerling JC. Diet and haemostatic processes. *Nutr Res Rev.* 1997; 10(1):115-35. <https://doi.org/10.1079/NRR19970007> PMID:19094260
4. Perez-Jimenez F, Delgado Lista J, Perez-Martinez P, et al. Olive oil and haemostasis: a review on its healthy effects. *Public Health Nutr.* 2006; 9(8A):1083-8. <https://doi.org/10.1017/S1368980007668566> PMID:17378945
5. Zamora-Ros R, Serafini M, Estruch R, et al.; PREDIMED Study Investigators. Mediterranean diet and non-enzymatic antioxidant capacity in the PREDIMED study: evidence for a mechanism of antioxidant tuning. *Nutr Metab Cardiovasc Dis.* 2013; 23(12):1167-74. <https://doi.org/10.1016/j.numecd.2012.12.008> PMID:23484910
6. Kolomvotsou AI, Rallidis LS, Mountzouris KC, et al. Adherence to Mediterranean diet and close dietetic supervision increase total dietary antioxidant intake and plasma antioxidant capacity in subjects with abdominal obesity. *Eur J Nutr.* 2013; 52(1):37-48. <https://doi.org/10.1007/s00394-011-0283-3> PMID:22237557
7. Ortner HM, Vitali ČD, Rahelić D, Božikov V. The Effect of the Mediterranean Diet on Serum Total Antioxidant Capacity in Obese Patients: A Randomized Controlled Trial. *J Am Coll Nutr.* 2016; 35(3):224-35. <https://doi.org/10.1080/07315724.2014.982770> PMID:25989426
8. Liali M, Printz's L, Vagdatli E, Pantziarella E, Konstantinidou V, Limperaki E, et al. The Effects of Orthodox Christian Fasting on Blood Coagulation. *IJBLS.* 2015; 4(2):39-43.
9. Allman-Farinelli MA, Gomes K, Favaloro EJ, Petocz P. A diet rich in high-oleic-acid sunflower oil favorably alters low-density lipoprotein cholesterol, triglycerides, and factor VII coagulant activity. *J Am Diet Assoc.* 2005;105(7):1071-9. <https://doi.org/10.1016/j.jada.2005.04.008> PMID:15983523
10. McEwen BJ. The influence of diet and nutrients on platelet function. *Semin Thromb Hemost.* 2014; 40(2):214-26. <https://doi.org/10.1055/s-0034-1365839> PMID:24497119
11. Latifynia A, Vojgani M, Gharagozlou MJ, Sharifian R. Neutrophil function (innate immunity). *J Ayub Med Coll Abbottabad.* 2009; 21(4):111-5. PMID:21067041
12. Sarri KO, Kafatos GA, Higgins S. Is religious fasting related to iron status in Greek Orthodox Christians? *Br J Nutr.* 2005; 94:198–203. <https://doi.org/10.1079/BJN20051472> PMID:16115353
13. Gonçalves S, Moreira E, Grosso C, Andrade PB, Valentão P, Romano A. Phenolic profile, antioxidant activity and enzyme inhibitory activities of extracts from aromatic plants used in Mediterranean diet. *J Food Sci Technol.* 2017; 54(1):219-227. <https://doi.org/10.1007/s13197-016-2453-z> PMID:28242919 PMCID:PMC5305718
14. Sarri KO, Tzanakis NE, Linardakis MK, Mamalakis GD, Kafatos AG. Effects of Greek Orthodox Christian Church fasting on serum lipids and obesity. *BMC Public Health.* 2003; 3:16. <https://doi.org/10.1186/1471-2458-3-16> PMID:12753698 PMCID:PMC156653
15. Sarri KO, Linardakis MK, Bervanaki FN, Tzanakis NE, Kafatos AG. Greek Orthodox fasting rituals: a hidden characteristic of the Mediterranean diet of Crete. *Br J Nutr.* 2004; 92(2):277-84. <https://doi.org/10.1079/BJN20041197> PMID:15333159