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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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STUDY OF THE ASSOCIATION BETWEEN ASTHMA, WEIGHT STATUS AND NUTRITIONAL INTAKE: RESULTS OF A TUNISIAN PILOT SURVEY

Chaima Jemai^{1,2*}, Haifa Zaibi^{2,3}, Tesnim Farhat⁴, Nesrine Dhieb¹, Achwak Mehrez¹, Mouna Djebbi¹, Zohra Hadj Ali¹, Yosra Htira^{1,2}, Faika Ben Mami^{1,2}.

¹Department "C" of Nutrition and Therapeutic Dietetics, National institute of nutrition of Tunisia, Tunisia.

²Faculty of medicine of Tunis

³Department of Pneumology, Charles Nicolle Hospital, Tunisia.

⁴Higher School of Health Sciences and Technology of Tunis, Tunis El Manar University, Tunis, Tunisia.

Abstract.

Objectives: The aim of this study was to assess asthma characteristics in adults based on weight status and nutritional intake.

Materials and Methods: This was a cross-sectional study conducted among asthmatic patients aged over 18 years. We collected epidemiological characteristics, asthma characteristics (duration, etiology, severity, disease control (GINA), exacerbations frequency, treatment regimen and adherence (MMA Scale), physical activity level (Ricci and Gagnon questionnaire), basic metabolism (Black & al. formula), energy expenditure, and body composition (bioelectrical impedance). Nutritional intake was assessed (dietary survey was analyzed using Bilnut software). Statistical tests were performed using SPSS 23.

Results: The mean age was 46.15 ± 14.13 years, and the sex ratio was 0.25. The majority of the population (75%) were overweight. With an average body fat of 34.96%. A total of 67.5% had an excessive caloric intake, and micronutrient intake was insufficient for the majority of the population. No significant association was found between asthma characteristics and either weight status or nutritional intake ($p=NS$).

Conclusion: Obesity and dietary errors were common, with no significant association with asthma characteristics.

Key words. Asthma, obesity, body composition, impedancemetry, micronutrients.

Introduction.

Chronic respiratory diseases are among the leading causes of morbidity and mortality worldwide. They affect at least 550 million adults and represents around 7% of all deaths across the world (4.2 million) [1]. Asthma is one of the most common chronic respiratory diseases and thus constitutes a significant public health issue. This disease is included in the Global Action Plan of the OMS for the prevention and control of non-communicable diseases and in the United Nations' Sustainable Development Goals for 2030 [2]. Its prevalence is rising worldwide, with approximately 330 million people suffering from asthma [3]. This prevalence is increasing alongside the westernization of lifestyles and urbanization. By 2025, the global urbanization rate is expected to rise from 45% to 59%, while the number of asthmatics could reach 100 million [4]. In Tunisia, the prevalence of asthma in adults is estimated at 6.5% [5].

Obesity has been identified as a factor associated with poor asthma control [6-8]. Obese individuals have increased asthma morbidity and reduced quality of life [9]. Currently,

the management of obese asthmatics should involve a weight reduction strategy, alongside a healthy, balanced, and varied diet, in addition to standard asthma therapies [10,11].

Several hypotheses have been proposed to understand the links between obesity and asthma [12,13]. One of the mechanisms discussed is the direct effect of obesity on lung mechanical functions, leading to reduced respiratory volumes. Indeed, the accumulation of fat in the thoracic and abdominal cavities causes pulmonary compression thus a concomitant reduction in lung volumes. Similarly, obesity leads to airway closure, which could exacerbate airway reactivity and alter the bioavailability of inhaled medications [14,15]. Furthermore, adipose tissue acts as an organ with specific secretory properties and interactions with the body's systems. It secretes adipokines that promote inflammation and may exacerbate asthma [16]. Genetic and epigenetic factors may also be involved [17,18]. More recently, it has been suggested that obesity could influence asthma by altering the composition of the gut microbiota.

Data on this relationship in Tunisia are limited, motivating this study to examine the characteristics of asthma in adults based on weight status and nutritional intake.

Methods.

1. Setting and Type of the study: This was a cross-sectional study conducted over a period of 6 weeks, from February 6, 2023, to March 18, 2023. It took place at the pneumology department of Charles Nicolle Hospital of Tunis and at the department C of the National Institute of Nutrition of Tunisia.

2. Studied population:

2-a. Sampling:

We recruited all asthmatic patients who consulted during the recruitment period.

2-b. Study Procedure:

***Inclusion Criteria:** We included patients aged over 18 years, followed for asthma in the pneumology department of Charles Nicolle Hospital for at least 6 months and who consented to participate in our study. The diagnosis of asthma was based on the GINA 2019 diagnostic criteria [19].

***Exclusion Criteria:** We did not include patients with other respiratory diseases, those with contraindications for bio-impedance analysis (such as electrical medical devices like pacemakers or cochlear implants), or conditions that could bias the results (e.g., edema, amputations...). We also excluded patients with psychiatric disorders that would make the interview and the clinical examination difficult, as well as those who, after the initial interview in the pulmonology department, did not consult in the department C to complete the nutritional assessment and body composition evaluation.

3. Data Collection:

3-a. Epidemiological Data: Epidemiological data (age, gender, geographic origin, socioeconomic status (SES) assessed based on three criteria: education level, profession, and social coverage), education level, profession, smoking (cigarettes, hookah, neffa), and illicit substance use), as well as characteristics of the asthmatic condition (duration, etiology, severity, disease control according to GINA [20], frequency and severity [21] of exacerbations (hospitalization in pulmonology/ICU), treatment regimen, and medication adherence according to the Moresky Medication Adherence Scale (MMAS)) were collected through an interview and a complete physical examination.

3-b. Energy Requirements and Physical Activity Level:

We calculated the basal metabolic rate (BMR (Kcal)) using the formula developed by Black & al [22] as follows:

Female (Kcal/day) = $[0,963 \times W \text{ (Kg)} + 0,48 \times H \text{ (m)} + 0,50 \times A \text{ (years)} - 0,13] \times (1000/4,1855)$

Male (Kcal/j) = $[1,083 \times W \text{ (Kg)} + 0,48 \times H \text{ (m)} + 0,50 \times A \text{ (years)} - 0,13] \times (1000/4,1855)$

To reduce underestimations and overestimations of basal metabolic rate (BMR), we made adjustments based on body mass index (BMI) (-1% BM for each BMI > 22 kg/m² and +1% BM for each BMI < 22 kg/m²) and based on age (-5% BM for each decade starting from age 40).

The theoretical daily energy requirement (DER) in kilocalories (Kcal) was estimated using the following formula: DER (kcal) = adjusted BMR × PAL

The physical activity level (PAL) was estimated using the Ricci and Gagnon questionnaire: a score of less than 18 points indicates a sedentary profile, a score between 18 and 35 points indicates an active profile, and a score of more than 35 points indicates a very active profile.

The difference between spontaneous caloric intake and the estimated theoretical DER was calculated. We then interpreted caloric intake as insufficient, adequate, or excessive.

3-c. Nutritional Intake: We conducted a dietary survey based on the dietary history method, initiated by a 24-hour recall. We assessed the weekly frequency of consumption of certain foods associated with the relief or exacerbation of asthma according to the literature [23].

We obtained a nutritional assessment by analyzing the patients' dietary surveys using the online Nutrilog software, which is based on the CIQUAL 2020 composition table validated and provided by the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) [17]. The nutritional assessment obtained was interpreted according to ANSES recommendations [24, 25].

According to the same reference, the interpretation of protein intake was based on ideal body weight (IBW). This was calculated using the Lorentz formula [26].

$$IBW \text{ (Kg)} = H \text{ (cm)} - 100 - (H \text{ (cm)} - 150) \times X$$

Where W (Weight) is in kg, H (Height) is in centimeters, and X = 4 for men and 2.5 for women.

3-d. Anthropometric Parameters: Height (cm) was measured using a telescopic height chart graduated in cm (Seca 224). The patient stood barefoot, with relaxed shoulders, arms hanging down, legs straight, heels together, and the head positioned so that the line of sight was perpendicular to the body. The height

chart was lowered until it touched the top of the head, and the measurement indicated was recorded as the patient's height.

Weight and body composition were evaluated using a professional bioelectrical impedance meter called Tanita BC 418 MA type, with the patient standing, barefoot, motionless, and lightly dressed, with an empty bladder and rectum.

We collected data on body fat mass (Kg), visceral fat mass (Kg), body fat percentage relative to weight (%), lean mass (Kg), muscle mass (Kg), bone mass (Kg), total body water weight (Kg), total body water percentage relative to weight (%), and visceral fat level [27].

Next, we calculated the body mass index (BMI) using the formula: BMI = W / H² (Kg/m²), where W (Weight) is in kg and H (Height) is in meters.

The BMI was interpreted according to the thresholds defined by the World Health Organization [28].

Statistical Analysis:

Data entry and analysis were performed using SPSS 23 software. We calculated simple frequencies for qualitative variables, and means, medians, standard deviations, and extreme values for quantitative variables. Comparisons of two percentages in independent series were conducted using the Chi-square test, and in cases where this test was not valid, the Fisher test was used. The comparison of two means in independent series was performed using the student's t-test. The threshold for statistical significance was set at p < 0.05.

Ethical Considerations:

This study was conducted in accordance with the Declaration of Helsinki principles. All patients were informed about the study procedures and gave their informed consent. We ensured the confidentiality and anonymity of their informations. No conflicts of interest were declared.

Results.

1. Sample Size: 40 patients were enrolled in the study.

2-a. Epidemiological, Anthropometric, and Asthma Characteristics of the Population: Epidemiological, anthropometric, and Asthma Characteristics of the Population are detailed in tables I and II.

2-b. Evaluation of the Nutritional Profile of the Population: Evaluation of the Nutritional Profile of the Population are detailed in tables III, IV, and V.

3. Study of the Association Between Asthma Characteristics, Weight Status, and Micronutrient and Fiber Intake: The study of the Association Between Asthma Characteristics, Weight Status, and Micronutrient and Fiber Intake are detailed in tables VI and VII.

Discussion.

Weight Status, Body Composition, and Asthma:

Since the 1990s, some epidemiological studies have suggested a relationship between asthma and obesity [29]. In fact, in asthmatic subjects, it has been shown that the prevalence of obesity is higher, reaching up to 58% in adults and 28% in children [30]. The weight status and body composition of an individual could be associated with an increase in the prevalence and severity of asthma in cases of obesity and excess body fat.

Table 1. Epidemiological, anthropometric, and body composition characteristics of the population.

Average age (years):	46.15 ± 14.13
Sex ratio:	0.25
Geographical origin (Urban/Rural):	97.5/2.5
Level of education:	
Secondary or higher/Primary or not schooled (%):	67.5/32.5
Socio-economic level: Good/Average (%):	67.5/32.5
Smoking status:	
Active/Passive/Former/Non-smoker (%):	0/50/12.5/37.5
Professional category:	
Employee/Retired/Manual worker/Student/Unemployed (%):	40/7.5/10/5/37.5
Marital status:	
Single/Married/Divorced/Widowed (%):	20/77.5/2.5/0
Illicit substance use (%):	0
Average weight (Kg):	75.9 ± 12.6
Average height (m):	161.7 ± 9.5
Average BMI (Kg/m ²):	29.1 ± 5.7
Weight status (%): Underweight/Normal BMI/Overweight/Obesity class 1/Obesity class 2/Obesity class 3:	2.5/22.5/27.5/30/17.5/0
Body composition:	
Average body fat (%):	34.96 ± 10
Fat mass (kg):	27.56 ± 10.76
Lean mass (kg):	48.92 ± 6.65
Muscle mass (kg):	46.54 ± 6.39
Bone mass (kg):	2.38 ± 0.30
Total body water (%):	47.62 ± 7.33
Visceral fat (Kg):	8.88 ± 4.07

Table 2. Characteristics of Asthma in the Population.

Average Duration [Extremes]: (Years):	14.30 ± 13.32 [1; 57]
Duration: <10 years / 10-20 / > 20 years:(%)	42.5 / 32.5 / 25
Average Age of Asthma Onset [Extremes]: (Years):	32.5 ± 17.08 [1; 66]
Age of Asthma Onset: <10 / 10-20 / 20-30 / 30-40 / >40 years: (%)	12.5 / 7.2 / 20 / 20/40
Severity (Intermittent Asthma / Mild Persistent / Moderate to Severe): (%)	2.5 / 75 / 22.5
Etiology (Allergic / Viral-induced / Asthma and Aspirin Intolerance) (%):	65 / 30 / 5
Asthma Control (Well / Partially / Not Controlled) (%):	27.5 / 35 / 37.5
Average Frequency of Severe Exacerbations per Year (%):	22.5% (15%)
Frequency of Hospitalizations per Year (in Pulmonology and Intensive Care) (%)	22.5 (15; 7.5)
Therapeutic Regimen: 1/2/3/4/5 (%):	2.5/ 65/ 10/2.5/10
Therapeutic Adherence (Good/Average/Poor) (%):	45/20/35

Table 3. Basal Metabolism, Energy Requirements, and Energy and Macronutrient Intake.

Average Basal Metabolism (Kcal/day):	1301.95 ± 209.21
Physical Activity Level (Inactive / Active / Very Active) (%):	82.5 / 15 / 2.5
Average Total Energy Expenditure (TEE) (Kcal/day):	1714.54 ± 420.30
Average Total Energy Intake (TEI) (Kcal/day):	1938.20 ± 753.35
Total Energy Intake (TEI) (Excessive / Insufficient) (%):	67.5 / 32.5
Average Caloric Difference (Kcal/day):	223.66 ± 773.96
Proteins: % TEI	15.63 ± 4.35
g/kg of ideal body weight/day:	1.32 ± 0.54
Carbohydrates:	
% TEI:	29.22 ± 8.90
g/day:	246.84 ± 110.43
g/kg of body weight/day:	4.28 ± 1.79
Lipids:	
% TEI:	51.43 ± 10.07
g/day:	62.56 ± 31.08
g/kg of body weight/day:	1.09 ± 0.57

Table 4. Descriptive Data of Micronutrients and Fibers Intake.

		Mean ± Standard Deviation	Sufficient Intake	Insufficient Intake
Calcium (mg/day):		453,73± 214,32	2,5%	97,5%
Phosphorus (mg/day):		948,38± 340,56	87,5%	12,5%
Potassium (mg/day):		2397,60± 806,69	10,0%	90,0%
Iron (mg/day):		8.11 ± 3.34	5.0%	95.0%
Magnesium (mg/day):		262.55 ± 100.55	30.0%	70.0%
Selenium (µg/day):		94.02 ± 41.19	67.5%	32.5%
Fat-Soluble Vitamins:	A (µg/day):	548,70± 215,83	32,5%	67,5%
	D (µg/day):	9,73± 2,91	5,0%	95,0%
	E (mg/day):	12,46± 5,43	65,0%	35,0%
Water-Soluble Vitamins:	C (mg/day):	94,26± 63,37	27,5%	72,5%
	B1 (mg/day):	2,28± 9,20	37,5%	62,5%
	B2 (mg/day):	1,31± 1,61	17,5%	82,5%
	B3 (mg/day):	15,77± 7,96	45,0%	55,0%
	B6 (mg/day):	1,33± 0,52	30,0%	70,0%
	B9 (µg/day):	195,74±71,77	5,0%	95,0%
	B12 (µg/day):	2,30±1,43	20,0%	80,0%
Fiber (g/day):		22,61±8,42	30 %	70,0%

Table 5. Frequency of Consumption (%) of Certain Foods per Week.

	Never	once	twice	3 times	4 times	5 times	6 times	daily
Fruits	42.5	2.5	5	2.5	10	5	2.5	30
Vegetables	25	7.5	5	12.5	10	10	0	30
Dairy products	0	0	0	0	0	0	0	100
chicken	7.5	5	2.5	7.5	7.5	17.5	22.5	30
fish	52.5	30	10	5	2.5	0	0	0
eggs	62.5	12.5	5	7.5	5	0	0	7.5
giblet	97.5	2.5	0	0	0	0	0	0
Cold cuts	87.5	2.5	2.5	0	5	0	0	2.5
Legumes	55	37.5	5	2.5	0	0	0	0
Sweet Products	30	15	10	7.5	5	2.5	2.5	27.5
Sodas	65	15	7.5	0	0	2.5	2.5	7.5
Fast food	65	15	7.5	0	0	2.5	2.5	7.5
Fried food	27.5	37.5	7.5	0	10	2.5	5	10

Table 6. Study of the Association Between Asthma Control, Weight Status, and Body Composition.

Variables	Asthma Control			p value
	Good	Partial	Poor	
Underweight % (n)	100% (n=1)	0	0	0,158
Normal BMI	33,3% (n=3)	11,1% (n=1)	55,6% (n=5)	
Overweight	36,4% (n=4)	45,5% (n=5)	18,2% (n=2)	
Obesity class 1	8,3% (n=1)	58,3% (n=7)	33,3% (n=4)	
Obesity class 2	28,6% (n=2)	14,3% (n=1)	57,1% (n=4)	
Body fat (%)	32,1 ± 12,5	34,2 ± 8,7	37,8 ± 9,0	0,452
Fat Mass (kg)	24,6 ± 12,3	27,2 ± 8,3	30,1 ± 11,7	0,452
Lean Mass (kg)	49,4 ± 6,4	50,5 ± 5,8	47,1 ± 7,6	0,308
Muscle Mass (kg)	47 ± 6,1	48,1 ± 5,5	44,8 ± 7,2	0,365
Visceral Fat (kg)	6,7 ± 4,3	9,9 ± 3,1	9,5 ± 4,4	0,114

Table 7. Study of the Association Between Asthma Control and Sufficient/Insufficient Intake of Micronutrients and Fiber.

Sufficient (%) / Insufficient (%) Intake:	Asthma Control			p value
	Good	Partial	Poor	
Vitamin A	30,8/25,9	46,2/29,6	23,1/44,4	0,401
Vitamin D	0/28,9	50/34,2	50/36,8	0,67
Vitamin E	19,2/42,9	42,3/21,4	38,5/35,7	0,223
Vitamin C	27,3/27,6	36,4/34,5	36,4/37,9	0,993
Vitamin B1	20/32	46,7/28	33,3/40	0,465
Vitamin B2	14,3/30,3	42,9/33,3	42,9/36,4	0,686
Vitamin B3	22,2/31,8	38,9/31,8	38,9/36,4	0,783
Vitamin B6	25/28,6	50/28,6	25/42,8	0,395
Vitamin B9	0/28,9	100/31,6	0/39,5	0,142
Vitamin B12	25/28,1	50/31,3	25,0/40,6	0,582
magnesium	25/28,6	41,7/32,1	33,3/39,3	0,845
phosphor	25,7/40	40/0	34,3/60	0,213
calcium	100/25,6	0/35,9	0/38,5	0,259
iron	50/26,3	50/34,2	0/39,5	0,519
selenium	29,6/23,1	40,7/21,3	29,6/53,8	0,318
potassium	50/25	50/33,3	0/41,7	0,25
fibers	25/28,6	50/28,6	25/42,9	0,395

Similarly, several studies have highlighted the consequences of the association between asthma and obesity, particularly impaired disease control, reduced response to inhaled treatments, and an increased risk of exacerbations requiring escalation to a more intensive treatment level [31,32].

In our study, we did not find a link between weight status and asthma control. This result may be explained by the high prevalence of overweight individuals in our population (75%).

In our study, we did not find a link between weight status and asthma control. This result may be explained by the high prevalence of overweight individuals in our population (75%). However, several studies have shown an association between obesity and asthma. According to a recent meta-analysis involving more than 300,000 adults, obesity increases the risk of asthma [33]. In another meta-analysis, the authors concluded that there is a "dose-response" relationship between body mass index (BMI) and the incidence of asthma [34]. Other studies have established that asthma is more difficult to control in asthmatics with overweight [35,36]. It is important to note that all the previously presented conclusions are based on the use of BMI as a measure to evaluate weight status and analyze the relationship with asthma control. However, BMI does not provide a faithful description of the distribution of body fat.

In our study, we demonstrated that body composition was characterized by an average fat mass of 34.96%. The association with the characteristics of the asthmatic condition was not retained.

In 2019, a cross-sectional study conducted among 65 asthmatics showed that 46% of participants were considered obese, with an average fat mass of 28%. A statistically significant correlation was observed between poor asthma control and higher fat mass levels in these patients [37].

Dietary Habits and Asthma Characteristics:

The results of our study highlight alarming dietary habits within the studied population. We found that nearly half of the participants never consume fruits, vegetables, eggs, nor fish. Additionally, 27.5% consumed sweet products daily, and 62.5% never eat eggs.

10% reported consuming fried foods daily, and 7.5% consume processed meats at least once a week. Thus, our population is characterized by a Western-style diet. This pro-inflammatory diet is associated with an increased risk of asthma [38-40].

A meta-analysis conducted in 2018 concluded that the consumption of fast food, particularly hamburgers, ≥ 3 times per week, is associated with severe asthma and respiratory wheezing compared to consumption of 1 to 2 times per week [41]. In a French prospective study, the consumption of processed meats was associated with an exacerbation of asthma symptoms [42]. A high consumption of pizza/savory pies, desserts, and processed meats has been linked to an increased risk of asthma attacks [43].

Similarly, a diet rich in fruits and vegetables helps meet antioxidant needs and may reduce the risk of developing asthma [44,45]. Consuming more than 5 servings per week is associated with good asthma control and a reduced frequency of exacerbations [46]. According to an Australian study, children who frequently consume fatty fish have fewer asthma-related respiratory symptoms [47]. This result may be explained by the high omega-3 content in these fatty fish.

Dietary Intake and Asthma:

The evaluation of caloric intake is an important step in analysing the nutritional balance of the studied population. The results of our study reveal that the average spontaneous caloric intake was 1938.20 ± 753.35 kcal/day, with 67.5% having a caloric intake exceeding their total energy expenditure.

The average proportions of protein, carbohydrates, and lipids were $15.63 \pm 4.35\%$, $29.22 \pm 8.90\%$, and $43 \pm 10.07\%$ of total energy intake (TEI), respectively. The intake of proteins, carbohydrates, and lipids was excessive in 10%, 10%, and 22.5%, respectively.

The results of our study regarding vitamin intake were concerning. 95% of the population had an insufficient intake of vitamin D. Vitamin D plays a crucial role in lung development

and the immune system, providing several beneficial effects. Among these, its potential to inhibit cytokines induced by allergens stands out, thereby reducing the risk of asthma [48].

However, the action of vitamin D is not limited to its anti-inflammatory effect on the respiratory tract. It also has the ability to decrease bronchial hyperreactivity and slow the remodelling of the airways by acting on the smooth muscles [49].

Similarly, the intake of antioxidant vitamins (A, C, and E) was insufficient for most of the population (67.5%, 35%, and 72.5%, respectively). According to the literature, deficiencies in vitamins A, C, and E are associated with an increased risk of asthma in adults [50,51]. A case-control study and a prospective study have shown a potential beneficial effect of vitamin E from food sources, while supplementation with vitamin E was not protective [52,53].

For all the studied B vitamins, more than 50% of the population had insufficient intake. Regarding minerals and trace elements, the majority had insufficient intake of calcium (97.5%), iron (95%), potassium (90%), and magnesium (70%). The entire population had excessive sodium intake. Some studies have highlighted the role of certain minerals in the development of respiratory diseases. Sodium influences smooth muscle contraction; A high-salt-diet may predispose individuals to pulmonary diseases by increasing bronchial hyperreactivity [54]. Magnesium helps maintain the electrical potential of membranes and can thus modulate the contractility of bronchial smooth muscles by promoting airway dilation [55].

Physical Activity and Asthma:

Our study highlights another concerning finding: 82.5% of patients exhibited physical inactivity. This sedentariness has been identified by several studies as a risk factor associated with poor asthma control, diminished quality of life, and more frequent access to healthcare services [57,58].

International guidelines propose clear algorithms for asthma management [59]. Non-pharmacological interventions, like nutritional management, have demonstrated their effectiveness [60, 61]. The Mediterranean diet, characterized by low saturated fat intake and rich in fruits and vegetables containing vitamins, minerals, fiber, and antioxidants, has been particularly beneficial in asthma by combating systemic and respiratory inflammation [62,63]. Weight loss interventions also contribute to improving asthma outcomes [64]. Weight loss leads to enhanced respiratory muscle strength and reduced dyspnea [65,66].

According to a randomized controlled trial, weight loss achieved through a combination of caloric restriction and physical exercise constitutes a major objective to prioritize as a first-line strategy for improving asthma [13]. Regular physical exercise, tailored to the capabilities of each individual, could promote improvements in pulmonary function, increase exercise capacity, enhance quality of life, and contribute to better control in asthma patients [67].

Seventy percent of the population had insufficient fiber intake. A study conducted in 2020 concluded that the consumption of fiber-poor foods is associated with the presence of asthma, respiratory wheezing, and a systemic inflammatory profile [56].

Strengths of the Study:

We report on a relevant and timely topic, employing a rigorous methodology with validated and reproducible methods. Despite the small sample size and random recruitment, we demonstrated a high prevalence of obesity. This indicates that this issue does not spare our country and that asthma patients are particularly affected.

Additionally, despite the limited sample size and the elevated prevalence of obesity, we identified several dietary errors increasingly associated with asthma. These dietary mistakes could represent a significant therapeutic target for controlling asthma and promoting overall health.

Limitations:

The cross-sectional nature of the study, the small sample size, and the lack of a control group are the main weaknesses of our research. Additionally, collecting data from two institutions was challenging, and the long questionnaire may have limited the reliability of the results. Increasing our sample size could enhance the robustness of future findings.

Furthermore, the analysis of the impact of diet on asthma is complicated due to the variability of dietary patterns. Cultural culinary habits may also influence dietary intake, adding another layer of complexity to the analysis.

Conclusion.

Asthma and obesity are major public health issues. It is crucial to emphasize that obesity is a contributing factor to the onset and poor control of asthma. Therefore, it is essential to raise awareness among asthmatic patients about the importance of a balanced diet and a healthy lifestyle.

Implementing a multidisciplinary approach that includes dietitians and exercise physiologists within asthma clinics and services could optimize clinical outcomes. By combining tailored nutritional advice with appropriate exercise programs, it is possible to enhance asthma management and improve patients' quality of life.

What Is Already Known on This Topic:

Asthma and obesity are among the leading causes of morbidity and mortality worldwide. International guidelines propose clear algorithms for asthma management.

What This Study Adds: Obesity and nutritional deficiencies are frequent among patients with asthma. These nutritional problems should be screened and managed systematically as they seem to be associated with poorly controlled asthma and altered quality of life.

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REFERENCES

1. Maladies respiratoires chroniques. NCD Alliance. 2017. <https://ncdalliance.org/fr/%C3%A0-propos-des-mnt/mnt/maladies-respiratoireschroniques>

2. Asthme. 2023. <https://www.who.int/fr/news-room/factsheets/detail/asthma>
3. New understanding of asthma medicines could improve future treatment. EurekAlert! 2023. <https://www.eurekalert.org/news-releases/844320>
4. Sonia T, Meriem M, Yacine O, et al. Prevalence of asthma and rhinitis in a Tunisian population. *Clin Respir J*. 2018;12:608-615.
5. The Global Asthma Report 2022. 2023. <http://globalasthmareport.org/burden/deaths.php>
6. Laouini I, Zaibi H, Ben Amar J, et al. L'indice de masse corporelle at-il un impact sur l'asthme ? À propos d'une population tunisienne. *Revue des Maladies Respiratoires*. 2019;36:A95.
7. Chabati O, Gharnaout M. Profil clinique et évolutif de l'asthme chez l'adulte obèse. *Revue algérienne d'allergologie*. 2019;4:56-60.
8. Wood LG. Diet, Obesity, and Asthma. *Ann Am Thorac Soc*. Nov 2017;14:S332-8.
9. Guguen C, Launois C, Dormoy V, et al. Asthme et obésité: mécanismes et pistes thérapeutiques. *Revue des Maladies Respiratoires*. 2020;37:134-143.
10. Didier A, Maillhol C. Asthme, alimentation et obésité. *Revue Française d'Allergologie*. 2011;51:126-129.
11. Guilleminault L, Williams EJ, Scott HA, et al. Diet and Asthma: Is It Time to Adapt Our Message? *Nutrients*. 2017;9:1227.
12. Guguen C, Launois C, Dormoy V, et al. Asthme et obésité: mécanismes et pistes thérapeutiques. *Revue des Maladies Respiratoires*. 2020;37:134-143.
13. Guilleminault L. Asthme de l'obèse ou l'importance des interventions non pharmacologiques. *La Presse Médicale Formation*. 2021;2:173-180.
14. Dixon AE, Peters U. The effect of obesity on lung function. *Expert Rev Respir Med*. 2018;12:755-767.
15. Watson RA, Pride NB, Thomas EL, et al. Reduction of total lung capacity in obese men: comparison of total intrathoracic and gas volumes. *J Appl Physiol* (1985). 2010;108:1605-1612.
16. Sood A, Shore SA. Adiponectin, Leptin, and Resistin in Asthma: Basic Mechanisms through Population Studies. *J Allergy (Cairo)*. 2013;2013:785835.
17. Murphy A, Tantisira KG, Soto-Quirós ME, et al. PRKCA: a positional candidate gene for body mass index and asthma. *Am J Hum Genet*. 2009;85:87-96.
18. Kuo NW, Tung KY, Tsai CH, et al. β -Adrenergic receptor gene modifies the association between childhood obesity and asthma. *J Allergy Clin Immunol*. 2014;134:731-3.e3.
19. GINA-2019-main-Pocket-Guide-French-wms.pdf. 2023. <https://ginasthma.org/wp-content/uploads/2019/09/GINA-2019-main-Pocket-Guide-Frenchwms.pdf>
20. GINA-Main-Report-2022-FINAL-22-07-01-WMS.pdf. 2023. <https://ginasthma.org/wp-content/uploads/2022/07/GINA-Main-Report-2022-FINAL-22-07-01-WMS.pdf>
21. Black AE, Coward WA, Cole TJ, et al. Human energy expenditure in affluent societies: an analysis of 574 doubly-labelled water measurements. *Eur J Clin Nutr*. 1996;50:72-92.
22. Guilleminault L, Williams EJ, Scott HA, et al. Diet and Asthma: Is It Time to Adapt Our Message? *Nutrients*. 2017;9:1227.
23. Ciqual. 2023. <https://ciqual.anses.fr/>
24. AVIS et RAPPORTS de l'Anses relatifs à l'Actualisation des repères du PNNS. 2023. <https://www.anses.fr/fr/system/files/NUT2012SA0103Ra-1.pdf>
25. Les références nutritionnelles en vitamines et minéraux ANSES [Internet]. Anses – Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail. 2021. <https://www.anses.fr/fr/content/lesr%C3%A9f%C3%A9rencesnutritionnelles-en-vitamines-et-min%C3%A9raux>
26. Comment mesurer la corpulence et le poids « idéal »? Histoire, intérêts et limites de l'indice de masse corporelle.
27. Graisse viscérale: comment en venir à bout | Tanita | TANITA Europe [Internet]. TANITA EUROPE B.V. 2023. Disponible sur: <https://tanita.fr/>
28. Classification de l'obésité et le surpoids chez l'adulte selon l'indice de masse corporelle (IMC) ou (BMI). 2023. https://www.alyabbara.com/utilitaires/calcul%20imc/IMC_fr_classification.html
29. Ca C, St W, S Z, et al. Prospective study of body mass index, weight change, and risk of adult-onset asthma in women. *Archives of internal medicine*. 1999;159:2582-2588.
30. Peters JI, McKinney JM, Smith B, et al. Impact of obesity in asthma: evidence from a large perspective disease management study. *Ann Allergy Asthma Immunol*. 2011;106:30-35.
31. Hedhli A, Essebaa S, Cheikhrouhou S, et al. Évaluation de la masse grasse et de l'indice de masse maigre au cours de l'asthme: quel lien avec le contrôle et la qualité de vie? *Revue des Maladies Respiratoires Actualités*. 2020;12:173-174.
32. Vortmann M, Eisner MD. BMI and health status among adults with asthma. *Obesity (Silver Spring)*. 2008;16:146-152.
33. Beuther DA, Sutherland ER. Overweight, obesity, and incident asthma: a meta-analysis of prospective epidemiologic studies. *Am J Respir Crit Care Med*. 2007;175:661-666.
34. Lv N, Xiao L, Camargo CA, et al. Abdominal and General Adiposity and Level of Asthma Control in Adults with Uncontrolled Asthma. *Ann Am Thorac Soc*. 2014;11:1218-1224.
35. Ma J, Strub P, Xiao L, et al. Behavioral weight loss and physical activity intervention in obese adults with asthma. A randomized trial. *Ann Am Thorac Soc*. 2015;12:1-11.
36. Hedhli A, Essabaa S, Mjid M, et al. Évaluation de la masse grasse au cours de l'asthme: association avec le contrôle et la qualité de vie. *Revue Française d'Allergologie*. 2020;60:378.
37. Özbey Ü, Uçar A, Shivappa N, et al. The Relationship between Dietary Inflammatory Index, Pulmonary Functions and Asthma Control in Asthmatics. *Iran J Allergy Asthma Immunol*. 2019;18:605-614.
38. Han YY, Forno E, Shivappa N, et al. The Dietary Inflammatory Index and Current Wheeze Among Children and Adults in the United States. *J Allergy Clin Immunol Pract*. 2018;6:834-841.e2.
39. Ep B, F K, N H, et al. Association between Western diet pattern and adult asthma: a focused review. *Annals of allergy, asthma & immunology: official publication of the*

- American College of Allergy, Asthma, & Immunology. *av* 2015;114.
40. Wang CS, Wang J, Zhang X, et al. Is the consumption of fast foods associated with asthma or other allergic diseases? *Respirology*. 2018;23:901-913.
 41. Cured meat intake is associated with worsening asthma symptoms. 2023. <https://pubmed.ncbi.nlm.nih.gov/27999171/>
 42. Varraso R, Kauffmann F, Leynaert B, et al. Dietary patterns and asthma in the E3N study. *Eur Respir J*. 2009;33:33-41.
 43. Garcia-Larsen V, Del Giacco SR, Moreira A, et al. Asthma and dietary intake: an overview of systematic reviews. *Allergy*. 2016;71:433-442.
 44. Romieu I, Varraso R, Avenel V, et al. Fruit and vegetable intakes and asthma in the E3N study. *Thorax*. 2006;61:209-215.
 45. Andrianasolo RM, Kesse-Guyot E, Adjibade M, et al. Associations between dietary scores with asthma symptoms and asthma control in adults. *Eur Respir J*. 2018;52:1702572.
 46. Hodge L, Salome CM, Peat JK, et al. Consumption of oily fish and childhood asthma risk. *Med J Aust*. 1996;164:137-140.
 47. Mendy A, Cohn RD, Thorne PS. Endotoxin Exposure, Serum Vitamin D, Asthma and Wheeze Outcomes. *Respiratory medicine*. 2016;114:61.
 48. Hall SC, Agrawal DK. Vitamin D and Bronchial Asthma: An Overview of Data from the Past 5 Years. *Clin Ther*. 2017;39:917-929.
 49. Riccioni G, Bucciarelli T, Mancini B, et al. Plasma lycopene and antioxidant vitamins in asthma: the PLAVA study. *J Asthma*. 2007;44:429-432.
 50. De Luis DA, Armentia A, Aller R, et al. Dietary intake in patients with asthma: a case control study. *Nutrition*. 2005;21:320-324.
 51. Larkin EK, Gao YT, Gebretsadik T, et al. New risk factors for adult-onset incident asthma. A nested case-control study of host antioxidant defense. *Am J Respir Crit Care Med*. 2015;191:45-53.
 52. Troisi RJ, Willett WC, Weiss ST, et al. A prospective study of diet and adult-onset asthma. *Am J Respir Crit Care Med*. 1995;151:1401-1408.
 53. Bartoszewski R, Matalon S, Collawn JF. Ion channels of the lung and their role in disease pathogenesis. *Am J Physiol Lung Cell Mol Physiol*. 2017;313:L859-72.
 54. Geiger H, Wanner C. Magnesium in disease. *Clin Kidney J*. 2012;5:i25-38.
 55. Saeed MA, Gribben KC, Alam M, et al. Association of Dietary Fiber on Asthma, Respiratory Symptoms, and Inflammation in the Adult National Health and Nutrition Examination Survey Population. *Ann Am Thorac Soc*. 2020;17:1062-1068.
 56. Hansen ESH, Pitzner-Fabricius A, Toennesen LL, et al. Effect of aerobic exercise training on asthma in adults: a systematic review and meta-analysis. *Eur Respir J*. 2020;56:2000146.
 57. Bacon SL, Lemiere C, Moullec G, et al. Association between patterns of leisure time physical activity and asthma control in adult patients. *BMJ Open Respir Res*. 2015;2:e000083.
 58. Raheison C, Bourdin A, Bonniaud P, et al. Updated guidelines (2015) for management and monitoring of adult and adolescent asthmatic patients (from 12 years and older) of the Société de pneumologie de langue française (SPLF) (summary). *Rev Mal Respir*. 2016;33:271-278.
 59. Schuers M, Chapron A, Guihard H, et al. Impact of non-drug therapies on asthma control: A systematic review of the literature. *Eur J Gen Pract*. 2019;25:65 76.
 60. Nurmatov U, Devereux G, Sheikh A. Nutrients and foods for the primary prevention of asthma and allergy: systematic review and meta-analysis. *J Allergy Clin Immunol*. 2011;127:724-33.e1-30.
 61. Davis C, Bryan J, Hodgson J, et al. Definition of the Mediterranean Diet: A Literature Review. *Nutrients*. 2015;7:9139-9153.
 62. Guilleminault L. Alimentation et asthme: mieux se nourrir fait-il mieux respirer ? *Revue des Maladies Respiratoires*. 2021;38:278-288.
 63. Peters U, Dixon A, Forno E. Obesity and Asthma. *J Allergy Clin Immunol*. 2018;141:1169-1179.
 64. Mafort TT, Rufino R, Costa CH, et al. Obesity: systemic and pulmonary complications, biochemical abnormalities, and impairment of lung function. *Multidiscip Respir Med*. 2016;11:28.
 65. Juel CTB, Ali Z, Nilas L, et al. Asthma and obesity: does weight loss improve asthma control? a systematic review. *J Asthma Allergy*. 2012;5:21-26.
 66. Scott HA, Gibson PG, Garg ML, et al. Dietary restriction and exercise improve airway inflammation and clinical outcomes in overweight and obese asthma: a randomized trial. *Clin Exp Allergy*. 2013;43:36-49.
 67. Labarde S. Asthme et sport, une association bénéfique. *Actualités Pharmaceutiques*. 2016;55:43-46.