INTAKES & BARRIERS TO CONSUMPTION OF WHOLE GRAINS (EVIDENCE FROM INDIA)

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Whole Grain Council, 2004

“100% of the original kernel – all of the bran, germ, and endosperm – must be present to qualify as a whole grain.”

“If the grain has been processed (e.g., cracked, crushed, rolled, extruded, and/or cooked), the food product should deliver the same rich balance of nutrients that are found in the original grain seed.”
Recommendation for whole grain intake

The USDA Dietary Guidelines, 2015:
“whole grains should constitute at least half of the grains in the diet”

National Dietary Guidelines, NIN, India, 2011:
“Include whole grains, pulses and greens in the diet”

FAO food based dietary guidelines of many countries promote whole grain intake.
### INTAKE OF DIFFERENT FOOD GROUPS IN URBAN AND RURAL CHENNAI - CURES

<table>
<thead>
<tr>
<th>Food groups (g/d)</th>
<th>Urban (n= 2220) (Median)</th>
<th>Rural (n=6900) (Median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refined grains</td>
<td>337g/d</td>
<td>444g/d</td>
</tr>
<tr>
<td>Whole cereals (milled)</td>
<td>10g/d</td>
<td>3.3g/d</td>
</tr>
<tr>
<td>Millets</td>
<td>7g/d</td>
<td>3.3g/d</td>
</tr>
<tr>
<td>Pulses and legumes</td>
<td>53 g/d</td>
<td>17 g/d</td>
</tr>
</tbody>
</table>

Radhika et al, PHN, 2010; Narasimhan et al, IJMR 2016
CONTRIBUTION OF FOOD GROUPS [ITS GI]– CURES (N = 2220)

Dietary profile of urban adult population in South India in the context of chronic disease epidemiology (CURES – 68)

Ganesan Radhika, Rangaswamy M Sathya, Anbazhagan Ganesan, Raghavan Saroja, Parthasarathy Vijayalakshmi, Vasudevan Sudha and Viswanathan Mohan*

Madras Diabetes Research Foundation & Dr. Mohan’s Diabetes Specialities Centre, WHO Collaborating Centre for Non-Communicable Diseases, International Diabetes Federation Centre of Education, 4 Conran Smith Road, Gopalapuram, Chennai, India

Submitted 14 March 2009; Accepted 2 June 2010

Energy = 2500 kcal  
Protein = 11.3 %E  
Fat = 23.9%E  
Carbohydrates = 64.4%E
### Glycemic Index and Glycemic Load Levels

<table>
<thead>
<tr>
<th>Glycemic Index</th>
<th>Glycemic Load / Serving</th>
<th>Glycemic Load / Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 70</td>
<td>≥ 20</td>
<td>&gt;120</td>
</tr>
<tr>
<td>56-69</td>
<td>11-19</td>
<td>80-120</td>
</tr>
<tr>
<td>≤ 55</td>
<td>≤ 10</td>
<td>&lt; 80</td>
</tr>
</tbody>
</table>

(CURES – Urban component (n = 1843)      Rural Component (n = 6900)

**Women**
- GI: 69 ± 3 GL: 277 ± 86; GI 69.3 GL 256

**Men**
- GI: 69 ± 2 GL: 276 ± 89; GI 69.2 GL 272

GI OF BROWN RICE, WHITE RICE, AND UNDER MILLED RICE FROM SINGLE RICE VARIETY (BPT 5204)- PARBOILED

Reference food: Glucose - GI= 100

Shobana et al, APJCN (in press)
Average change in interstitial glucose concentrations from baseline of overweight participants fed with BR, WR and BRL (n=15)

\[ \text{IAUC (CI)}: \begin{align*} 
\text{WR} &= 81.8 \ (61.2 – 96.3) \\
\text{BR} &= 65.5 \ (53.8 – 77.1) \\
\text{BRL} &= 63 \ (51.0 – 75.1) 
\end{align*} \]

**Fasting Insulin (% change)**

- BR vs WR = -57%
- BRL vs WR = -54%

Consumer Acceptance and Preference Study (CAPS) on Brown and Undermilled Indian Rice Varieties in Chennai, India

Cooking quality and appearance of the grains were perceived as the most important factors to consider when purchasing rice among Chennai urban adults.

Education regarding health benefits may help this population switch to brown rice.
“Price is not very important, rice should be good...”

“Rice does not look good so it is of cheap quality...”

“It is like cow chewing food...... it is very hard...”

“Rice sits in the stomach like a stone.”

Cooking time and shelf life --- barriers
OVERCOME BARRIERS TO WHOLE GRAINS CONSUMPTION

Technical Innovation
- Improvement in post harvest technologies
- Develop appropriate Germinated brown rice
- Innovation with low lipase brown rice
- Innovate intact brown rice based value added products
- Improve refined grains to mimic whole grain glycemic property

Policy Advocacy
- Promote Brown rice through PDS
- Retain taxes and subsidy for Brown rice production
- Promote rice millers with incentives on Brown rice
- Food and Nutrition labelling, functional and health claims - scientific

Community Awareness
- Health, nutrition programs at state and central levels, conferences, religious organizations, school, community, food service establishments, through media (sms/radio/TV /print/ social media- FB/whatsapp)
Glycemic Index of High fibre rice and white rice compared to reference glucose

Glucose White rice High fibre rice

Glycemic Index

- Glucose: 100
- White rice: 79.2, P=0.004
- High fibre rice: 61.3

Diabetes Technology & Therapeutics 2016
High fibre rice vs white rice

Anjana et al. eposter @ ATTD, Vienna, 2014

20% ↓

White rice vs Brown rice

Mohan V, Sudha V et al. Diab Tech Therapeutics 2013

20% ↓
SUMMARY

- **Consumption** of whole grains and millets are lower in southern states
- **Glycemic property** - not significantly different between White rice (refined grain) and whole grains milled (whole wheat flour based)
- The intact whole grains play an important role in prevention and management of chronic diseases

**Break the barriers – Two prong approach**

- **Improve technology** to develop intact wholegrain products or lower GI with functional ingredients for the whole grain milled products
- **Educate and help consumers to break their perceptions** and improve intake of wholegrains whole.
Our Team

Foods, Nutrition and Dietetics Research team

Food technology and food quality analysis team

THANK YOU