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Research Article

Arthrospira platensis in Family Medicine

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Abstract – *Arthrospira platensis* (commonly known as *Spirulina*) has emerged as a prominent microalga with significant therapeutic and nutritional potential. This review investigates the role and applications of *A. platensis* within family medicine by exploring its nutrient composition, health benefits, clinical evidence, and implications for preventive healthcare. A systematic review methodology was utilized, drawing from databases including PubMed, ScienceDirect, and Scopus, with inclusion criteria emphasizing peer-reviewed articles from the past ten years. The principal findings indicate substantial antioxidant, anti-inflammatory, and immunomodulatory effects, highlighting the microalga's potential as a supportive therapeutic agent in managing chronic diseases such as metabolic syndrome, cardiovascular diseases, diabetes mellitus type 2, and inflammation-related disorders. Challenges related to standardization, clinical validation, and regulatory considerations are identified as critical areas for future research. Ultimately, integrating *A. platensis* into family medicine practice could enhance patient-centered care through preventive and complementary health strategies.

Keywords – Arthrospira Platensis, Spirulina, Family Medicine, Functional Foods, Preventive Healthcare.

I. INTRODUCTION

Algae are pivotal in tackling environmental issues and advancing sustainable development objectives. Their capacity to contribute to atmospheric formation has been explored in Mars terraforming research, while plasma-assisted microalgae cultivation offers a green pathway for producing biofuels and biomass. Additionally, algae are effective in eliminating toxic dyes from wastewater and provide environmentally friendly innovations in green construction technologies. Altogether, these diverse applications highlight the biotechnological potential of algae, particularly in assessing the ecological footprint of functional foods, reinforcing their importance in building a sustainable future [1–7]. *Arthrospira platensis*, commonly known as *Spirulina*, is a filamentous cyanobacterium belonging to the Oscillatoriaceae family, characterized by its spiral-shaped microscopic filaments (Fig. 1a) [8]. It is extensively cultivated worldwide due to its exceptional nutritional composition for tablets (Fig. 1b) and therapeutic potential [9]. *A. platensis* is notably rich in essential amino acids, making it an excellent source of high-quality protein, comparable to animal proteins but with greater sustainability [10]. Additionally, it contains abundant vitamins, particularly from the B-complex group (including vitamin B12), vitamin E, and provitamin A (beta-carotene), contributing to its antioxidative capacity and supporting numerous metabolic processes [11].

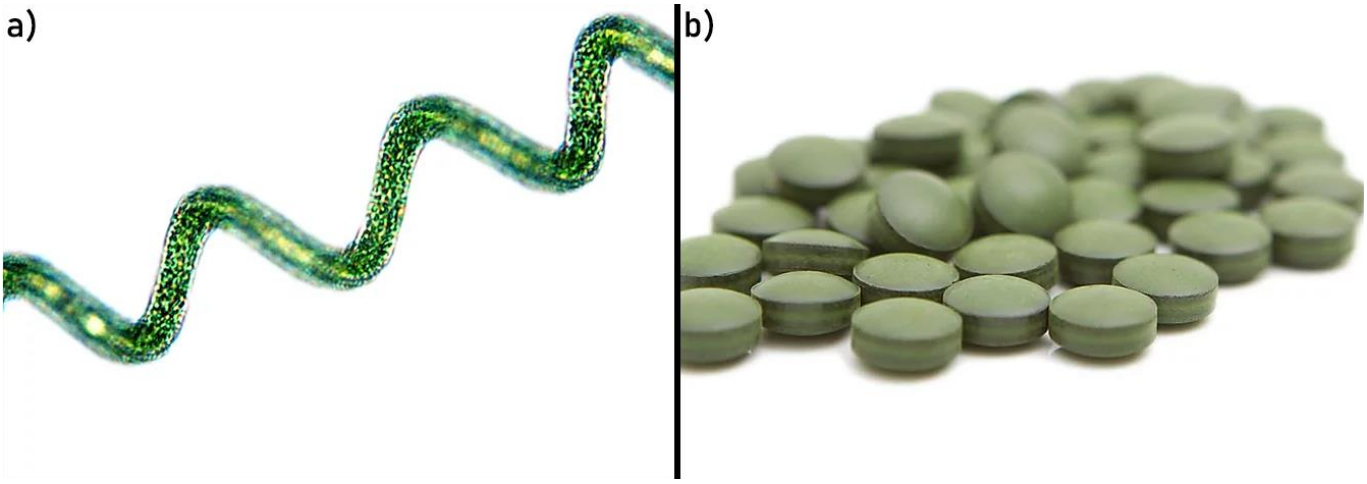

Fig. 1. a) *Arthrospira* microscopic view , b) *Arthrospira* tablets [12]

Minerals such as iron, calcium, magnesium, potassium, selenium, and zinc are also significantly present in *A. platensis*, playing essential roles in various physiological functions, including enzymatic reactions, immune modulation, and skeletal health [13]. Its powerful antioxidants, primarily phycocyanin and carotenoids, have demonstrated considerable efficacy in combating oxidative stress, a critical factor implicated in the pathogenesis of many chronic diseases [14]. Moreover, *A. platensis* is rich in polyunsaturated fatty acids, especially omega-3 (α-linolenic acid) and omega-6 (gamma-linolenic acid), known for their roles in reducing inflammation, improving cardiovascular health, and modulating immune responses [15]. The heightened interest in *A. platensis* within the domain of family medicine arises from its well-documented therapeutic properties, particularly its potential role in preventive and adjunctive treatment strategies for prevalent chronic health conditions [16]. Conditions such as metabolic syndrome, cardiovascular diseases, diabetes mellitus type 2, obesity-related disorders, and various inflammatory and immune-mediated diseases are frequent challenges encountered in primary healthcare settings. Therefore, natural, safe, and effective adjunct treatments like *A. platensis* are increasingly sought by healthcare providers to improve patient outcomes and reduce disease burden. This research aims to systematically synthesize and critically evaluate the current scientific literature regarding the clinical applications, efficacy, safety, and integration challenges associated with *A. platensis* in family medicine. It further explores potential strategies to overcome existing limitations and discusses evidence-based guidelines necessary to facilitate the practical and widespread integration of *Arthrospira platensis* into routine preventive and therapeutic care within family medicine.

II. MATERIALS AND METHOD

A systematic literature search methodology was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and reproducibility in the selection and synthesis of relevant literature. The search aimed to identify high-quality scientific evidence related to the nutritional and therapeutic potential of Arthrospira platensis and its application within the context of family medicine. Electronic searches were carried out across three major databases—PubMed, Scopus, and ScienceDirect—to ensure comprehensive coverage of the biomedical and clinical literature. The search spanned a ten-year period, from January 2015 to December 2024. A combination of Boolean operators and targeted keywords was used, including: "*Arthrospira platensis* AND family medicine", "*A. platensis* AND chronic diseases", "*Spirulina* AND clinical trials", "*Spirulina* AND preventive care", and "*Spirulina* AND therapeutic use". The inclusion criteria were defined to capture peer-reviewed publications such as randomized controlled trials (RCTs), observational studies, systematic reviews, meta-analyses, and expert consensus articles focusing on human health outcomes associated with *A. platensis* supplementation or dietary integration. Excluded were studies not published in English, articles lacking peer review (e.g., conference abstracts, blog posts), those published before 2010, and studies that focused exclusively on in vitro or animal models without human health

implications. Relevant studies were screened based on title and abstract, followed by full-text review to assess eligibility. Data were extracted on study design, population characteristics, dosage, and formulation of *A. platensis*, outcome measures, and key findings. The final selection of studies formed the evidence base for the analysis and interpretation presented in this article.

III. RESULTS

Studies consistently highlight the multifaceted health benefits of *Arthrospira platensis*, emphasizing its potent antioxidant, anti-inflammatory, and immunomodulatory properties [17]. These effects are primarily attributed to its rich composition of bioactive compounds, such as phycocyanin, beta-carotene, tocopherols, and polyunsaturated fatty acids [18]. Clinical trials conducted across diverse populations have demonstrated statistically significant improvements in various metabolic and immunological parameters following *A. platensis* supplementation [19]. Notably, intervention studies report marked reductions in total cholesterol, low-density lipoprotein (LDL), triglycerides, and fasting blood glucose levels, particularly in patients with metabolic syndrome or type 2 diabetes mellitus [19,20]. In parallel, increases in high-density lipoprotein (HDL) and antioxidant enzyme activity (e.g., superoxide dismutase, catalase) have been observed [21]. These benefits collectively position *A. platensis* as a promising adjunct in the nutritional management of chronic diseases commonly encountered in family medicine. Table 1 below provides a synthesized overview of the nutritional profile and key therapeutic applications of *Arthrospira platensis* based on evidence from recent clinical trials.

Table 1. Nutritional Content and Therapeutic Applications of *Arthrospira platensis* Based on Recent Clinical Trials

Component / Property	Description / Observed Effect	Clinical Relevance	Referance
High-quality Protein	Contains 55–70% complete protein with all essential amino acids	Supports muscle maintenance, satiety, metabolic health	[22]
Phycocyanin	Potent antioxidant and anti-inflammatory pigment	Reduces oxidative stress and systemic inflammation	[23]
Essential Fatty Acids	Rich in omega-3 and omega-6 (esp. gamma-linolenic acid)	Improves lipid profile, cardiovascular protection	[24]
Vitamins	High in B12, provitamin A (beta-carotene), E	Supports neurological and immune function	[25]
Minerals	Includes iron, calcium, magnesium, potassium, zinc	Anemia prevention, bone health, enzymatic support	[26]
Hypoglycemic Effect	Decreases fasting blood glucose and HbA1c	Type 2 diabetes management	[20]
Lipid-lowering Effect	Lowers LDL, triglycerides; raises HDL	Cardiovascular disease prevention	[27]

IV. DISCUSSION

The findings of this review strongly underscore the clinical relevance and translational potential of *Arthrospira platensis* (*Spirulina*) in preventive and integrative approaches within family medicine. As a nutritionally dense, bioactive-rich organism, *A. platensis* presents itself as an ideal candidate for addressing the growing burden of chronic, lifestyle-related diseases—conditions that are highly prevalent and often managed within the scope of primary healthcare. The antioxidant, anti-inflammatory, hypoglycemic, lipid-lowering, and immunomodulatory properties observed across multiple clinical studies support its utility as a functional food and a nutraceutical agent with systemic effects [19,22,28]. From a preventive standpoint, *A. platensis* supplementation can offer significant health benefits through its capacity to modulate oxidative stress and inflammation—two core pathological processes implicated in the development and progression of metabolic syndrome, atherosclerosis, type 2 diabetes mellitus [29, 30]. Despite its promising therapeutic potential, several barriers limit the widespread clinical adoption of *Arthrospira platensis* in family medicine. Chief among these are the lack of standardized formulations

and dosing guidelines, variability in bioactive compound content due to cultivation and processing methods, and the limited scale and diversity of existing clinical trials. While *A. platensis* is generally regarded as safe, data on long-term use at therapeutic doses remain insufficient. Moreover, the absence of formal clinical guidelines contributes to hesitation among practitioners. To advance its integration into mainstream care, future research must focus on large-scale, randomized controlled trials, dose standardization, safety profiling, and pharmaceutical interaction studies. With proper validation and regulatory support, *A. platensis* could become a valuable adjunct in holistic, preventive, and patient-centered approaches characteristic of family medicine.

V. CONCLUSION

The integration of *Arthrospira platensis* into family medicine presents a promising opportunity to enhance the preventive, nutritional, and complementary care frameworks of modern primary healthcare. Given its rich composition of bioactive compounds—ranging from high-quality proteins and essential fatty acids to potent antioxidants and immunomodulators—*A. platensis* offers tangible clinical benefits in the management of chronic, non-communicable diseases such as diabetes mellitus, hyperlipidemia, metabolic syndrome, cardiovascular disorders, and chronic inflammatory conditions. The existing body of clinical evidence supports its efficacy in improving key biomarkers related to metabolic health and immune function, aligning with the holistic and long-term orientation of family medicine. Furthermore, *A. platensis*'s natural origin, sustainability, and general safety profile make it an attractive adjunct for use in both preventive strategies and supportive therapy, particularly among populations seeking non-pharmaceutical or integrative options. However, to move from promising evidence to clinical implementation, several critical gaps must be addressed. These include the establishment of standardized dosing guidelines, clarification of long-term safety at therapeutic doses, and the development of high-quality, large-scale, randomized controlled trials across diverse demographic groups. Regulatory clarity and the incorporation of *A. platensis*-based interventions into evidence-based clinical practice guidelines are also essential for widespread adoption. In conclusion, while *Arthrospira platensis* should not be viewed as a replacement for conventional therapies, it holds substantial potential as a complementary modality within the scope of family medicine. With rigorous scientific validation and standardized formulation practices, *A. platensis* could become a valuable tool for physicians striving to implement preventive, patient-centered, and nutritionally integrated approaches to chronic disease management.

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