Invigorated barley in diabetes

Ashok K. Tiwari

With over 41 million diabetics, India has become diabetes-capital of the world. The country is also a leader in the prevalence of metabolic syndrome and obesity, with hypertension to join the list soon. Historical evidences suggest that the ancient Indian physicians were able to stabilize diabetes, obesity and related metabolic syndrome effectively through recommendations, which are not different from those given today to patients, like weight management, suitable diet and exercise. Dietary management in diabetes has always been amongst the key strategies. Some 2800 years ago, the ancient Hindu physician, Charaka had identified barley as a low glycemic-dietary substitute for diabetes patients. He also advocated different invigorating agents like honey, triphala and vinegar for use with barley-based diet and drink. This article presents scientific evidence for the genuineness of selection of barley as a dietary substitute and inclusion of other fortifying agents in barley-based diet and drink.

Keywords: Barley, diabetes, hypertension, invigorating agents, obesity.

Diabetes mellitus is a serious global health problem that significantly affects a person’s quality of life and lifespan. With over 41 million diabetics and every fifth diabetic in the world being an Indian, the country is the diabetes capital of the world. It is also leader in the prevalence of metabolic syndrome as well as obesity, with 20 million people being either obese or abdominally obese. It has been observed that the real impact of diabetes and obesity is through hypertension and cardiovascular disease. Unfortunately, India being a world leader in diabetes is also heading towards hypertension.

Modern scientific understanding about the driving forces for the current worldwide epidemic of diabetes finds environmental factors such as adoption of a sedentary lifestyle, changes in eating habits and the consequent obesity as the main factors. This hypothesis is supported by observations that prevalence of diabetes in urban regions of India is increasing dramatically in affluent migrants. These modern scientific observations and understanding of diabetes are not different from those mentioned thousands of years ago in Ayurvedic literature.

The science of life, Ayurveda, which evolved in ancient India, was designed not only to treat diseases, but also emphasized the ways to prevent and manage long-term chronic health problems. The ancient Indian physicians were able to stabilize diabetes effectively, type-II diabetes in particular, by advocating weight loss, dietary formulations and exercises like in the case of modern medicine. In the case of diet, barley (वाव, *Hordeum vulgare* Linn.), one of the oldest cultivated grains, found prime importance as a substitute for other foodgrains. More than 2800 years ago, the Indian physician Charaka mentioned that ‘use of parched barley grains and its flour (सरक, *Statto*) prevents the development of diabetes’ according to the verse ‘वावानि वृत्यानि भक्षणं: प्रयोग्धुलएकध सरकुल भवति मेघा:’ (Ch.Chi.6.48) from *Charaka Samhitā*. Charaka advocated, ‘use of barley and goose berry (अमलामा, *amala*) powder as the best remedy for obesity’, according to the verse ‘स्पष्ट्य व्यथावधिक सूर्यः सङ्गोङ: श्रेष्ठ उपचार’ (Ch.Su.21.23)9. However, these remedial measures and measures from Ayurveda could not surface at the modern international scientific platform in order to maximize their potential contributions to the health care system globally.

This article highlights the methods for preparation and use of barley-based diet and drink as mentioned in *Charaka Samhitā* for diabetics, provides modern scientific evidences for the genuineness of selection and the inclusion of other fortifying ingredients along with barley, and possible reasons for the failure of these ancient Indian medical contributions at the international scientific platform.

Use of barley in diabetes as described in Charaka Samhitā

The verse ‘सरकिने वावानि वृत्यानि अभक्षणम् भक्षणं एवं श्रेष्ठम्।
यथा भक्षणं विशिश्वास्यान्तः कुशलम् महोपेक्षितः’ (Ch.Chi.6.21)9 mentions that ‘the diet of diabetic patients should consist predominantly of barley, wherein various food items should be prepared along with different wild varieties of rice. In the primary stages of diabetes development, a person should take honey also along with various food items prepared with barley’. *Charaka Samhitā* also describes a drink for diabetics. According to the verse:

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The drink should be prepared as follows: ‘dehusked, pouded and parched barley should be soaked overnight in the decoction of triphala (विकर्चिता). Diabetic patient should drink the slurry made up of this triphala-impregnated parched barley along with vinegar (सीबू-
दिसका).’

It is noteworthy to mention here that triphala is an Ayurvedic preparation made up of the mixture of three fruit powders, namely harad (हरद), हरीनकी, Terminalia chebula), bahera (बहेरा, विभीषतकी, Terminalia belerica) and amala (अमला, Emblica officinalis). According to the Ayurvedic classic Sharrangadhar Samhita, in order to prepare triphala powder, one should take one fruit of harad, two of bahera and four of the amala as described in the verse: एक ढंगी बदला दो च बदली की तीसरी के वदानि प्रतीत। (Sh.6.9) 10. Triphala itself is mentioned in this text to ‘calm polyurea (मैट), inflammation (सौंदर्य) and a kind of fever (प्रोत्साहन)’ according to the verse: विकर्चिता में गुणसमावेश नाता (Sh.6.10) 10.

A thick bread called littee (लिटी), small round/oval-shaped Battee (बटी) and staple food like khicharee (खिचारी) are some of the common traditional Indian food items prepared with barley as the main ingredient. Littee is prepared by baking a thick dough of barley flour. Battue is special fast-food preparation of the northern part of India. It is prepared with barley flour dough. The dough of required quantity is first made in the shape of a bowl filled with dry, parched flour of black gram in particular, premixed with spices like ginger, garlic, mustard and mango powder, closed and then baked brown. The staple food Khicharee is cooked in water, particularly by boiling two parts of wild rice with one part of ground barley grain. Whole parched barley grain is also used as munching snack. The drink prepared with parched flour called Battue (बटी) is famous in the northern part of India and is still prescribed by local physicians to diabetes patients. It is prepared by making a slurry of parched barley flour (50 g) in a glass of water (250 ml). Different tasty additives like vinegar (one teaspoonful) or a pinch of sour paste made up of unripe mango and mint are also added into this slurry in order to make it tasty.

Scientific proof of antidiabetic properties of barley, honey, triphala and vinegar

Barley and its various products have been reported to possess preventive and therapeutic antidiabetic properties, both in experimental animals and clinical studies. Table 1

<table>
<thead>
<tr>
<th>Table 1. Effect of barley diet/products on various parameters in diabetes</th>
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<td><strong>Study type</strong></td>
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<td>-----------------------------------------------</td>
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<tr>
<td>Animal</td>
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<tr>
<td>Adult diabetic rats</td>
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<td>STZ diabetic rats</td>
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<td>Spontaneously diabetic G-K rats (3–9 months feeding study)</td>
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<td>Genetically diabetic mice ([C57BL/Ks (−/−) × (+/+) Lepr (db)])</td>
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<td>Human</td>
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<td>NIDDM patients</td>
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<td>Type-II diabetic men</td>
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<td>NIDDM diabetic subjects</td>
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<td>Healthy volunteers</td>
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<td>Mildly hypertensive men (a randomized controlled crossover study)</td>
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<td>Non-diabetic normal control and diabetic patients</td>
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<td>Lean healthy men</td>
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<td>Type-II diabetes patients</td>
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<td>Plant</td>
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<tr>
<td><em>Triphala chama</em></td>
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<td><em>Terminalia chebula</em></td>
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<tr>
<td>Water extract</td>
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<td>Aqueous methanolic extract</td>
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<tr>
<td><em>Embleca officinalis</em></td>
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<tr>
<td>Aqueous extract and constituent tannoids</td>
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<td><em>Terminalia belerica</em></td>
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summarizes the animal experimental and clinical observations made with various preparations of barley. These studies indicate barley as a food substitute that has low glycemic index and also has the capacity of improving impaired carbohydrate and lipid metabolism in diabetic subjects. Mugimeshi (prepared by boiling rice and barley in the ratio of 7:3) is a Japanese staple food that finds similarity with Indian food preparation Khicharee. In a recent study it was observed that consumption of staple food Mugimeshi along with well-regulated lifestyle had beneficial effects on metabolic control in patients with type-II diabetes\(^{11}\).

Charaka Samhita\(^4\) emphasized that honey should also be taken along with various food preparations made up of barley. Animal experiments\(^12\) and observations made in normal human volunteers, type-I diabetes patients\(^13\), type-II diabetes patients\(^14\), and in young adults with impaired glucose tolerance\(^15\), showed that honey attenuates postprandial hyperglycemic response and hence may serve as a suitable sugar substitute for diabetics.
While prescribing the drink made up of barley for diabetics, verses from Charaka Samhita mention that parched barley should be impregnated in triphala decoction overnight. The slurry made up of this triphala-impregnated barley should be taken mixed with vinegar. Table 2 presents evidences for the usefulness of triphala and its ingredient fruits in different diabetic conditions. Though T. chebula, T. belerica and E. officinalis have been reported to possess beneficial antidiabetic properties by various mechanisms, it was observed that the homogeneous hypoglycaemic activity could be achieved only by the use of triphala. 

Vinegar ingestion has been found to significantly reduce postprandial fluxes in insulin in normal, insulin-resistant subjects and type-II diabetic subjects. Increased hepatic glucose production, decreased utilization of glucose in skeletal muscle and adipose tissues are important features associated with type-II diabetes. The "metabolic switch", 5'-AMP-activated protein kinase (AMPK) has been suggested to play an important role in glucose utilization and fatty-acid oxidation independent of the insulin-signalling pathway. Acetic acid is the primary constituent of vinegar and is present in the amount of 3–5 g/100 g. Diet supplemented with acetic acid has been reported recently to lower plasma glucose level and Hb Alc in different diabetic animal models, reduce the expression of genes involved in gluconeogenesis and lipogenesis partly by regulating AMPK in liver of KK-A (γ) mice, lower the expression of genes for glucose-6-phosphatase and sterol regulatory element binding protein-1 (SREBP-1) in rat hepatocytes. These findings support the beneficial effects of vinegar in type-II diabetes and also its addition in the barley-based drink described in Ayurveda.

Conclusion

Moran observed that the ancient Greeks (AD 45–117) were the first to advocate diet and lifestyle management for individuals with diabetes. Unfortunately, he failed in finding records of the first-ever advocated medicinal fast food prescribed particularly for diabetic patients by the ancient Indian physicians, as discussed in this article. The reason maybe that during the transition phase of ancient India to the modern era, this knowledge could not get its due recognition, and the fact that hardly any modern scientific study could recognize and assess Ayurveda as a system of diagnosis and care.

Though individual ingredients as described in the Ayurvedic verses have been found to possess antidiabetic properties by modern scientific analysis, Ayurveda believes that the sum of a formula is more potent than the constituents individually. In a recent study, it was observed that the traditional Oriental remedy, Ginseng radix, when processed with vinegar became more potent in decreasing insulin resistance and adiposity in metabolic syndrome induced by a high fat diet in ICR mice than the non-processed Ginseng radix. Invigoration of triphala-soaked barley-based drink with vinegar, and addition of honey with barley-based dietary preparations as advocated in Ayurvedic verses may find scientific support from such reports. It becomes important in the light of the above discussions therefore, to make a retrospective analysis of our traditional medicinal foods in order to provide them sound scientific basis and modernize them according to the present requirements.

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CURRENT SCIENCE, VOL. 95, NO. 1, 10 JULY 2008
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ACKNOWLEDGEMENTS. I thank Dr. J. S. Yadav, Director, IICT, Hyderabad, for encouragement. Thanks are also due to Sridhar Sharma and M. Philip Anand Kumar, Dr. B. R. K. R. Government Ayurved College, Hyderabad, for providing ancient Ayurvedic texts and expan-

Received 6 December 2007; revised accepted 21 May 2008