COMBATING IRON DEFICIENCY

3. Wheat Consumption Patterns in Sri Lanka

C. Piyasena[1], R. Mudalige[2] and P. Nestel[3]

The Ceylon Journal of Medical Science 1996; 39: 17-22

Summary

The wheat flour consumption pattern in Sri Lanka has been studied by (i) including questions on wheat flour purchases and the consumption of wheat-based foods in the Third National Nutrition and Health Survey, carried out between October 1994 and January 1995 by the Ministry of Policy Planning, Ethnic Affairs and National Integration; and (ii) by a recipe survey carried out in the dry, the coastal and the highland zones, represented by the Anuradhapura, Matara and Colombo, and the Nuwara Eliya Districts, respectively. The quantity of wheat flour purchased by a household during the previous month was noted. In addition a 24 hour dietary recall provided information on consumption of wheat-based foods. The recipe survey entailed weighing the raw ingredients, total cooked weight, total number of cooked units, as well as the size and weight of one unit of each food. Data was also obtained from manufacturers of biscuits, cake and bread.

More than 4 out of 5 households purchase wheat flour, the average purchase being 7.5kg wheat flour/month, with large provincial and sectoral differences. Purchases in the estate sector (22kg/month/household) were about 4 times greater than in either the urban or rural sectors. The main sources of wheat flour were bread, roti and Marie biscuits. Wheat flour consumption by children under 5yrs and their mothers was about 140g/day in the estate sector, about 80g/day in the urban sector and about 100 g/day in rural sector.

The results indicate that wheat flour is a suitable vehicle for iron fortification.

Introduction

Low haemoglobin levels, which are often used as an indicator of anaemia, are widespread throughout Sri Lanka (1). In order to address the problem of iron deficiency anaemia, the government undertook a number of studies to determine the feasibility and viability of fortifying wheat flour with iron. National level data exist for wheat imports and wheat flour availability, but no data exist on wheat consumption per se. For this reason, the Ministry of Policy Planning, Ethnic Affairs, and National Integration included questions on both wheat flour purchases and consumption of wheat-based foods in its Third Nutrition and Health Survey, which was conducted between October 1994 and January 1995.

Methods

A full description of the sampling procedure is given elsewhere (2). Briefly, the National Nutrition and Health sample is based on the Department of Census and Statistics' (DCS) Quarterly Labour Force Survey (QLFS) sampling frame, which was developed using the 1981 population census. Using the 1981 census data, the DCS constructed 65,000 census blocks (CBs) for the QLFS. These 65,000 CBs cover the entire country and are stratified into urban, rural or estate strata. CB size is dependent on the population density, thus rural CBs tend to be smaller than urban ones.

For logistical reasons, it was decided that the Nutrition and Health Survey sample would be limited to 2,000 household units (HU) so that field work and data analyses could be completed in a timely manner. Pretests

1 Nutrition Division, Medical Research Institute, Colombo, Sri Lanka
2 Ministry of Youth, Sports and Rural Development, Sethsiripaya, Battaramulla, Sri Lanka
3 Department of International Health, Johns Hopkins University, USA

conducted by the DCS, in two districts, showed that about 30 percent of HUs have children under the age of five years; thus 772 CBs would be needed. CBs were selected from all parts of the country except for the Northern and Eastern provinces because of security reasons.

Sample selection involved a two-stage, stratified, systematic sampling procedure. In the first stage, 772 CBs were selected and each of the included provinces was allocated a near equal number of CBs (the average being around 100), which were divided more or less equally between the urban stratum and the combined rural and estate strata. The exception was the Western Province, which received an allocation of 172 CBs. Of these, 68 were allocated to Greater Colombo, which was treated as a separate stratum because it contains a relatively large population and economic activities and labour markets are more diverse in Greater Colombo than elsewhere. The urban and rural/estate starta within each province were further subdivided by district and CBs were allocated proportional to the population size of the district; thus, the more HUs in a district, the more CBs assigned to it.

In the second stage, 10 HUs were systematically selected from each of the 772 CBs; thus, the survey provides data that is representative at the provincial and sector level. Households were considered eligible and included in the survey if they had at least one child between the age of 3 and 59 months. Data were collected on household demographics as well as the health and nutrition status of children under the age of 5 years and their mothers.

In order to get information on wheat consumption patterns, the quantity of wheat flour purchased by the household in the preceding month was obtained. In addition, a 24-hour dietary recall was carried out on the

Table 1

Percentage of households that purchased wheat flour in previous month and mean quantity (kg) of wheat flour purchased by all households

	Households purchased wheat flour %	Quantity of wheat flour (kg/month) Mean	SD	n
Overall	85.1	7.5	8.5	1687
Province				
Western	65.0	2.1	2.8	325
Central	98.8	18.2	15.4	333
Southern	80.9	3.7	4.9	244
N. Western	79.5	6.3	6.4	214
N. Central	92.3	4.6	3.5	158
Uva	96.7	8.3	8.3	211
Sabaragamuwa	88.9	6.1	7.3	202
ANOVA		p<0.001		
Sector				
Urban	77.9	4.6	6.0	785
Rural	88.3	5.6	6.6	656
Estate	99.6	22.0	15.5	246
ANOVA		p<0.001		

consumption of wheat-based foods. Respondents included one child under the age of 5 years, the mother, and one adult male over the age of 18 years. Where more than one child under the age of five years was present in a household, the child whose date of birth was closest to January was selected. In the 24-hour dietary recall, the number of units (e.g. piece, bowl) of each food consumed at breakfast, morning snack, lunch, afternoon snack, and dinner was recorded for each individual. The unit for each food was converted to grams of wheat flour using data collected in a recipe survey.

For the recipe survey, the island was divided into three zones representing the dry (Anuradhapura, Polonnaruwa, Kurunegala, and Puttlam districts), coastal (Colombo, Gampaha, Kalutara, Galle, Matara, and Hambantota districts), and highland (Kandy, Nuwara Eliya, Moneragala, Ratnapura, and Kegalle districts) areas. Within these, Anuradhapura, Matara and Colombo and Nuwara Eliya districts were selected from the dry, coastal, and highland zones, respectively, for the recipe survey. Within these four districts, two sub-divisions were randomly selected and at least five recipes were collected in each one. The recipe survey entailed weighing the raw ingredients, total cooked weight, total number of cooked units, as well as the size and weight of one unit of each food. In addition, data on the composition of wheat-based foods were obtained from Ceylon Biscuits Co., Ltd. (Pannipitiya), Maliban Biscuits Co., Ltd. (Ratmalana), The Bakery (Borella), Little Lion Associates, Nikado Trading Co., Ltd. (Kadawatha), Harischandra Co., (Matara), and Sweet House (Kadawatha).

Data were entered using the U.S. Census Bureau's IMPS program and analysed using SPSS PC+version 4.0. Statistical analyses were done using ANOVA.

Results

Overall, 85 percent of households purchased wheat flour in the previous month but there were provincial and sector (urban, rural, estate) differences (Table 1). Fewer households in the Western province (65 percent), but more in Central (99 percent), Uva (97 percent), and North Central (92 percent) provinces purchased wheat flour than in the other areas. Nearly all households in the estate sector purchased wheat flour, which was 20 and 10 percent over and above the proportion buying wheat flour in urban and rural areas respectively.

On average, households purchased 7.5kg of wheat flour each month (Table 1). Wheat flour purchases were much higher in the Central province (18 kg/month) than elsewhere, which reflects the greater use of wheat flour by people living in the estates (22 kg/month) than in urban (4.5kg/month) or rural areas (5.5 kg/month).

The most common wheat-based foods eaten were bread, roti, and commercial biscuits (Table 2). One-half of the children under 6 years old and their mothers ate bread on the previous day,

Table 2

Percentage of children under 5 years, mothers, and adult males consuming wheat-based foods by type of food

	Children < 5 yrs	Mothers	Adult men
	% consuming		
Bread	50.9	51.9	14.1
Roti	20.9	22.3	56.1
Godamba Roti	0.6	0.4	0.0
String hoppers	8.9	9.2	2.8
Buns – sugar	5.1	4.7	0.4
– stuffed	0.6	0.4	0.8
Pittu	1.6	1.8	2.8
Thosai	0.6	0.6	0.8
Lavaria/pancake	0.9	0.8	0.4
Pastry	0.4	0.3	0.0
Cakes	5.4	5.4	1.6
Biscuits – Marie	26.3	23.2	2.0
– Tikiri Marie	10.3	7.5	2.0
– Rusk	0.7	0.6	1.2
– Air	1.3	0.9	0.0
Viskiringna/rusk	0.5	0.5	0.0
Noodles	1.2	1.4	0.8
Papadam	4.1	4.1	0.4

Table 3

Wheat flour content per unit food item

Food	Unit	Wt(g)/unit Mean±SD	Wheat flour (g)/unit Mean±SD
Bread (loaf)	1/2" slice	25.7 ± 2.8 385.6 ± 41.4	18.2 ± 2.6 272.6 ± 39.7
Roasted bread	piece	64.7 ± 13.4	52.6 ± 10.2
Roti – small – medium – large	piece	93.4 ± 22.3 137.8 ± 43.6 214.7 ± 82.2	49.4 ± 8.4 85.4 ± 31.3 137.3 ± 48.4
Vegetable roti (Godambe)	piece	87.5 ± 21.9	46.9 ± 5.3
String hoppers	piece	26.1 ± 8.8	13.2 ± 5.4
Buns – sugar – stuffed	piece	72.7 ± 10.1	42.8 ± 9.8 40.4 ± 12.4
Pittu	piece cup	122.3 ± 27.5 154.3 ± 22.6	49.4 ± 5.5 59.9 ± 4.2
Thosai	piece	75.8 ± 22.1	22.2 ± 9.9
Lavaria/pancake	piece	75.6 ± 21.9	28.7 ± 8.9
Pastry/patties		50.3 ± 19.7	25.3 ± 7.7
Cake – butter – cream – fruit	piece	29.0 ± 11.6 35.0 37.5 ± 2.5	9.2 ± 3.6 9.0 9.5 ± 1.0
Biscuit – Marie – Tikiri Marie – Rusk	piece		7.6 ± 3.2 1.4 ± 0.7 7.2 ± 1.6
Viskiringna/rusk	piece	14.2 ± 1.9	15.8 ± 1.8
Papadam	piece	12.0 ± 0.3	4.5 ± 1.6
Murukku	piece	15.0	16.6
Cup cake (Sponge)	piece	48.2 ± 7.5	20.7 ± 7.6
Gnanakatha – large – small	piece	53.0 ± 3.0 25.0	32.7 ± 0.7 16.0 ± 1.2
Viyani roll	piece	74.7 ± 14.8	53.4 ± 12.9
Wadai	piece	100.0	55.5

Table 4

Mean and standard deviation of amount of wheat flour (g) consumed in previous 24 hours, by province, sector and group

	Children< 5 yrs g flour/day			Mothers g flour/day			Adult men g flour/day		
	Mean	SD	n	Mean	SD	n	Mean	SD	n
Overall	92.0	120.8	1382	97.1	122.6	1487	137.8	125.5	924
Province									
Western	88.7	103.6	274	94.9	124.9	311			
Central	135.9	164.7	287	134.6	158.5	311			
Southern	72.1	109.3	200	74.8	107.8	209			
N. Western	70.6	55.5	168	78.2	55.6	171			
N. Central	86.8	140.7	115	99.1	135.9	130			
Uva	80.2	139.8	172	87.7	136.7	182			
Sabaragamuwa	82.7	73.6	166	87.7	73.4	173			
ANOVA	p<0.001			p<0.001					
Sector									
Urban	79.6	85.4	657	83.0	83.1	721			
Rural	89.5	136.0	521	97.8	145.0	541			
Estate	138.0	170.3	204	140.7	63.8	225			
ANOVA	p<0.001			p<0.001					
Age group (mo)									
<6	60.9	57.67	20						
6 – 11	94.5	102.59	129						
12 – 17	103.1	142.09	153						
18 – 23	92.0	114.96	168						
24 – 35	85.9	120.52	362						
36 – 47	92.0	119.57	440						
48 – 59	96.7	176.42	76						
	ns								

ns = not significant

one out of five ate roti, and one in four ate Marie biscuits. In contrast, the majority of adult men ate roti.

Table 3 shows the mean and standard deviation weight of each food and the mean and standard deviation weight of wheat flour in each of the foods studied in the recipe survey. The latter were used to calculate wheat flour intake. Overall, children under 6 years old consumed 92 g wheat flour/day (Table 4). However, there was substantial variation in the consumption of wheat-based foods within the different groups, which was reflected in the large standard deviations. Among children under 5 years of age, there was no difference in wheat flour intake by age but, as expected, there were provincial and sector differences. Children in the estate sector consumed close to 140 g/wheat flour/day, which was about 75 and 55 percent more than in the urban and rural areas, respectively. This difference was also reflected in

consumption being much higher in the Central province than elsewhere.

The average consumption of wheat flour by adult women (97 g/day) was not much greater than that of children under the age of 5 years and the provincial and sector patterns for consumption are similar (Table 4). Women in the estate sector consumed about 140 g/wheat flour/day, which was about 70 and 45 percent more than in the urban and rural areas, respectively.

Adult men consumed an average of 138 g/wheat flour/day (Table 4). Because data are available for relatively few men, they have not been disaggregated by province or sector.

Discussion

More than four out of five households in Sri Lanka purchase wheat flour. Overall, households used an average of 7.5 kg/wheat flour/month but there were large provincial and sector differences. Wheat flour purchases in the estate sector were more than four times greater than in either the urban or rural sectors. Urban households have better access to commercially made wheat-based foods, e.g., bread, hence the lower quantity of wheat flour purchased. Rural households have poorer access to wheat flour and culturally they prefer rice. The sector difference in wheat flour purchasing patterns explains, in part, the provincial differences.

The main food sources of wheat flour were bread, roti and Marie biscuits. Children under the age of 5 years and their mothers consumed between 90 and 100 g/wheat flour/day. Among the children, there was no difference in consumption by age group. Wheat flour consumption by children and their mothers was much greater in the estate sector (about 140 g/day) than in either the urban (about 80 g/day) or rural (between 90 and 100 g/day) sectors reflecting dietary preferences, wheat-based foods being more 'convenient', in that bread requires no preparation and rotis are easier to take as meals than rice, and the price differential between wheat flour and rice. Overall, wheat flour consumption for men was about 140 g/day.

The findings in this study show wheat flour is an appropriate vehicle for iron fortification. The fact that wheat flour intake among children under 6 years old did not differ by age is encouraging and suggests that the benefits of iron fortification can impact the entire population.

Acknowledgment

This study was funded by the government and implemented by staff at the Nutrition Unit, Ministry of Policy Planning. Rebecca Stoltzfus, Johns Hopkins University assisted with developing the recipe survey, which was conducted by staff at the Medical Research Institute. We would like to thank all the field staff for their assistance in collecting the data. The support of USAID for data analyses is greatly appreciated.

References

1. Mudalige R, Nestel P. Prevalence of Anaemia in Sri Lanka. Ceylon Journal of Medical Science 1996;39: 9-16.

2. Nestel P, Ratnayake R. Nutrition and Health of Sri Lankan Children. Ministry of Finance, Planning, Ethnic Affairs, and National Integration, Colombo, 1993.