QUANTITATIVE ASSESSMENT OF MACRONUTRIENTS AND MICRONUTRIENTS AVAILABILITY IN SELECTED READILY AVAILABLE FOODS IN THE PREPARATION OF DIETARY GUIDELINES

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Ph.D. **2015**

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Kodithuwakku Wickramaarachchige Madhura Arunoda Jayasinghe

Thesis submitted to the University of Sri Jayewardenepura – Sri Lanka, for the award of the Degree of Doctor of Philosophy in Food Science and Technology, on 31.12. 2015.

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Certification of the Supervisor

I certify that the candidate has incorporated all corrections, additions and amendments recommended by the examiners to the final version of the Ph.D. thesis.

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Declaration

The work described in this thesis was carried out by me under the supervision of Professor K.K.D.S Ranaweera and a report on this has not been submitted in whole or in part to any University or any other institution for another Degree / Diploma.

Signature of the candidate

(K.W.M.A. Jayasinghe)

I certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.

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Acknowledgement

I am extremely grateful to my supervisor, Professor K.K.D.S. Ranaweera for giving me this valuable opportunity and for his continuous guidance, support, care and encouragement given throughout this entire period with a marvelous enthusiasm towards this research and how I carried on the works as a student of his. I would also like to thank all the academic and non-academic staff members of the department of Food Science and Technology for their support.

My heartiest thanks go to Mr. R.M.G.B. Rajanayake for letting use the facilities of "City Analyst Laboratory", Colombo and I'm grateful to all the staff members there.

I hardly find words to express my deepest gratitude to all my friends who volunteered for my study, donating their valuable time and effort, in interviewing and collecting data in community surveys.

I would like to show my sincere gratitude to Dr. Rohan Marasinghe and Prof. Sagarika Ekanayake of Faculty of Medical Sciences – USJP, for educating me on research methodologies and for facilitating me on research work. A very warm hearted gratitude should be shown to Mr. Pubudu Gunawardene of "Zone 24×7" Organization, for his unbelievable assistance in teaching me software development tools for the purpose.

My sincere thanks go to the "Sri Lanka Centre for Research and Development", for providing us an adequate grant to fulfill all financial needs during this study and for the staff of the Faculty of Graduate studies – USJP, for providing me this golden opportunity to conduct this study successfully.

Abbreviations

RDI	- Reference Dietary Intake
RDA	- Recommended Dietary Allowance
WHO	- World Health Organization
FDA	- Food and Drug Administration
^{o}C	- Degrees Celsius
kg	- Kilograms
g	- Grams
pH	- Power of Hydrogen
rpm	- Revolutions per minute
mL	- Milliliters
µL	- Microliters
IAUC	- Incremental area under the curve
HDL	- High-density lipoproteins
LDL	- Low-density lipoproteins
ATP	- Adenosine try phosphate
BMI	- Body Mass Index
BMR	- Basal Metabolic Rate

Abstract

Sri Lankans have access to a vast range of food resources available in this tropical country, although many are not aware of their quantitative nutritional values. Drastic changes of lifestyles have remarkably affected the food culture of Sri Lankans over the last few decades, resulting in underutilization of freely available food resources, especially in urban areas of the island. This study was initiated with a survey conducted island-wide; with a view to collect data of dietary choices, cooking methods and portion sizes of regularly consumed foods in seven different active social segments (housewives, office workers in the public sector, lecturers/teachers, managerial level employees in the private sector, school children aging 14-18 years and athletes).

Food combinations that were identified to be consumed frequently by people were analyzed for their nutrition contents. School children and managerial level employees elicited significantly ($p<0.05$) deficient intakes of Magnesium, Manganese, Vitamin A, B_9, C and dietary fibre compared to the RDI values recommended by WHO. School children elicited significant ($p<0.05$) deficiencies in Vitamin B_2 and B_6 as well. Both above social segments were found to consume significantly ($p<0.05$) excessive contents of fat and protein than their RDI. Labourers showed significant ($p<0.05$) deficiencies in daily intakes of Calcium, Iodine, Iron Manganese, Zinc and Vitamin A, B_2, B_6, B_9, C than the RDI values. Athletes and housewives obtained significantly high ($p<0.05$) daily doses for 59 % and 53 % of all nutrient types tested respectively. Lecturers/teachers and public sector officials elicited relatively healthy dietary patterns, but both sects were found to suffer from significant deficits ($p<0.05$) of Vitamin A, compared to RDI. Lecturers/ Teachers elicited significant deficits of

Vitamin B_6, whereas Calcium and Zinc deficiencies were significant ($p<0.05$) in a typical Office Worker's diet. Higher daily intakes than the RDI of Vitamin B_5 was evident in all segments, where as there were significantly ($p<0.05$) excess intakes in Vitamin D, E and Vitamin K. All segments had elicited very high intakes of Phosphorus and Chloride, exceeding their RDI levels. Intakes were significantly high ($p<0.05$) in Sodium and Selenium as well.

As a remedial measure to these nutritional discrepancies and dietary disorders, a nutritional data base containing quantitative nutritional values of; 13 types of grains and pulses, 9 leafy vegetables types, 12 non-leafy vegetables, 14 types of animal foods (including dairy foods), 12 fruit types, 7 root crop types, 6 other popular curry/gravy food types; was made. All foods were cooked/prepared according to local culinary methods.

Using the nutrition data base, dietary guidelines were prepared for the common public with sample diet plans to follow in daily life to fulfill RDI levels of all nutrients, without exceeding the limits adversely. Since, dietitians may need to formulate different types of meal combinations relative to different patients; a software with an embedded search engine was made using Java language and Derby, SQL and Mavel building tools, which includes the nutritional data of the local foods analyzed.