

## A STUDY IN KULIYAPITIYA TO ASCERTAIN PUBLIC AWARENESS OF THE LIPID COMPOSITION OF EDIBLE COCONUT KERNEL PRODUCTS AND THEIR EFFECT ON HEALTH

P. W. M. L. H. K. Marambe<sup>1</sup>, R. Sivakanesan<sup>2</sup> and K. D. R. R. Silva<sup>1</sup>

<sup>1</sup>*Department of Applied Nutrition, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Gonawila, Makandura, Sri Lanka*

<sup>2</sup>*Department of Biochemistry, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka*

### ABSTRACT

The nexus between coconut consumption and coronary heart disease is controversial. There is much confusion in the minds of the general public on this subject. In this context, a study was conducted, in year 2003, with 308 adults (148 males and 160 females from 189 families) living in Kuliypitiya area, to ascertain their knowledge and perceptions on the implications of consuming coconut kernel products on their health, and the manner in which they used coconut for culinary preparations. This information and other socio-economic data were collected using an interviewer-administered pre-tested questionnaire. Majority of the respondents were under the impression that coconut oil, scraped coconut and coconut milk contain cholesterol. However, coconut oil was the most popular cooking oil in the study area and coconut kernel products were used by all, on a daily basis, for culinary purposes as a traditional practice and due to its unique taste. Housewives with a higher level of monthly family income and education showed a preference for using other cooking oils instead of coconut oil, and to use a liquidizer for extracting coconut milk rather than hand squeezing. The results of the present study demonstrate the widespread nature of the misconceptions regarding coconut and draws attention to the urgent need to educate the community on scientific findings relating to the nutritional value and health benefits of coconut.

### INTRODUCTION

Since colonial times, coconut has been Sri Lanka's third most important commercial crop (Kumar *et al.* 2003). The present extent under coconut in Sri Lanka is 443,952 ha (Department of Census and Statistics, 2004). The larger plantations are found in the southern part of North-Western Province and in the northern part of Western Province. This area is called the coconut triangle. In other areas coconut is generally grown in home gardens and in isolated plots (Kumar *et al.* 2003). The coconut triangle is located in the districts of Puttalam, Kurunegala and Gampaha, and accounts for two-thirds

of the extent under coconut. Kurunegala district, with 143,002 ha, has the largest extent (Department of Census and Statistics, 2004).

Scraped (grated) or ground coconut kernel, their water extracts (coconut milk) and coconut oil are used, on a daily basis, for culinary purposes in Sri Lanka. Since coconut oil is a plant product it contains no cholesterol (Raheja & Bhoraskar, 1999). As coconut fat contains about 92% saturated fats, it is generally believed that consumption of coconut raises serum cholesterol and the risk of cardiovascular diseases. However, recent findings show that the long chain fatty acids, polyunsaturated fatty acids (PUFA) and trans fatty acids are the fat constituents that are more involved in heart disease related biochemical pathways in human metabolism (Bamunuarachchi, 1997). It has therefore been argued that coconut fat, which is rich in medium chain fatty acids, has no significant effect on blood cholesterol because medium chain fatty acids are easily digestible and requires no transport system to be absorbed, digested and metabolized. Coconut fat is easily oxidized and is therefore a preferred energy source (Arancon, 2000). During the past 40 years, the incidence of coronary heart disease (CHD) has increased in Sri Lanka, and it is argued that coconut contributes to the development of arterial disease (Wikramanayake, 1997). In this context, the perceptions of coconut consumers would be of interest.

A cross sectional study was conducted to investigate the association between coconut consumption and prevalence of risk factors of coronary heart disease (CHD). A preliminary component of that study was to ascertain the knowledge and perceptions of consumers in regard to the health and nutritional aspects of coconut oil (CO), coconut milk (CM) and scraped coconut (SC), and the modes of usage of coconut for culinary preparations. The results of this preliminary study are presented in this paper.

## METHODOLOGY

The study was conducted in two Grama Sevaka (GS) Divisions (Meegahakotuwa and Dandegamuwa) of the Kuliypitiya Divisional Secretary's Division (DSD) located in the coconut triangle. A total of 308 subjects (148 males and 160 females, belonging to 189 families) were recruited in the study by systematic sampling using the electoral list of the GS Divisions. Of the study population, 156 (50.6%) subjects drawn from 88 families were from Meegahakotuwa GS Division while 152 (49.4%) subjects from 101 families were from Dandegamuwa GS Division.

All 308 participants, both males and females, were middle-aged and apparently healthy with no history of CHD, cancer or diabetes, and followed their habitual diet during the data collection period. A survey was conducted with a pre-tested, interviewer-administered questionnaire to gather information on their socio-economic status, modes of coconut usage for

household culinary preparations, and knowledge and perceptions on health implications of consuming coconut kernel products (coconut oil, coconut milk, scraped coconut). Collection of information on the modes of using coconut and their rationale, was limited to the female participants as generally cooking for the family is their responsibility. All descriptive data and responses to the questionnaire were summarized and presented as percentages. The association of income and education on knowledge and perceptions on the health implications of different coconut products, choice of cooking oil and methods of extracting coconut milk were determined by chi square test. Statistical analysis was performed using SPSS for Windows version 10.00.

## RESULTS

The vast majority of the study population were Sinhalese (96.7 %), 2.6% Tamils, and 0.3% each of Muslims and Burghers. Fifty one percent had studied up to the 10<sup>th</sup> grade (GCE Ordinary level), and 36% and 13% had studied up to the 12<sup>th</sup> grade (GCE Advanced level) and Bachelor's degree level, respectively. Most of the subjects were employees in government or private sectors, followed by those self-employed in private business activities and daily paid unskilled workers. The average family size of the study sample was four and the average coconut consumption was 1.5 nuts/household/day. Around 47% and 14% of the families obtained their entire requirement of coconuts from their home garden and from family-owned coconut lands, respectively; 20% purchased their entire requirement from the market; and the rest obtained their requirements from a combination of the above mentioned sources.

### Lipid composition of coconut kernel products

The findings presented below were based on the participants' answers to specific questions of the interviewer-administered questionnaire. Almost all the participants (n=289, 93.8%) were aware of the term 'cholesterol'. Around 64.6% (n=199) believed that coconut oil had cholesterol; only 20.8% (n=24) stated that coconut oil did not contain cholesterol (Table 1). In regard to 'other vegetable oils', 31.5% (n=95) thought they contain cholesterol and 42.9% (n=132) stated they were free of cholesterol. While 95 participants subscribed to the misconception that 'other vegetable oils' contain cholesterol, more than double that number (199) did so in regard to coconut oil.

More than 50% of the subjects were of the view that scraped coconut and 'miti kiri' (first extraction of coconut milk) contained cholesterol, and 38.8% (n=95) stated that 'diya kiri' (second extraction of coconut milk) contained cholesterol. Only 12.7% (n=39), 13% (n=40) and 31.8% (n=98) of the

subjects stated that, scraped coconut, 'miti kiri' and 'diya kiri', respectively, were free of cholesterol.

Majority of the study population were aware that there was fat in scraped coconut (n=292, 94.8%), in 'miti kiri' (n=294, 95.5%) and in 'diya kiri' (n=199, 64.6%). 'Miti kiri', and scraped coconut were classified by (n=177, 57.5%) and (n=173, 56.3%) respectively, as items that contain high levels of fat. However only 38% (n=117) and 24.7% (n=76) were aware of the terms 'saturated fats' and 'PUFA', respectively. Around 15.4% (n=47) were aware that coconut contained saturated fats. Only 18.2% (n=56) were of the view that excessive consumption of saturated fat can lead to CHD while majority (n=240, 77.9%) knew the adverse effects of consuming excessive dietary cholesterol.

**Table 1: Participants' awareness of the cholesterol status of coconut kernel products**

Statement	Response		
	Yes % (n)	No % (n)	Don't know % (n)
Coconut oil contains cholesterol	64.6 (199)	20.8 (64)	14.6 (45)
Scraped coconut contains cholesterol	56.5 (174)	12.7 (39)	30.8 (95)
Miti kiri contains cholesterol	58.1 (179)	13.0 (40)	28.9 (89)
Diya kiri contains cholesterol	30.8 (95)	31.8 (98)	37.3 (115)
Other vegetable oils contain cholesterol	31.5 (97)	42.9 (132)	25.6 (79)

Source: Authors' household survey (2003)

### Use of coconut oil as a cooking oil

Coconut oil was the principal cooking oil used by the participating households. Other vegetable oils, margarine and ghee were also used by them for culinary purposes. Some 70.2% (n=132) of the families used only coconut oil and 0.5% (n=1) used only vegetable oil as their cooking oil (Table 2). Another 28.0% (n=53) of the families used coconut oil along with other types of vegetable oil, margarine and ghee for cooking. Only 1.3% did not use any type of cooking oil. Of the coconut oil users, 4.5% (n=6) used coconut oil only for tempering, 0.8% (n=1) only for frying and 94.7% (n=125) for both tempering and frying.

The reasons given by respondents for using coconut oil exclusively as their cooking oil are summarized in Table 3. Most of them (n=57, 43.7%) used coconut oil as it was the traditional practice, whereas 33.3% (n=44) used coconut oil because of its superior taste. Only 3.8% (n=5) used coconut oil because it was nutritious.

The reasons given for not using coconut oil at all, or not using it exclusively, for culinary purposes are summarized in Table 4. The majority (n=36, 66.7%) did so because they held the view that "coconut oil is not good for their health." High cost of coconut oil was the reason for 22.2% (n=12) of the families. Another 1.9% (n=1) used other oils because they were medically advised to restrict coconut oil consumption; for 5.6% (n=3) the reason for using other cooking oils was the poor quality of coconut oil available in the market; and 3.7% (n=2) had restricted their consumption of coconut oil both on medical advice and because they themselves consider coconut oil as 'not healthy'.

**Table 2: Type of cooking oil used in the households**

Type of cooking oil	Number of families	%
Coconut oil only	132	70.2
Other vegetable oils only	1	0.5
Coconut oil+ Other vegetable oils	22	11.7
Coconut oil+ Margarine	18	9.6
Coconut oil+ Other vegetable oils + Margarine	7	3.7
Coconut oil+ Other vegetable oils + Margarine + Ghee	6	3.2

Source: Authors' household survey (2003)

**Table 3: Reasons for using coconut oil exclusively as their cooking oil**

Reason for exclusive use of coconut oil	Number	%
(1) Because it is the traditional practice	57	43.7
(2) Because it is tasty	44	33.3
(3) Because it is nutritious	5	3.8
(1) + (2)	13	9.8
(1) + (3)	1	0.8
(1) + (2) + (3)	1	0.8
Other	11	8.3

Source: Authors household survey (2003)

**Table 4: Reasons for not using coconut oil exclusively**

Reason	Number	%
(1) High cost	12	22.2
(2) Coconut oil is not good for health	36	66.7
(3) Medical advice to restrict its use	1	1.9
(4) Poor quality of coconut oil available in the market	3	5.6
(2)+(3)	2	3.7

Source: Authors' household survey (2003)

## Use of coconut milk

All the households used coconut milk everyday for culinary purposes. The most popular method of extracting coconut milk was by squeezing scraped coconut by hand, using cold water, which was practiced by 52.4% of the families; a further 4.2% used the same procedure with hot water (Table 5). Blending in a liquidizer followed by hand squeezing using cold water was practiced by 6.3% families; a further 2.1% used the same procedure with hot water. The other methods used were grinding the kernel or scraped coconut using a grinding stone followed by hand squeezing with cold or hot water, and various combinations of the above noted methods

**Table 5: Methods used for extracting coconut milk**

Method of extraction of coconut milk	Number	%
(1) Hand squeezing scraped coconut with cold water	99	52.4
(2) Hand squeezing using hot water	8	4.2
(3) Hand squeezing liquidized scraped coconut using cold water	12	6.3
(4) Blending in a liquidizer followed by hand squeezing using hot water	4	2.1
(5) Hand squeezing ground kernel with cold water	0	0
(6) Grinding on a stone followed by hand squeezing using hot water	1	0.5
(1)+(3)	15	7.9
(2)+(4)	3	1.6
(3)+(5)	7	3.7
(4)+(6)	2	1.1
(1)+(5)	4	2.1
(2)+(6)	1	0.5
(1)+(3)+(5)	1	0.5

Source: Authors' household survey (2003)

## Influence of the level of education

The knowledge and perceptions of the respondents on the cholesterol status of coconut kernel products and other vegetable oils varied with their level of education among the female respondents but not in the case of males (Table 6). Strangely, the proportion of females under the misconception that scraped coconut and coconut milk contain cholesterol was significantly higher among those with a higher level of education (GCE A level or higher) (Table 6).

The proportion of females using coconut oil as the principal cooking oil was significantly higher among those with a lower level of education (GCE O level or lower) (Table 7).

**Table 6: Participants' awareness of the cholesterol status of coconut kernel products in relation to their education level**

Level of education	Coconut oil contains cholesterol %(N)	Scraped coconut contains cholesterol %(N)	Miti kiri contains cholesterol %(N)	Diya kiri contains cholesterol %(N)	Other vegetable oils contain cholesterol %(N)
<b>Male (148)</b>					
Up to GCE Ordinary level	69.0 (49)	47.4 (36)	54.9 (39)	38.0 (27)	28.2 (20)
GCE Advanced level and higher education	58.4 (45)	52.6 (40)	57.1 (44)	33.8 (26)	33.7 (29)
P value	0.18	0.88	0.09	0.18	0.43
Pearson chi square	1.78	0.02	4.91	3.42	1.68
<b>Females (160)</b>					
Up to Ordinary level	59.1 (52)	46.6 (41)	45.5 (40)	20.5(18)	29.5 (26)
Advanced level and higher education	73.6 (53)	79.2 (57)	77.8 (56)	33.3 (24)	30.6 (22)
P value	0.05	<0.001**	<0.001**	0.04*	0.21
Pearson chi square	3.71	17.85	19.02	6.65	3.08

\*p<0.05;\*\*p<0.001

N: Number

Source: Authors household survey (2003)

### **Influence of the level of family income**

Use of coconut oil as the cooking oil was more common in families with a monthly income of less than Rs. 10,000 than in families with a higher income although the relationship was not significant (p=0.08). Extraction of coconut milk by hand squeezing was more commonly practiced by females with a lower level of education and in families with a monthly income of less than Rs 10,000 (0.05; not significant).

**Table 7: Choice of cooking oil and the method of extraction in relation to education level and family income**

	Use of coconut oil as the only cooking oil % (N)	Extraction of coconut milk by hand squeezing % (N)
<b>Level of education of females</b>		
Up to Ordinary level	74.7 (65)	70.1 (61)
Advanced level and higher education	64.8 (46)	63.4 (45)
P value	0.04*	0.37
Pearson chi square	9.92	6.48
<b>Monthly family income (Rs/Mt)</b>		
</=Rs10,000	78.8 (52)	77.6 (52)
>Rs.10,000	66.4 (79)	60.8 (73)
P value	0.08	0.05
Pearson chi square	3.159	5.898

\*p<0.05

N= Number

Source: Authors household survey (2003)

## DISCUSSION

The results indicate that the majority of the study population still believes the myth that coconut oil, coconut milk and scraped coconut contain cholesterol. Although many held the view that coconut oil contains cholesterol, it was the most popular cooking oil in the study area. The popularity of coconut oil stemmed from the fact that it is used traditionally and also because participants favoured its taste. The housewives who used other cooking oils, instead of or in addition to coconut oil, did so because they thought that coconut oil is not good for their health. However, several studies in coconut consuming countries found no adverse effects from coconut consumption. Lipoeto *et al.* (2004) reported that consumption of coconut fat was not a predictor for CHD among the Minangkabau in Indonesia who are known to consume large amounts of coconut in their daily diet. Also a study conducted in Kerala found no specific role of coconut or coconut oil in the causation of CHD (Kumar, 1997). Unpublished data of the Kerala study also indicates that consumption of coconut fat had no major harmful effect on CHD risk factors (personal communication).

The housewives with a higher level of education and family income tended to use cooking oils other than coconut oil. These attributes also had an influence on the method of coconut milk extraction, and housewives in this



category commonly used a liquidizer to extract coconut milk rather than only squeezing by hand.

Hiniduma *et al.* (2004) reported that the highest amount of short chain fatty acids, which are known to be readily oxidized without getting deposited in the blood vessel walls are extracted by hand squeezing ground coconut kernel using cold water. However, none of the housewives in the study population depended entirely on this method for their requirements of coconut milk; a few combined grinding with liquidizing (3.7%) and hand squeezing (2.1%).

## CONCLUSION

The study population had a poor knowledge of the lipid composition of the coconut kernel products. Majority were not aware that coconut oil and other coconut products do not contain cholesterol. Despite this, coconut oil was the main cooking oil used by the subjects. The level of education and the monthly family income of housewives influenced their choice of cooking oil and method of coconut milk extraction.

Further studies are necessary to determine the nutritional composition of different kernel products, and the nexus between coconut consumption and health, specifically CHD risk factors. Important findings of these studies should be disseminated to the community through mass media and extension programs.

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