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Review Article

Barley Water (*Mā' al-Sha'īr*): An Evidence-Based Review of Its Nutritional, Pharmacological and Therapeutic Potential

Uzma Parveen [1], Fouzia Bashir [2]*

[1] Dept of Ilmul Atfal, School of Unani Medical Education and Research, Jamia Hamdard, New Delhi-110062

[2] Dept. of Tahaffuzi Wa Samaji Tib, School of Unani Medical Education and Research, Jamia Hamdard, New Delhi-110062

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For Correspondence:

Dr. Fouzia Bashir, Dept. of Tahaffuzi Wa Samaji Tib, School of Unani Medical Education and Research, Jamia Hamdard, New Delhi-110062

Abstract

Background: *Mā' al-Sha'īr* (barley water), prepared from barley (*Hordeum vulgare* L.), is a traditionally used preparation described in the Unani system of medicine. Barley has considerable nutritional and therapeutic importance due to its dietary fibre, β-glucan, phenolic compounds, vitamins, minerals, and other bioactive constituents. Although *Mā' al-Sha'īr* has traditionally been used for various therapeutic purposes, its classical Unani description and its potential benefits in the context of contemporary scientific evidence have not been adequately mentioned till date. **Objective:** The present review aims to explore the traditional Unani concept of *Mā' al-Sha'īr*, including its preparation, pharmacological actions and therapeutic applications, and to critically examine these traditional claims in the light of evidence on the nutritional, phytochemical, pharmacological, and therapeutic properties of barley and barley-derived preparations. **Methods:** Relevant information was collected from classical Unani literature, authoritative sources and various databases like Pubmed, Google Scholar for scientific publications based on barley (*Hordeum vulgare* L.), barley water and other varieties of barley. **Results:** The available literature indicates that barley contains several biologically active constituents, particularly β-glucan and phenolic compounds, which have been associated with antioxidant, anti-inflammatory, hypolipidaemic, glycaemic, gastrointestinal, and cardiometabolic effects. Classical Unani literature describes *Mā' al-Sha'īr* as a therapeutically useful preparation and attributes various actions and indications to it. **Conclusion:** *Mā' al-Sha'īr* is an important traditional Unani preparation with significant nutritional and potential therapeutic importance. Modern evidence on barley provides a scientific basis for investigating several of its traditionally described benefits; however, the findings should not be directly inferred from whole barley or barley extracts to barley water without appropriate evidence.

Keywords: *Mā' al-Sha'īr*; barley water; *Hordeum vulgare*; Unani medicine; β-glucan; phytochemicals; traditional medicine.

1. Introduction

Barley (*Hordeum vulgare* L.) is an ancient cereal that has been cultivated and consumed for thousands of years and has traditionally been valued not only as a food but also for its medicinal properties. It is a member of the family *Poaceae* and is cultivated extensively in different parts of the world. In recent years, barley has received considerable scientific attention because of its diverse nutritional and bioactive constituents, particularly soluble dietary fibre such as β-glucan, phenolic compounds, vitamins, minerals, tocopherols, phytosterols, and other phytochemicals.

In Unani system of Medicine, many nutritive diets have been mentioned. For eg. *Mā' al-Sha'īr* (Barley water), *Ma' al -'Asal* (Honey water), *Gulqand*, *Murabba*, *Halwa* (Gheekwar/Badam) and many more. The aqueous preparation of barley (*Sha'īr*) is referred to as *Mā' al-Sha'īr*. It is considered as the most beneficial 'diet cum drug' preparation. Hippocrates has mentioned its 10 properties. It is traditionally prepared using barley and water. One part of barley and 10 or 14 parts of water are boiled till the colour changes to reddish. Its use reflects the fundamental Unani principle of using appropriate foods and simple preparations for the maintenance of health as well as the management of disease.[1]

Modern research has further increased interest in barley because of the biological activities associated with its constituents. β-glucan has been extensively studied for its effects on postprandial glycaemic response and lipid metabolism, while phenolic compounds and other phytochemicals have been explored for antioxidant and other pharmacological activities. Experimental and clinical research on barley-based foods and preparations has consequently explored their possible roles in cardiometabolic health, gastrointestinal function, oxidative stress, and inflammation.

However, the available evidence requires careful interpretation when considering *Mā' al-Sha'īr* specifically. A substantial proportion of modern research has focused on whole barley, barley flour, isolated β-

glucan, or concentrated extracts rather than the traditional aqueous preparation. The composition and biological activity of *Mā' al-Sha'īr* may differ according to factors such as the variety of barley used, grain-to-water ratio, duration and temperature of boiling, and subsequent filtration. Therefore, findings obtained from whole barley or isolated barley constituents cannot necessarily be extrapolated directly to *Mā' al-Sha'īr*.

Through this review paper, an attempt has been made to provide an integrated account of *Mā' al-Sha'īr* (barley water) by examining its traditional description in Unani medicine, preparation, *Mizāj*, pharmacological actions, therapeutic applications, nutritional and phytochemical characteristics, and available experimental and clinical evidence. The review also highlights the existing limitations in the evidence and identifies areas for future research, particularly the need for standardized preparation and studies specifically evaluating *Mā' al-Sha'īr* rather than relying solely on evidence derived from whole barley or its isolated constituents.

2. Taxonomical classification[2]

Kingdom	Plantae
Clade	Angiosperms
Order	Poales
Family	Poaceae
Tribe	Triticeae
Genus	*Hordeum*
Species	*Hordeum vulgare* L.

3. Botanical Description

Barley is botanically identified as *Hordeum vulgare* L., a cultivated species belonging to the family *Poaceae*. The species belongs to the genus *Hordeum* and is classified within the tribe *Triticeae*. It is one of the oldest domesticated cereal crops and has developed into a highly diverse crop with numerous varieties adapted to different climatic and geographical conditions.[1,2]

Barley is an annual, erect, tufted grass with a relatively simple vegetative structure. The plant possesses a fibrous root system and a hollow, jointed stem. Leaves are linear and arise alternately from the nodes. As in other grasses, the leaf consists principally of a sheath and a blade, with a characteristic ligule at the junction of the two structures.

The inflorescence is a characteristic terminal spike. Spikelets are arranged along the central rachis, and the arrangement of fertile spikelets forms the basis for distinguishing the major two-row and six-row types. In two-row barley, the central spikelet at each node is fertile, whereas in six-row barley all three spikelets are fertile. This difference produces the characteristic appearance of the respective barley spikes.

The fruit is commonly referred to as the barley grain. The mature grain may remain enclosed within the lemma and palea, producing a hulled type, or may separate more readily from these structures, as observed in naked or hull-less barley. Grain characteristics, including size, shape, colour, and surface morphology, vary considerably among barley varieties.[3]

4. Method of Preparation

According to Unani literature, healthy fresh barley seeds are first soaked in water and the outer seed coat is removed using a pestle and mortar. The de-husked grains are referred to as *Jau Muqashshar.* The de-husked barley is subsequently boiled in water until it develops a relatively thick consistency, after which it is filtered. The filtrate obtained is termed *Mā' al-Sha'īr*. The same source also differentiates preparations according to processing: when meat is incorporated, the preparation is termed *Mā' al-Sha'īr Mulham*, whereas a preparation made using roasted barley is described as *Mā' al-Sha'īr Muhammas*. [1, 4, 5]

5. Mizāj (Temperament) of *Mā' al-Sha'īr*

In the Unani system of medicine, *Mizāj* is an important determinant of the physiological and therapeutic effects of a substance. The temperament of a drug or food is traditionally assessed in terms of the qualities of *Hararat* (heat), *Barudat* (coldness), *Ratubat* (moisture), and *Yabusat* (dryness). These qualities are considered when selecting a substance according to the temperament of the patient and the nature of the disease.[6]

Mā' al-Sha'īr is traditionally described as having a *Barid wa Ratab* (cold and moist) temperament. This description is particularly relevant to its traditional use in conditions associated with excessive heat and dryness. [7]

6. Af'āl (Actions)

In Classical Unani books, a number of therapeutic and dietetic actions of *Mā' al-Sha'īr* has been mentioned. These include its ability to provide moderate nourishment, quench thirst, facilitate digestion and absorption, and assist in the elimination of morbid material. Some literature also describes it as producing *Nuzj of Akhlāṭ*, a traditional concept referring to the appropriate maturation or modification of abnormal humoral material before its elimination. [8,9,10]

The principal actions of *Mā' al-Sha'īr* in the Unani literature can be summarized as follows:[11-15]

Unani term/action	Traditional interpretation
Munḍij / Mu'addil of Akhlāṭ	Maturation/modification of humoral material
Mudirr / Munaffith of Mawād-e-Mardiya	Traditionally described in relation to elimination of morbid material
Mughadhdhi	Provides nourishment in a moderate manner
Musakkin al-'Atash	Quenches thirst
Sahl al-Hadm	Easily digestible
Latīf	Regarded as a relatively light preparation
Mulaṭṭif	Traditionally associated with a gentle/modifying effect

7. *Mawāq 'a Isti 'māl* (Therapeutic Uses)

Mā' al-Sha'īr can be used in various medical situations such as: [5,12 –20]

- Diabetes
- Chest pain
- Pleurisy
- Lung ulcers
- Dry and chronic cough
- Stomach disorders
- Dysentery
- Various inflammatory and infectious conditions.

It also serves as a diuretic, anti-inflammatory, astringent, appetizer, and many more.

8. Pharmacological Studies

Antidiabetic activity

In an in vivo study on type 2 diabetes rat models, the consumption of insoluble and soluble fibers isolated from barley significantly reduced fasting blood glucose levels, improved insulin sensitivity, ameliorated liver function, regulated serum lipids, and had a hypoglycaemic effect.[21]

Anti-obesity activity

Mio K et al., evaluated the effects of β-glucan rich barley flour on lipid metabolism in the ileum, liver, and adipose tissues of male mice fed a high-fat diet. Liver weight and the weights of retroperitoneal and mesenteric fat were significantly reduced in the barley flour-treated group compared with the control group ($p < 0.05$). Accumulation of cholesterol and triglyceride in the liver as well as the serum total cholesterol and low-density lipoprotein-cholesterol concentrations were decreased significantly in the treatment group compared with the control group.[22]

Hypo cholesterolemic activity

In another study, administration of 5% and 10% barley bran to the hypercholesterolemic rats for 8 weeks improved the level of lipids, lactate dehydrogenase, liver enzymes, and creatine kinase-MB. Furthermore, abnormal histology of heart, liver, and kidney tissues nearly restored the normal state in barley bran-treated rats.[23]

Cardioprotective activity

In a study, the long-term dietary intake of pasta enriched with barley beta-glucan demonstrated a cardioprotective effect against post-ischemic reperfusion injury in adult male mice. Consumption of barley beta-glucan showed a 109% survival rate after cardiac ischemia (30 min)/reperfusion (60 min) injury, reduced left ventricular anion superoxide production and infarct size, and increased capillary and arteriolar density and vascular endothelial growth factor (VEGF) expression in the hearts of mice.[24]

Bowel health improvement

In an *in vivo* study, the administration of a barley-based probiotic food mixture for 7 days was useful in controlling *E. coli*-induced diarrhoea in mice.[25]

Skincare

In an *in vivo* study, intake of fermented barley and soybean mixture in hairless mouse model showed synergistic protective effects that prevent UVB-induced skin dehydration, oxidative stress, matrix degradation, and collagen synthesis.[26]

Anticancer activity

In an in vitro study, phenolics extracted from hulless barley showed strong antiproliferative activity against HepG2 human liver cancer cells.116 In an in vivo study, aqueous extract of fermented barley induced apoptosis in the transplantation tumor model of human HT-29 Cells in nude mice. [27]

Anti-inflammatory activity

In an in vitro and in vivo study, methanol extract of the aerial parts of barley (Hordeum vulgare) demonstrated anti-inflammatory activity by causing a significant reduction in serum TNF-α, IL-6 and IL-1β concentrations. Phenolic compounds were identified as the main constituents responsible for the activity. [28]

Wound healing activity

In an *in vivo* study, barley β-glucan accelerated the wound-healing process in mouse skin by promoting the

migration and proliferation of human dermis fibroblasts. [29]

Abundant in Vitamins and Minerals

Barley serves as a valuable reservoir of essential vitamins and minerals, encompassing B-vitamins, iron, magnesium, and phosphorus. These nutrients are pivotal in supporting energy metabolism, immune function, and bone health. [29]

9. Clinical Studies

Numerous experimental and clinical studies have demonstrated the efficacy of *Mā' al-Shaʿīr* and related products in managing chronic and metabolic disorders.

- A randomized controlled trial was conducted where 200 overweight adults were given barley-based food for 12 weeks, showing reductions in cholesterol, triglycerides, and waist circumference.[30]
- In a study, it was found that patients consuming *Maʿūl Shaʿīr* experienced improvements in blood glucose regulation, liver function, and urinary tract symptoms.[31]
- Reported in vivo that *Maʿūl Shaʿīr* reduced mucosal damage in experimentally induced gastric ulcers and normalized TNF-α levels.[32]
- In several *in vitro* and *in vivo* studies, it was found that barley water extracts help in hepatoprotection, nephroprotection, and inflammation suppression.[33]
- In a study it was found that hypercholesterolemic individuals who consumed β-glucan from barley had improved lipid profiles over 5 weeks. [34]
- A study revealed renal protective effects of barley extract in a gentamicin-induced nephrotoxicity model.[35]

10. Discussion and Conclusion

In our dynamic world, we observe continuous transformations across various aspects, such as our environment, food sources, population, and the expansion of scientific knowledge. Within our personal spheres, both our physical bodies and our personalities undergo changes, leading to shifts in our individual needs and aspirations. For maintaining a state of well-being, it is crucial to strike a harmonious balance amidst these ongoing life alterations. Therefore, given this ever-changing reality, our exploration of food, nutrition, and healthcare should primarily emphasize on the promotion of health. While different perspectives and definitions of health and disease may exist, a fundamental pillar for promoting health and averting disease consistently remains the consumption of wholesome food and the nutritional sustenance it offers, including the documented pharmacological effects of *Maʿūl Shaʿīr* encompasses a range of activities antibacterial, antispasmodic, astringent, antidiarrheal, antidiabetic, anticarcinogenic, mutagenic, antioxidant, analgesic, antifungal, hepatoprotective, immunomodulatory, and nephroprotective properties. Ongoing research suggests even more potential applications for this natural remedy in various health conditions. The present paper offers valuable insights into the pharmacological actions and applications of *Maʿūl Shaʿīr* within the Unani System of Medicine, highlighting its continued relevance in contemporary healthcare. Despite being a potent example of nature's therapeutic gifts to humanity, there is a lack of consistent standards for its clinical application. Therefore, it is imperative that this ancient therapy undergoes additional clinical trials to receive scientific validation for broader acceptance, allowing humanity to fully access its remarkable benefits.

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