

ROLE OF ACCURATE ASSESSMENT OF NUTRITIVE VALUE IN EXPLORING FOOD AND NUTRITIONAL STATUS RELATIONSHIPS: OBSERVATION FROM A PRE-SCHOOL CHILD STUDY CONDUCTED IN KARACHI PAKISTAN.

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ABSTRACT

It is hypothesized that relationship between diet and nutritional status could be masked by ignoring variation in cooking methods in certain communities. This study was planned to test the above hypothesis by studying the association between diet and nutritional status of children, by identifying variations in nutritive value of home cooked Lentils.

From the data collected for a larger cross sectional study samples of home cooked dals and information about nutritional status of pre-school children was used from 51 lower middle class households. Lab analyzed values were higher for moisture and fat and lower for protein, as compared to the Pakistani food composition tables (PFCT) A positive relationship ($r= 0.335$) with $a(P<0.05)$, suggested an association between the MUAC of children and the percentage of calories coming from protein in dals in our study children. No such association was observed when values given in PFCT were used. These observations indicate that for valid assessment of association between composition of home cooked foods and nutritional status of children, use of generalized information given in national food composition tables be may not be inaccurate.

Keywords: *Pakistan, home cooked food, nutrition, lentils, food composition and children, malnutrition.*

INTRODUCTION:

Nearly half of Pakistani children are undernourished (Baig-Ansari, Rahbar, Bhutta, & Badruddin, 2006; Fikree, Rahbar, & Berendes, 2000; Jafar, Qadri, Islam, Hatcher, & Chaturvedi, 2007; Qureshi, Shaikh, & Rahimtoola, 1989). In Pakistan out of every 1000 children 135 die before reaching the age of five years. Improvement in the quality of weaning food has been identified as a preventive measure to reduce morbidity and mortality for nutritional causes (ref) add references for this statement. For weaning, home cooked food is the main food given to children and thus assessment of the quality of home cooked food is an initial step towards formulating recommendations for improving weaning foods. However lack of valid information about composition of home cooked food is a constraint in accurate assessment of nutrient intake and identification of causes of malnutrition. It has been noticed that the nutrient composition of similar dishes could vary according to income level of the families. Even with in a particular income group differences in nutritional status of pre-school children are observed. Since, home cooked food is the main food for pre-school children, differences in the composition of home cooked food could be one of the determinants of their nutritional status.

In Pakistan, qualitative adequacy of protein intake is dependent on the kind of curry eaten with chapati. Wheat is the staple food in Pakistan and is generally consumed at each meal in the form of chapati. In making chapati, apart from salt no other ingredient is used and it is eaten with any curry. Curry is usually liquid in consistency and is made with lentils, vegetables, meat or a combination of these. Lentils, commonly called 'dals' in Pakistan, are the most common protein rich curries used by the lower income families. (Leterme, 2002; Rochfort & Panozzo, 2007).

Nutritive values of a few varieties of raw and cooked lentils are given in Pakistani food composition tables(FCT) ref (reference).It is observed that the variety of lentils consumed is greater than those mentioned in FCT. Also due to the variability in cooking method,s the nutritive values of dals consumed by children could be different from those given in Pakistani FCTs (table 1) (Government of Pakistan, 2001). Analyzing the diets of children only on the basis of values in Pakistani FCT may mask the true variability of nutrient intake. This masked variability could be a significant factor in the association between nutrient intake and nutritional status of the subjects.

Thus, as an initial step towards exploring the validity of this assumption this study was planned to estimate the degree of variability in the nutritive composition of 'dals', cooked in lower-middle income households of Karachi, and to observe any association between nutritive value of home cooked lentils and nutritional status of children.

Materials and Methods

Subjects

With the help of a Karachi city map and descriptive information obtained from local housing authority, for each of the five districts, communities having houses built on 80 square yards were identified. A total of approximately 120 communities were identified. A stratified random sample of ten communities was achieved by randomly selecting 12 % of the communities from each district. From each selected locality first thirty households having a preschool child and showing willingness to participate in the study were recruited. One preschool child nearest to age of three years was studied from each household. A total of 300 households having a preschool child were selected for this study. This paper presents results from sixty households where Lentils curry ('dal') was cooked on the day of data collection.

Data collection

Mothers of the recruited child were interviewed to get demographic information and mid upper arm circumference of the child was taken to assess the nutritional status.

non stretchable measuring tapes. Data collectors were trained for using equipment, and following correct procedures.

Demographic characteristics

Information about socio-demographic characteristics was collected through a structured interview questionnaire. The questions assessed financial and educational status, possessions in general, food preparation related household assets and cultural background of the family.

Collection of samples of home cooked food

Sample of available home cooked food was collected. (This paper presents results only from households where Lentils Curry ('dal') was cooked on the day of data collection). Food was weighed and stored in plastic containers and labeled on the spot with the name of the food and family number. Food was stored in ice boxes during transportation and then stored in deep-freezers till analysis. All the food samples were collected within a span of one

month and analyzed after about 10 weeks within a duration of four weeks.

Nutrient analysis of home cooked food

Protein was assessed by Micro-Jeldahl method, moisture by drying method, fat by centrifuging and energy by Bomb-calorimeter (Horowitz 2000).

Data Analysis

Correlation between Mid upper circumference and protein content of lentils was assessed to explore association between nutritive value of lentils and nutritional status of the child.

Results:

Dal was cooked in 60 out of 300 households on the day of data collection. In order to minimize confounding, Lentil Curries ('dal') cooked with either vegetables or meat was excluded. Energy and nutritive values of dals are given in table 2. Mid upper arm circumference values were available for 51 children from this sub-group.

Nutritive value of home cooked lentils

Percentage of calories coming from fat, protein and carbohydrates are given in figure 1.

Differences between mean energy and nutritive value of cooked dals as analyzed from this study and those given in Pakistani food composition tables are given in table 3. In general dals analyzed for this study had a markedly higher percentage of moisture, fat and lower proportion of protein than those given in Pakistani Food Composition Tables. There was a positive ($r = 0.335$) and a significant ($P < 0.05$) association between the MUAC of children and the percentage of calories coming from protein in dals as assessed on the basis of lab analysis done for this study (fig 2). On the other hand there was no such association observed when the protein density was calculated on the basis of values given in PFCT (fig 3).

Discussion:

This paper points out the importance of appropriate assessment of food intake while studying relationship between diet and nutritional status in Pakistan and other similar countries, where food composition tables give limited information as well as variability in recipes of cooked foods is likely to be great.

There could be several reasons for variability in recipes however income is one of the major determinants of the quality and quantity of ingredients used for cooking food (Hakeem, 1999; Lawrence et al., 2007).

Table 1: Energy and Proximate Analysis Values of Commonly Used Lentils in Pakistan. From the Pakistani Food Composition Tables (7)

SN Pk. FCT	Name of Food			Energy kcal	Moisture gms	Protein gms	Fats gms	CHO gms
	English	Urdu	Scientific					
26	Chickpea w	Channa	Cicer Arietinum	360	9.8	20.5	3.8	60.7
27	Chickpea Cooked	Channa	Cicer Arietinum	187	51.9	12.4	3.8	28.8
31	Kidney Bean Cooked	Moth	Phaseolus Vulgaris	154	59.2	11.4	1.0	25.7
32	Lentil Raw	Masoor	Lens Culinaris	348	10.0	24.8	1.1	59.7
33	Lentil Cooked	Masoor	Lens Culinaris	178	68.3	11.2	1.4	16.6
34	Mung Raw	Mung	Vigna Radiata	337	6.8	22.5	1.4	63.8
35	Mung Cooked	Mung	Vigna Radiata	120	66.5	9.2	0.7	23.4
36	Mash Raw	Mash	Phaseolus Radiatus	363	7.5	23.4	1.5	62.2
37	Mash Cooked	Mash	Phaseolus Radiatus	158	62.5	10.6	1.0	22.5
38	Pigeon Pea Raw	Arhar	Cajanus Cajan	345	9.7	21.0	1.6	64.6
39	Pigeon Pea Cooked	Arhar	Cajanus Cajan	135	70.2	8.8	0.8	17.1

Table 2: Mean Energy and Nutritive Value (per 100 gram) of Cooked Dals

FOOD NAME	Count	Energy (Kcal.)		CHO (gm)		Moisture (gm)		Fat (gm)		Protein (gm)	
		Mean	Std Deviation	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Dal Masoor Black	6	128.90	21.21	21.03	3.99	72.01	4.70	3.38	1.48	3.58	1.32
Dal Arhar	7	117.37	30.46	17.54	7.45	75.80	5.51	4.12	5.34	2.54	1.21
Dal Channa	5	165.62	54.55	28.54	6.26	63.17	10.34	3.66	2.65	4.64	1.57
Dal Maash	2	163.23	62.63	29.12	7.33	62.38	11.31	2.55	3.48	5.95	0.49
Dal Masoor White	2	99.47	16.14	17.07	2.54	77.74	2.73	2.09	1.04	3.10	0.85
Dal Mixed	8	132.96	35.05	19.82	6.62	72.69	7.55	4.74	3.04	2.75	1.41
Dal Mung	16	124.64	44.54	19.01	6.74	73.81	8.86	3.97	3.26	3.21	1.72
Dal Mung & Masoor	5	112.99	12.12	19.59	2.54	75.11	2.50	2.69	1.35	2.62	0.95

Table 3: Difference Between Mean Energy and Nutritive Value of Cooked Dals Analyzed for this Study and Those Given in Pakistani Food Composition Tables

Dals	Moisture gm/100 gm	CHO gm/100 gm	Fat gm/100 gm	Protein gm/100 gm	Calories /100gm	%Cal. from Prot.	%Cal. from Fat	%Cal. from CHO.
Dal Channa	11.27	-0.26	-0.14	-7.76	-21.38	-13.11	1.21	16.60
Dal Masoor	5.25	3.25	2.21	-8.21	-54.14	-26.29	15.51	12.63
Dal Mung	7.31	-4.39	3.27	-5.99	4.64	-16.34	21.46	-4.46
Dal Maash	-0.12	6.62	1.55	-4.65	5.23	-13.80	5.56	13.09
Dal Arhar	5.60	0.44	3.32	-6.26	-17.63	-22.65	21.33	2.44
Average	5.86	1.13	2.04	-6.57	-16.66	-18.44	13.02	8.06

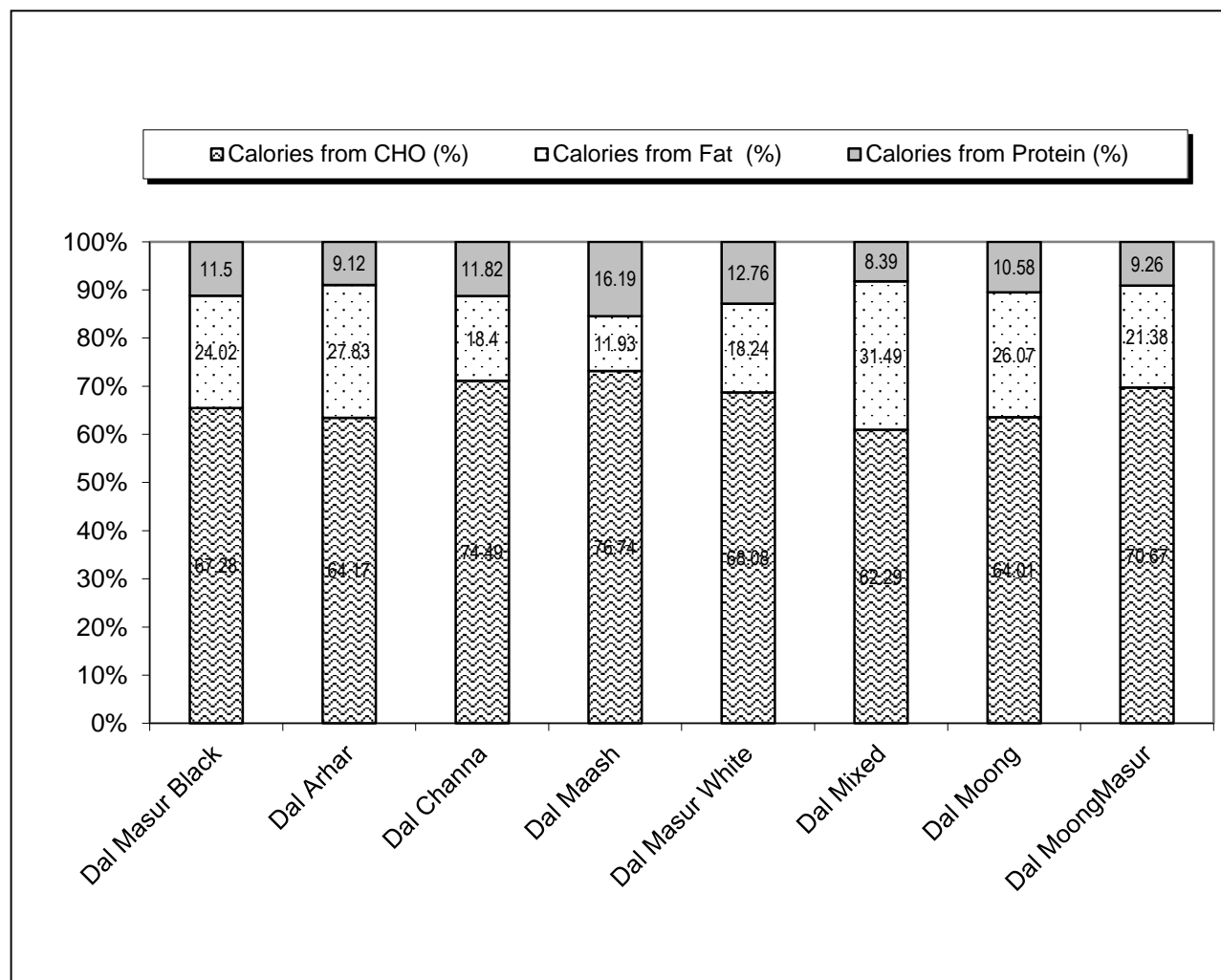
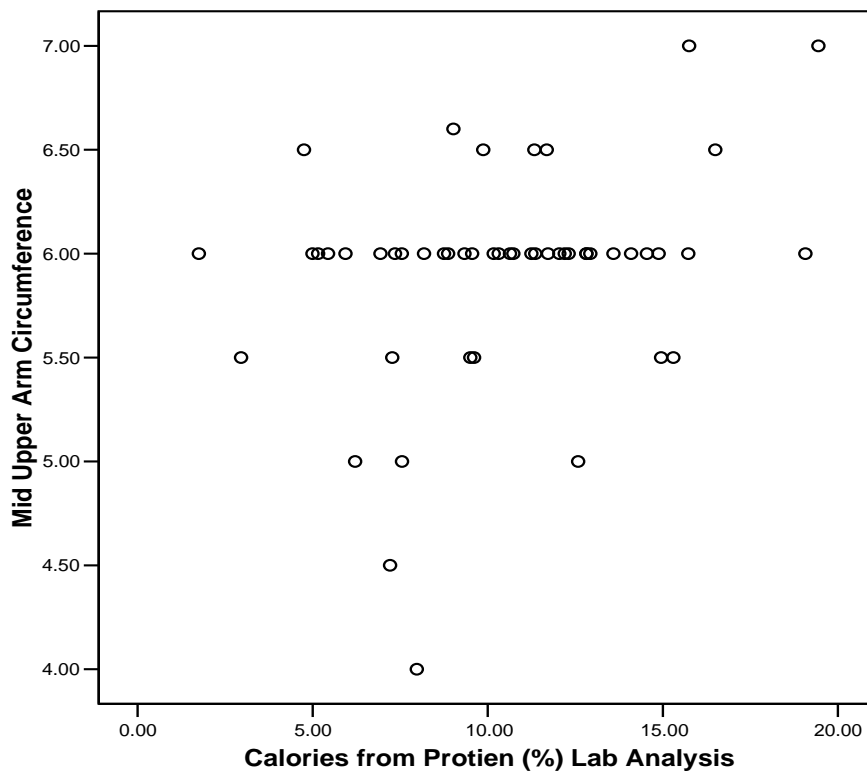
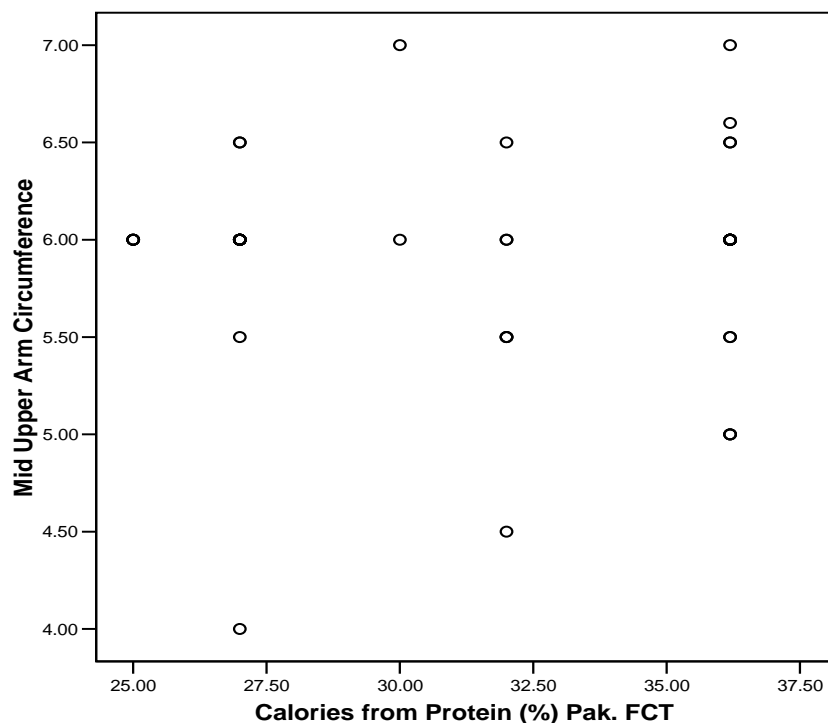


Figure 1: Mean Percentage of Calories from Fats Proteins and Carbohydrates in Various Dals.



Pearsons' $r = 0.357$, $P = 0.01$

Figure 2: Scatter Plot for Association of MUAC with Protein Density of Home Cooked Dals Assessed on the Basis of Values of Lab Analysis Done for this Study .



Pearsons' $r = -0.026$, $P = 0.858$

Figure 3: Scatter Plot for Association of MUAC with Protein Density of Home Cooked Dals Assessed on the Basis of Values Given in Pakistani Food Composition Tables.

In the absence of a well established social welfare system in Pakistan, quality and quantity of food intake is very sensitive to economic conditions (Hakeem, 1999; Lawrence et al., 2007). Ignoring these facts would lead to an underestimation of the malnutrition attributed to the variation in cooking methods of food and therefore the nutrient consumption. This may restrict the possibilities of intervention in improving cooking methods.

Need for having local/regional food composition data has been repeatedly felt and highlighted by experts (Bedogni et al., 1999; Bharathi & Vaz, 2004; Garcia, Rona, & Chinn, 2004; Hakala, Knuts, Vuorinen, Hammar, & Becker, 2003; Leclercq, Valsta, & Turrini, 2001). It has also been noted that computed and chemically analyzed nutritive values of foods may be different and the kind of differences observed are not always the same in different studies (Kim et al., 2003; Bedogni et al., 1999), thus it is important to have regional and local lab based assessment of nutritive values of most foods in general but of cooked and prepared food in particular.

This study was very limited in scope. However, it is an indication of association between composition of home cooked foods and nutritional status. It is a strong advocate for the need for having comprehensive, in-depth studies of food habits of local populations, so as to accurately assess the food and nutrient intake and identify possibilities of exploring indigenous diet patterns conducive or non-conducive to health.

Conclusion

These observations indicate that for a valid assessment of association between composition of home cooked dals and nutritional status of children, the use of generalized information from the Pakistani food composition tables may not be sufficient. Pakistan food composition tables need to be updated and enhanced in the light of indigenous diet patterns and practices in different regions and communities. Till the availability of more enhanced data, researchers should beware of these variations. It may be required to assess nutritive values of foods in question of any particular study.

Reference List

Baig-Ansari, N., Rahbar, M. H., Bhutta, Z. A., &

Badruddin, S. H. (2006). Child's gender and household food insecurity are associated with stunting among young Pakistani children residing in urban squatter settlements. *Food and Nutrition Bulletin*, 27, 114-127.

Bedogni, G., Bernini, C. E., Gatti, G., Severi, S., Poli, M., Ferrari, F. et al. (1999). Comparison of food composition tables and direct chemical analysis for the assessment of macronutrient intake in a military community. *International Journal of Food Science and Nutrition*, 50, 73-79.

Bharathi, A. V. & Vaz, M. (2004). Dilemmas in planning diets using existing food composition tables. *National Medical Journal of India*, 17, 280.

Fikree, F. F., Rahbar, M. H., & Berendes, H. W. (2000). Risk factors for stunting and wasting at age six, twelve and twenty-four months for squatter children of Karachi, Pakistan. *Journal of Pakistan Medical Association*, 50, 341-348.

Garcia, V., Rona, R. J., & Chinn, S. (2004). Effect of the choice of food composition table on nutrient estimates: a comparison between the British and American (Chilean) tables. *Public Health Nutrition*, 7, 577-583.

Government of Pakistan (2001). *Food Composition Table for Pakistan* Planning and Development Division, Ministry of Planning and Development, Government of Pakistan; Department of Agricultural Chemistry and Human Nutrition, NWFP, Agricultural University, Peshawar.

Hakala, P., Knuts, L. R., Vuorinen, A., Hammar, N., & Becker, W. (2003). Comparison of nutrient intake data calculated on the basis of two different databases. Results and experiences from a Swedish-Finnish study. *European Journal of Clinical Nutrition*, 57, 1035-1044.

Hakeem, R. (1999). Socio-economic differences in the in the composition of home cooked foods in Karachi Pakistan. In (pp. -110 p.). Rome (Italy): FAO. Jafar, T., Qadri, Z., Islam, M., Hatcher, J., & Chaturvedi, N. (2007). Rise in Childhood Obesity with Persistently High Rates of Under-nutrition among Urban School Aged Indo-Asian Children. *Archives of Diseases in Childhood*.

Kim, E. S., Ko, Y. S., Kim, J., Matsuda-Inoguchi, N., Nakatsuka, H., Watanabe, T. et al. (2003). Food composition table-based estimation of energy and major nutrient intake in comparison with chemical analysis: a validation study in Korea. *Tohoku Journal of Experimental Medicine*, 200, 7-15.

Lawrence, J. M., Devlin, E., Macaskill, S., Kelly, M., Chinouya, M., Raats, M. M. et al. (2007). Factors that affect the food choices made by girls and young women, from minority ethnic groups, living in the UK. *J.Hum.Nutr.Diet.*, 20, 311-319.

Leclercq, C., Valsta, L. M., & Turrini, A. (2001). Food composition issues--implications for the development of food-based dietary guidelines. *Public Health Nutrition*, 4, 677-682.

Leterme, P. (2002). Recommendations by health organizations for pulse consumption. *British Journal of Nutrition*, 88 Suppl 3, S239-S242.

Qureshi, F., Shaikh, T. Q., & Rahimtoola, R. J. (1989). Malnutrition of children under 5--findings from

Mahmoodabad survey. *Journal of Pakistan Medical Association*, 39, 3-6.

Rochfort, S. & Panozzo, J. (2007). Phytochemicals for health, the role of pulses. *Journal of Agriculture Food Chemistry*, 55, 7981-7994.

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