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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и http://www.nlm.nih.gov/bsd/uniform_requirements.html В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректур авторам не высылаются, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of 3 centimeters width, and 1.5 spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - 12 (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned
Requirements are not Assigned to be Reviewed.**

ავტორთა საქურაღებოლ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დაიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგების ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფხიხლებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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INTERMITTENT FASTING (5:2) VS. NON-FASTING: A COMPARATIVE ANALYSIS OF ANTHROPOMETRIC PARAMETERS, DEPRESSION, AND STRESS IN HEALTHY ADULTS - A CROSS-SECTIONAL STUDY

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Abstract.

Abstract: Intermittent fasting, particularly the 5:2 diet, has emerged as a popular dietary strategy for weight loss and metabolic health improvement.

Objective: To compare the anthropometric and nutritional profiles among individuals adhering to the 5:2 intermittent fasting diet (IF 5:2) and non-fasting individuals.

Methods: A cross-sectional study was conducted between December and June 2023. The study included 71 fasting and non-fasting patients who attended a private general medical practice. Among them, 35 were regular fast IF 5:2, consisted of two days per week fasting (Monday and Thursday) and five days per week of habitual intake, and 36 were non-fasting individuals. The two groups were matched for age and gender. Data were collected through a pre-established questionnaire, anthropometric measurements, and a dietary survey (24-hour recall and dietary habit). Depressive symptoms using the Hospital Anxiety and Depression scale and stress levels using the Perceived Stress Scale 4 were performed

Results: Both groups had an average age of 55 years. None of the fasting group had a history of diabetes or dyslipidemia. There were no significant differences in weight and BMI between the two groups. The diet of fasters contained lower levels of proteins, lipids, and carbohydrates, while non-fasting individuals had a diet richer in potassium, phosphor and sugars. According to the HAD (Hospital Anxiety and Depression) score, the fasting group had fewer depressive symptoms ($p=0.04$). However, the level of stress was found to be similar between the two groups ($p=0.19$).

Conclusion: This study suggested that there is a difference in the nutritional profiles of fasting and non-fasting subjects.

Key words. Intermittent fasting, dietary survey, obesity, nutrition, fasting, anthropometric profiles, nutritional profiles, depression, stress levels, hospital anxiety and depression scale.

Introduction.

Obesity remains a significant public health challenge, and in recent years, intermittent fasting (IF) has emerged as a popular weight-loss strategy that offers potential health benefits [1]. IF involves voluntary or involuntary deprivation of food for specific periods. Traditionally practiced by Muslims for religious reasons, IF has deep historical roots, with examples found in ancient Greece, where fasting was utilized to prepare athletes for physical training ahead of the Olympic Games and

even as a means to enhance intelligence and clarity, as seen in the fasting practices of philosophers like Pythagoras.

The World Health Organization (WHO) has also acknowledged that fasting can strengthen the immune system [2]. Moreover, research studies have shown that fasting induces moderate hormonal and metabolic changes, reducing oxidative stress and potentially contributing to longevity [3].

Intermittent fasting comes in various forms, including time-restricted eating, alternative day fasting, periodic fasting, and fasting mimicking diet [4]. The 5:2 intermittent fasting diet (IF 5:2) involves cycles of limited food intake for two days a week (Fasting from sunrise to sunset), while unrestricted eating is permitted on the other five days. The intermittent fasting on Mondays and Thursdays is one such variation of periodic fasting. Other forms include daily intermittent fasting, where fasting periods occur for a few hours each day (e.g., 14/10, 16/8, 23/1), and water fasting, where only water is consumed for several days. Additionally, religious fasting practices, such as observing the month of Ramadan or specific days like the 13th, 14th, and 15th of each month in the Islamic calendar, are also common [5].

In Tunisia and other Arab countries, religious fasting is deeply ingrained in the culture, and while fasting on Mondays and Thursdays is based on the Sunnah (teachings of the Prophet Muhammad), it is practiced less frequently compared to other religious fasting periods. However, fasting alone may not suffice; balanced and healthy dietary practices during the non-fasting periods play a crucial role. Unfortunately, overeating in response to food restriction is often a primary reason why people struggle to maintain weight loss after fasting [6].

Given the importance of intermittent fasting in cultural practices and its potential impact on nutrition, this study aims to compare the nutritional profiles of individuals who regularly fast on Mondays and Thursdays with those who do not fast.

Methods.

Compliance with Ethical Standards: The study was approved by the Ethical Committee of the national institute of nutrition of Tunis (10/2023). All procedures performed in this study were in accordance with the ethical standards of the institution and the 1964 Helsinki declaration. Informed consent was obtained from all individual participants included in the study. There is no conflict of interest. Written informed consent was taken from all participants.

Sample size: For a descriptive comparison, the sample size formula for estimating a mean still applies $n=1.96^2 \times \sigma^2/E^2$

where: σ = estimated standard deviation of weight=3.16 kg [7] and E = margin of error=1 kg. We enter these values in G*Power, and we get 38.

Participants: We conducted a cross-sectional study, recruiting participants from two distinct sources. One part of the population was recruited from a private general medical practice, while the other consisted of healthy volunteers. The recruitment process took place from December to June 2023, during which we enrolled all eligible fasting individuals who sought medical consultation within this period. Notably, we did not recruit participants during the month of Ramadan. Both groups were matched for age and sex.

We enrolled all patients who practiced fasting from dawn to sunset every Monday and Thursday regularly for at least the past 6 months (IF 5:2 group). These individuals were under the care of the medical practice for various health concerns but were also willing to participate in the study. On the other hand, the healthy volunteer group consisted of individuals from the general population who voluntarily expressed their interest in participating in the study.

Our cross-sectional study included 71 participants divided into two groups based on their fasting habits:

1. Regular fasters on Mondays and Thursdays (IF 5 :2 group).
2. Matched controls for age and sex who did not observe fasting.

Inclusion criteria comprised adults who had been practicing regular fasting on Mondays and Thursdays for at least the past 6 months without interruption and were willing to participate in the study.

Exclusion criteria encompassed irregular fasters, individuals under the age of 18, non-cooperative participants, pregnant and breastfeeding women, volunteers practicing intermittent fasting, those with cardiovascular diseases, thyroid disorders, under oestro-progestative treatment, undergoing long-term corticosteroid therapy, diabetics requiring treatment other than metformin or diet or previous bariatric surgery.

Methods and measurements:

Data collection was carried out through interviews and physical examinations. We collected general patient data, including demographic details, marital status, socioeconomic status, education level, personal medical history, tobacco and alcohol consumption, physical activity level, and eating behaviour disorders.

Anthropometric measurements were recorded, including weight, height, and waist circumference. Body Mass Index (BMI) was calculated by dividing weight in kilograms by height in meters squared.

We also measured blood pressure and evaluated various aspects of participants' lifestyles, including physical activity using the short form of the International Physical Activity Questionnaire (IPAQ) [8] and depressive symptoms using the Hospital Anxiety and Depression scale (HAD) [9]. Furthermore, we assessed perceived stress levels using the Perceived Stress Scale 4 (PSS-4) [10].

Physical activity was measured using the short version of the International Physical Activity Questionnaire (IPAQ) in its French version. This validated questionnaire estimates the physical activity performed over the past 7 days, capturing its frequency, duration, and intensity. It allowed defining three levels of physical activity: high, moderate, and low, as well as the number of MET-minutes, which represents the average energy expended per minute by an individual [8].

To assess the presence of depressive symptoms in our patients, we used the Hospital Anxiety and Depression Scale (HADS). This scale consists of seven questions related to anxiety and another seven related to depression, thereby providing two separate scores. The maximum score for each component is 21 points [9]. In this study, only the depression part of the HADS was administered.

The interpretation based on the sum of scores obtained for each item is as follows:

- Less than 8 points: absence of depressive symptoms.
- 8 to 10 points: doubtful depressive symptoms.
- 11 and above: definite depressive symptoms.

We used the short version of the Perceived Stress Scale 4 (PSS-4) [11]. It is a validated scale that assesses levels of perceived stress in the population [10]. The PSS-4 consists of a 4-question multiple-choice questionnaire. Unlike the Hospital Anxiety and Depression Scale (HADS), the Perceived Stress Scale (PSS-4) does not have a specific threshold value. The analysis of the results indicates that the higher the score, the higher the perceived stress [12].

For the dietary survey, we employed the 24-hour dietary recall and dietary habits. Participants were asked to recall all the food and beverages they consumed over the past 24 hours, including the proportion and frequency of their consumption.

For individuals following the intermittent fasting (IF) 5:2 regimen, where they fast for two days a week and eat regularly on the other five days, we made a specific modification to the survey approach. Since the fasting days might not accurately represent their overall dietary patterns, we chose a day of non-fasting (regular eating) to conduct the dietary survey. This decision ensured that the collected data would be more representative of their weekly dietary intake.

We used the "Bilnut" computer software to convert the qualitative and quantitative food intake data into nutrient values. This process enabled us to estimate the participants' spontaneous nutritional intake.

Statistical analysis:

The data was analyzed using SPSS software. For qualitative variables, we calculated absolute frequencies and relative frequencies (percentages). For quantitative variables, we computed means, medians, standard deviations, and identified extreme values.

To compare means from multiple (> 2) groups, we utilized parametric analysis of variance (ANOVA) tests. For comparing percentages, we employed either the Pearson chi-square test or the bilateral Fisher's exact test. As the groups were matched for sex and age, we employed the appropriate statistical method, which is "Mann-Whitney test".

In all statistical tests, the significance level was set at 0.05.

Results.

Characteristics of the population:

A flowchart displaying how participants were included for this study is shown in Figure 1.

The final dataset consisted of 71 participants, with baseline characteristics shown in Table 1.

The two groups were comparable in terms of anthropometric measures. We noticed that no one in the IF 5:2 group had dyslipidemia, they practiced more sports according to the IPAQ, and they had fewer symptoms of depression than the control group that did not fast.

We investigated the presence of eating disorders such as binge eating, night eating syndrome, and snacking, which were all more frequent in the non-fasting group, but the difference was not significant.

Doubtful depressive state was more common in non-fasters than in fasters (30.6 vs 8.6 %). The difference was significant ($p=0.04$). However, the majority of the population did not show depressive symptomatology (88.6% for IF 5:2 group vs 63.9 % in control group).

The PSS 4 (Perceived Stress Scale 4-item version) score for the IF 5:2 group was 7.06, and for the control group, it was 6.86, with a p -value of 0.19.

For the results of the dietary survey between the two groups are in Table 2.

The analysis of Table 2 reveals significant differences in daily nutrient intake between individuals practicing the IF 5:2 diet and the control group. Notably, the IF 5:2 group exhibited a lower daily energy intake compared to the control group with a significant p -value of 0.006. The IF 5:2 group also showed

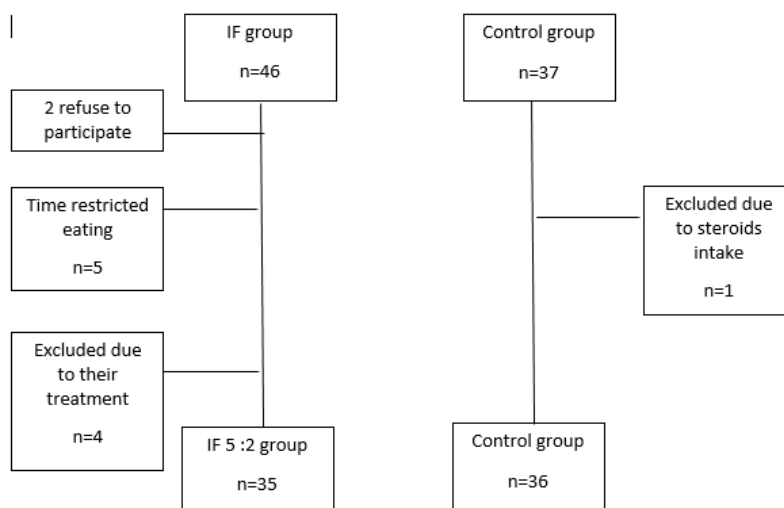


Figure 1. Participant flow chart for inclusion into this study.

Table 1. Characteristics of the participants in this study.

Variable	IF 5:2 n=35	Controls n=36	p
	mean±SD	mean±SD	
Age (years)	51.97±14	50.14±13	0.57
Female (n)	29	30	0.95
Personal history	Diabetes n (%)	6 (16.7)	0.52
	Hypertension n (%)	10 (28.6)	0.73
	Dyslipidemia n (%)	0	7 (19.4)
Weight (kg)	78.48±13	74.29±11	0.17
BMI (Kg/m ²)	28.7±5	27.2±6	0,26
Waist circumference (cm)	98.6±12	92.4±13	0,06
Systolic blood pressure (cmHg)	12.98±1	12.36±2	0.17
Diastolic blood pressure (cmHg)	8±1	7.8±1	0.55
IPAQ*	Low n (%)	20 (55.6)	0.01
	Moderate n (%)	13 (36.1)	
	High n (%)	4(11.4)	
Mean HAD** depression	4.4±3	5.94±3	0.04
Mean PSS 4*** score	7.06±3	6.86±3	0.19

*IPAQ: International Physical Activity Questionnaire

**HAD: Hospital anxiety and depression scale

***PSS4: Perceived Stress Scale 4

Table 2. Macro and micronutrients intake per day in our population.

	Means±deviation standard		P
	IF 5 :2	Controls	
Energy (kcal)	1995,78±743	2629,44±1100	0,006
Proteins (g)	59,15±26	85,31±36	0,001
Lipids (g)	86,22±44	118,43±54	0,008
Carbohydrate (g)	211,81±120	295,76±160	0,01
SFA (% TEI) †	10,53±9	10,33±5	0,84
PUFA (% TEI)	11,53±15	13,89±18	0,28
MUFA (% TEI)	17,04±15	17,24±17	0,92
Cholesterol (mg)	228±238	371,58±393	0,06
Iron (mg)	11,61±5	12,52±4	0,48
Zinc (mg)	4,43±4	5,06±2	0,43
Magnesium (mg)	143,2±95	176,31±90	0,13
Calcium (mg)	501,17±200	569,62±263	0,22
Sodium (mg) §	897,83±604	1202,31±789	0,07
Potassium (mg)	1527,91±703	1914,17±872	0,04
Phosphore (mg)	633,91±310	870,67±477	0,01
Vitamin C (mg)	96,29±59	102,89±79	0,69
Vitamin E (mg)	11,82±7	14,22±12	0,34
Vitamin B1 (mg)	0,68±0,5	0,76±0,43	0,46
Vitamin B9 (ug)	156,11±140	147,03±70	0,73
Fiber (g)	16,88±11	18,47±9	0,52
Sugar (g) ‡	24,87±2	42,5±4	0,04

† = %TEI stands for percent of total energy intake.

‡ = the value for sugar includes both added and naturally occurring sugar.

§ = sodium intake does not include discretionary salt use.

SFA= saturated fatty acid.

PUFA= polyunsaturated fatty acid.

MUFA=monounsaturated fatty acid.

lower consumption of proteins, lipids, and carbohydrates in comparison to the control group. The IF 5:2 group had significantly lower sugar and potassium intake compared to the control group.

Discussion.

There were no significant differences in weight and BMI between the two groups. According to the IPAQ score for physical activity, fasters were more active ($p=0.01$). The dietary survey of the 5:2 intermittent fasting group revealed that their diet is less rich in calories, lipids, proteins, carbohydrates, and sucrose compared to the control group. Similarly, the 5:2 intermittent fasting group had significantly fewer depressive symptoms according to the HAD score.

The majority of our population consists of women in their fifties. While it is true that the original purpose of fasting in our population is religious, they are justified in practicing intermittent fasting because it has beneficial effects on the brain and cognitive functions [13,14].

Regarding the personal history of dyslipidemia, the results were significant. None of the fasting group patients had a personal history of dyslipidemia, unlike the control group. According to a study conducted on obese women who fasted from dawn to sunset for a month, significant improvements in the lipid profile were observed, including total cholesterol, LDL cholesterol, and HDL cholesterol [15]. Another study demonstrated that fasting improved dyslipidemia by lowering

LDL cholesterol and triglyceride levels [16]. In a review article, Patterson and Sears showed that alternate-day fasting was as effective as traditional calorie restriction in reducing leptin and triglyceride levels while improving high-density lipoprotein cholesterol and adiponectin levels [17]. Muslims fasting during the month of Ramadan also showed better levels of HDL, LDL, and triglycerides [18]. Similarly, another study involving 83 obese participants showed improvements in HDL and LDL after 12 weeks of fasting every other day combined with exercise [19]. Recent research has explained the mechanisms through which intermittent fasting can improve blood lipid profiles [20]. Previous studies demonstrated that nuclear expression of peroxisome proliferator-activated receptor- α and peroxisome proliferator-activated receptor coactivator 1 α in the liver leads to increased fatty acid oxidation and Apo A production, while simultaneously reducing ApoB synthesis. Additionally, there is an increased fatty acid oxidation and decreased hepatic triglycerides and very-low-density lipoprotein (VLDL) production. Overall, these physiological changes can help reduce serum levels of VLDL and LDL-C [21].

No significant differences in anthropometric parameters were observed between the two groups in our study. When fasting is combined with calorie restriction, weight loss exceeding 5% of the initial body weight has been documented [22]. A meta-analysis conducted by Welton in 2020, encompassing 27 studies on intermittent fasting, revealed weight loss ranging from 0.8% to 13% of the baseline weight. Similarly, twelve

studies comparing intermittent fasting to calorie restriction reported comparable results [23]. Importantly, our study population engaged in intermittent fasting for only 2 days a week, underscoring the efficacy of this approach even with a reduced frequency in achieving significant weight loss within a relatively short timeframe. Notably, the practice of IF 5:2 for 28 consecutive days among a population of 52 participants resulted in a substantial and significant reduction in weight [24].

The relationship between physical activity and fasting has previously been recognized, but some explanation can be provided. Fasting can improve mood and energy levels, which may lead to increased physical activity. Fasting improves insulin sensitivity and metabolic indicators, as well as reducing inflammation, all of which can boost energy and performance [25]. Fasting has been associated to improved mood states, which may encourage people to be more active, according to Watanabe et al [26]. While fasting days are associated with lower activity, people frequently compensate by increasing activity on non-fasting days, indicating a cyclical pattern of behavior [27].

The depressive symptomatology was significantly higher in the non-fasting group. Both fundamental and clinical studies have suggested that short-term calorie restriction has antidepressant effects on depression and may offer new therapeutic avenues [28]. Furthermore, a study conducted in 2013 demonstrated significant reductions in anger, confusion, and overall mood disturbances in participants practicing intermittent fasting compared to the non-fasting group [29]. Fernandez-Rodriguez et al. showed that intermittent fasting had a positive influence on reducing depression scores [30]. These findings underscore the potential of intermittent fasting and specially 5:2 IF as a promising approach in managing depression symptoms and improving overall mood and well-being. However, further research is needed to fully understand the mechanisms behind these effects and to explore intermittent fasting as a potential therapeutic intervention for depression.

While there are several studies that have investigated changes in dietary behavior during Ramadan, there are fewer studies specifically focused on the 5:2 IF regimen.

For instance, Ali et al. conducted a prospective cohort study involving 366 adolescents in secondary schools. Dietary habits were assessed using a food frequency questionnaire, and dietary diversity was evaluated using a 24-hour dietary recall. The number and types of meals consumed during Ramadan differed considerably from those outside Ramadan. However, fasting led to a reduction in the consumption of foods from roots and tubers, legumes and nuts, and dark green leafy vegetables, while other food groups remained unchanged [31]. In a study similar to ours, thirty-eight overweight and obese participants were included and subjected to a 5:2 IF regimen. The selected participants included 27 men and 11 women. The IF 5:2 intervention consisted of two fasting days per week, either consecutive or non-consecutive, and five days of regular food intake. Four-day food records were prospectively completed to assess macronutrient and micronutrient intake at baseline and at the sixth week. The composition of the IF 5:2 diet was high in protein, moderate in fat, low in carbohydrates and fiber,

and showed insufficient consumption of certain micronutrients [32]. In another study, fifty-two participants were included and followed after 28 days of 5-2 fasting. There was a significant reduction in total energy intake during 5-2 fasting compared to before the diet. The consumption of carbohydrates, proteins, and fats proportionally decreased during 5-2 fasting. The authors concluded that 5-2 fasting was associated with a significant reduction in energy intake and weight loss over a 28-day period [33].

Our research has certain limitations: Firstly, a larger sample size would have been preferable to increase the statistical power of our tests and enhance the reliability of our findings. Secondly, the cross-sectional nature of our study could introduce a follow-up bias. Lastly, a minority of patients had available biological assessments, resulting in the omission of the biological parameters section. However, our study also presents several strengths: Firstly, to the best of our knowledge, this is the first study in Tunisia and worldwide to compare the nutritional profiles of regular fasters on Mondays and Thursdays with non-fasting individuals. Secondly, we utilized the BILNUT software to estimate the dietary intake of our patients, providing a more detailed view of their consumption of macronutrients, micronutrients, and dietary fibers. Lastly, our study benefited from the use of a wide range of validated questionnaires and scores, including the HAD, PSS4, and IPAQ, which added robustness to our data collection and analysis. These strengths contribute to the significance and originality of our research in exploring the differences between fasting and non-fasting individuals in terms of their dietary habits and nutritional profiles.

Conclusion.

In conclusion, our study comparing the nutritional profiles and health effects of regular fasters and non-fasting individuals has suggested a benefit of intermittent fasting. The findings from our study, along with existing literature, highlight the growing importance of considering intermittent fasting as a potential lifestyle intervention for promoting health and well-being. Future research in this area could open new avenues for personalized dietary approaches and interventions, enhancing the overall quality of life for individuals seeking to improve their health through fasting practices. Further studies with larger sample sizes and longitudinal designs are warranted to strengthen the evidence on intermittent fasting's efficacy and to explore its long-term effects on various health parameters.

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Authors' contribution:

Rym ben Othman: conceptualization and methodology.
Inchirah Karmous: data curation and crafting the original draft

of the work. Olfa Berriche: visualization and investigation process. Ramla Mizouri: supervision. Amina Bornaz: validation process. Ines Mannai: writing, reviewing, and editing. Fethi Ben Slama visualization and investigation. Henda Jamoussi: validation.

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