Health and Nutritional Benefits of Minor Millets

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A diet that contains the proper proportions carbohydrates, fats, proteins, vitamins, minerals, and water in necessary to maintain good health.
The double burden of malnutrition is characterised by the coexistence of undernutrition along with overweight and obesity, or diet-related non communicable diseases, within individuals, households and populations, and across the life course.
THE DOUBLE BURDEN OF MALNUTRITION

WHAT

The double burden of malnutrition is characterized by the coexistence of:

1. Undernutrition (malnutrition, stunting & micronutrient deficiencies) along with overweight and obesity.
2. And diet-related noncommunicable diseases.
3. Within individuals, households and populations.
4. Throughout life.
DOUBLE BURDEN AFFECTS MANY COUNTRIES

41 million children under 5 are overweight

&

161 million children under 5 are underweight

(Also adults suffer from the double burden)
WHO 2014 report

![Bar chart showing underweight children in developing countries](image)


**Figure 1:** Underweight children in the developing countries (%).
Under Nutrition

- India is listed in the countries where malnutrition and child mortality is alarmingly high.

- According to the data released by the Office of the Registrar General of India, indicate that although the mortality rate especially infant and under-five mortality rate is declining over the years, yet there are some states where these rates are very high.

- This shows that instead the progress in health care sector in India, young population especially in the age group 0-6 years continuously lost their lives due to inadequate nutrition and proper care.

- The mortality rates and nutritional status of the children reflects the threats in child health.
More than 1.9 billion adults worldwide, 18 years and older, were overweight while 462 million were underweight. More than 600 million were obese.

- In the same year, 42 million children under the age of five were overweight or obese but 156 million were affected by stunting (low height-for-age). While 50 million children were affected by wasting (low weight-for-height).

- Poor nutrition continues to cause nearly half of deaths in children under five, while low- and middle-income countries now witness a simultaneous rise in childhood overweight and obesity - increasing at a rate 30% faster than in richer nations. (WHO - 2014)
A healthy diet helps protect against malnutrition in all its forms, as well as non communicable diseases (NCDs), including diabetes, heart disease, stroke and cancer.
WHO recommendations-2

- Unhealthy diet and lack of physical activity are leading global risks to health.
- Healthy dietary practices start early in life
WHO recommendations-3

- Energy intake (calories) should be in balance with energy expenditure.
- Evidence indicates that total fat should not exceed 30% of total energy intake.
- Shift in fat consumption away from saturated fats to unsaturated fats.
- Elimination of industrial trans fats.
Limiting intake of free sugars to less than 10% of total energy intake is part of a healthy diet.

A further reduction to less than 5% of total energy intake is suggested for additional health benefits.
WHO recommendations-5

- Keeping salt intake to less than 5 g per day helps prevent hypertension and reduces the risk of heart disease and stroke in the adult population.

- WHO Member States have agreed to reduce the global population’s intake of salt by 30% and halt the rise in diabetes and obesity in adults and adolescents as well as in childhood overweight by 2025.
Risk of NCDs greater for Asians

- BMI value > 23.0 Kg/m² - risk of T2DM and CVD increases
- Greater correlation with increasing abdominal circumference / WHR
- Higher percent body fat at the same BMI in Asians.
- Metabolic SYNDROME
<table>
<thead>
<tr>
<th><strong>TRADITIONAL DIETS</strong></th>
<th><strong>CURRENT DIETS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BULKY</strong></td>
<td><strong>PALATABLE</strong></td>
</tr>
<tr>
<td><strong>LOW ENERGY DENSITY</strong></td>
<td><strong>ENERGY DENSE</strong></td>
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<tr>
<td><strong>SLOWLY DIGESTED</strong></td>
<td><strong>RAPIDLY DIGESTED</strong></td>
</tr>
<tr>
<td><strong>PROTEIN</strong>↑</td>
<td><strong>PROTEIN</strong>↑</td>
</tr>
<tr>
<td><strong>FAT</strong>↓</td>
<td><strong>FAT</strong>↑</td>
</tr>
<tr>
<td><strong>UNSATURATED FATS</strong>↑</td>
<td><strong>SATURATED FATS</strong>↑</td>
</tr>
<tr>
<td><strong>COMPLEX CARBOHYDRATES</strong>↑</td>
<td><strong>REFINED FOODS</strong></td>
</tr>
<tr>
<td><strong>FIBRE</strong>↓</td>
<td><strong>FIBRE</strong>↓</td>
</tr>
<tr>
<td><strong>VITAMINS/MINERALS</strong>↑</td>
<td><strong>VITAMINS/MINERALS</strong>↓</td>
</tr>
<tr>
<td><strong>PHYTONUTRIENTS</strong>↑</td>
<td><strong>PHYTONUTRIENTS</strong>↓</td>
</tr>
<tr>
<td><strong>GLYCEMIC INDEX</strong>↓</td>
<td><strong>GLYCEMIC INDEX</strong>↑</td>
</tr>
<tr>
<td><strong>Na/K RATIO</strong>↓</td>
<td><strong>Na/K RATIO</strong>↑</td>
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<tr>
<td><strong>CALCIUM</strong>↑</td>
<td><strong>CALCIUM</strong>↓</td>
</tr>
</tbody>
</table>
Characteristics of Traditional Foods

- High in Complex Carbohydrates
- High in Proteins
- Low in Fats or high in good fats
- High in vitamins and minerals
- High in Phyto Chemicals
A nutritious diet is one which boosts the economy of the country.

Countries like India carry the ‘double burden’ of high levels of malnutrition caused by food insecurity and growing levels of obesity caused by diets high in sugar, oil and salt.

A healthy diet is the need of the hour which can provide essential and adequate nutrients that are required for the proper function, growth and development of your body.
Is there an answer?
How and where it is available?
Is it affordable by all sects of society?
Do we know about this before or it should be introduced to us?
Can it be recommended to all?
How it should be consumed?
Do we have proof?
And many more questions may arise in your mind
Millets
CLASSIFICATION OF MILLETS

MAJOR MILLETS
- Sorghum
- Pearl millet

MINOR MILLETS
- Finger millet
- Kodo millet
- Proso millet
- Foxtail millet
- Barnyard millet
- Little millet
<table>
<thead>
<tr>
<th>Crop</th>
<th>Protein (g)</th>
<th>Fiber (g)</th>
<th>Minerals (g)</th>
<th>Iron (mg)</th>
<th>Calcium (mg)</th>
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<tbody>
<tr>
<td>Sorghum</td>
<td>10.4</td>
<td>1.6</td>
<td>1.6</td>
<td>4.1</td>
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<tr>
<td>Pearl</td>
<td>10.6</td>
<td>1.3</td>
<td>2.3</td>
<td>16.9</td>
<td>38</td>
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<tr>
<td>Finger</td>
<td>7.3</td>
<td>3.6</td>
<td>2.7</td>
<td>3.9</td>
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<tr>
<td>Foxtail</td>
<td>12.3</td>
<td>8</td>
<td>3.3</td>
<td>2.8</td>
<td>31</td>
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<tr>
<td>Proso</td>
<td>12.5</td>
<td>2.2</td>
<td>1.9</td>
<td>0.8</td>
<td>14</td>
</tr>
<tr>
<td>Kodo</td>
<td>8.3</td>
<td>9</td>
<td>2.6</td>
<td>0.5</td>
<td>27</td>
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<tr>
<td>Little</td>
<td>7.7</td>
<td>7.6</td>
<td>1.5</td>
<td>9.3</td>
<td>17</td>
</tr>
<tr>
<td>Barnyard</td>
<td>11.2</td>
<td>10.1</td>
<td>4.4</td>
<td>15.2</td>
<td>11</td>
</tr>
<tr>
<td>Rice</td>
<td>6.8</td>
<td>0.2</td>
<td>0.6</td>
<td>0.7</td>
<td>10</td>
</tr>
<tr>
<td>Wheat</td>
<td>11.8</td>
<td>1.2</td>
<td>1.5</td>
<td>5.3</td>
<td>41</td>
</tr>
</tbody>
</table>
Millets and its Potentials

I. Nutrient Dense
II. Rich in phytochemicals
III. Probiotics and Prebiotics
IV. Nutraceutical
The good carbohydrates - Dietary Fiber

- Eat as much as you want
- Satiety is achieved
- Digests slowly - Low GI
- Slows down absorption of Sugars and Cholesterol from other foods
- Improves Bowel motility
A GI of 45 or less is a reasonable definition of a low GI diet or meal. This is because what we now know from numerous observational studies around the world is that the daily average GI of the diet of people in the lowest quintile (20% of the population) is about 40–50.
# Glycemic Indices of Flat Breads Prepared from Cereals and Millets

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Glycemic Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEAT</td>
<td>72.33±3.12</td>
</tr>
<tr>
<td>OATS</td>
<td>59.49±4.65</td>
</tr>
<tr>
<td>MAIZE</td>
<td>64.31±2.37</td>
</tr>
<tr>
<td>BAJRA</td>
<td>53.14±2.14</td>
</tr>
<tr>
<td>JOWAR</td>
<td>59.91±3.16</td>
</tr>
<tr>
<td>BARLEY</td>
<td>39.26±1.67</td>
</tr>
<tr>
<td>RAGI</td>
<td><strong>67.54±2.39</strong></td>
</tr>
<tr>
<td>ITALIAN MILLET</td>
<td>49.32±2.16</td>
</tr>
<tr>
<td>KODO MILLET</td>
<td>47.64±3.14</td>
</tr>
</tbody>
</table>
Lignans, an essential phyto nutrient present in millet, act against different types of hormone-dependent cancers (breast cancer) and reduces the risk of heart disease.

Regular consumption of millet is very beneficial for men and women suffering from signs of cardiovascular disease, like high blood pressure and high cholesterol levels.

Millet - A high source of insoluble fiber, beneficial against breast cancer and gall stone formation in women.
Millets are high in phosphorus content which helps in maintaining the cell structure of the human body.

- Phosphorus helps in the formation of the mineral matrix of the bone and is also an essential component of ATP (adenosine tri-phosphate), which is the energy currency of the body. This mineral is a very important constituent of nucleic acids, which are the building blocks of genetic code.

- A single cup of millet provides around 24.0% of the body’s daily phosphorus requirement.
Recent research has indicated that the regular consumption of millet is associated with reduced risk of type 2 diabetes mellitus.

This is mainly due to the fact that whole grains like millet are a rich source of magnesium, which acts as a co-factor in a number of enzymatic reactions in the body, regulating the secretion of glucose and insulin.

Magnesium is also beneficial in reducing the frequency of migraine attacks. It is even very useful for people who are suffering from atherosclerosis and diabetic heart disease.
Celiac disease is one of the most common forms of food intolerance in children, being an autoimmune enteropathy occurring in genetically susceptible individuals.

The only treatment of celiac disease consists in a lifelong strict gluten-free diet.

After gluten free diet patients with normal weight or growth failure risk become obese on the one hand because of recovery intestinal absorption and, on the other hand, nutritionally unbalanced diet, high in fat and protein.
Need of the hour

- There is an urgent need to revive and promote these minor millets.
- Awareness studies and extension activities should be carried out to popularize these ‘Nutri cereals’.
- Improvised processing techniques should be used to get the maximum bioavailability of the nutrients present in these nutrient dense foods.
As we are progressing towards the technology sound mechanised world, our eating habits and food selection have altered. We are moving away from the traditionally cooked foods to ready to eat or ready to cook processed foods to minimize our time in cooking and consuming. Hence extra caution should be taken on food safety and food labelling which is crucial to the consumer as well as the producer or manufacturer.
Even in the feeding the young child families are moving away from giving traditional home cooked foods to the food mixes available in the market.

Molecular basis of waxy starch has been identified in foxtail millet, proso millet, and barnyard millet to facilitate their use in infant foods.
Food safety concerns

Substandard food

Unsafe food

Unhealthy food
Definition of Food Safety
(FAO/WHO, 2003)

It is the degree of confidence that food will not cause sickness or harm to the consumer when it is prepared, served and eaten according to its intended use.

Zero contamination is not the concept.
Media and Food Safety
FOOD SCARES

- Glutamate and Lead in ‘Maggi’ Noodles
- Artificial ripening
- Pesticide residues in fruit and vegetables
- Milk adulteration
- Hormonal injections to vegetables and cattle

(Konakan et al. 2016)
Media play a very pivotal role in the selection of foods by the consumers. A word of caution to the producers, manufacturers and the consumers - use/get the right information to select your foods.
Food Labels

- Essential source of Information for consumer
- Effective control and choice on what they eat for
  - Health
  - Safety
  - Religious
  - Ethical
- Potentially powerful tools of communication to discourage consumption of unhealthy packed foods
Nutrition labeling

- Information on energy expressed in Kcal / 100 gm or 100 ml or per serving
- Amounts of carbohydrate (specify quantity of sugar),
- Protein and fat expressed in gm
- The amount of any other nutrient for which a nutrition or health claim is made
- If the claim is on the type of fatty acids or the amount of cholesterol, the amount of SA, MUFA or PUFA and Cholesterol should be declared and also trans fat.
- Numerical information on vitamins and minerals shall be expressed in metric units per 100 gm or 100 ml.
Old grains in new pots
Haven’t you heard of the phrase “Old is Gold”. That’s exactly what millets are!

What got lost? It’s the traditional knowledge on millets

These are gradually gaining popularity in the present and said to be “A crop for the future”. 
Thank You