

Original Research



Consumption pattern of cooking oils, fats and its associated factors in households of a medical officer of health area in Colombo District, Sri Lanka

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DOI: <https://doi.org/10.4038/jccpsl.v31i4.8853>

Received: 21 Apr 2025

Accepted: 19 Sep 2025

Abstract

Introduction: Household use of cooking oils and fats, along with consumer knowledge and behaviour, significantly influence family nutrition and the risk of non-communicable diseases (NCD). Understanding these patterns is vital for planning interventions to promote healthier dietary practices.

Objectives: To describe the consumption patterns of cooking oils and fats in households and factors associated with their use in a defined area in Colombo District, Sri Lanka

Methods: A community-based cross-sectional study was conducted between March and June 2021 in a defined medical officer of health (MOH) area using a pretested, interviewer-administered questionnaire. Data were analysed using descriptive, bivariate and multivariate techniques in SPSS version 22.0.

Results: A total of 904 household members (response rate 89.3%) participated. Their ages ranged from 19 to 80 years, with the majority being female (n=663; 73.3%), married (n=751; 83.1%) and educated up to Advanced Level (22.3%). Hypertension was the most prevalent NCD (n=396; 43.8%). Coconut oil was used by 97% (n=877) and was the preferred choice for 92.1% (n=833). Only 21.1% (n=191) produced oil at home and 32.5% (n=294) used 250–500 ml of oil weekly. Safe practices were observed among 66.4% (n=600) associated with employment (adjusted odds ratio (AOR)=4.4), higher income (AOR=2.6) and absence of dyslipidaemia (AOR=1.5). Satisfactory knowledge (58.8%, n=532) was significantly associated with female gender (AOR=2.8), higher education (AOR=3.4) and income (AOR=1.5).

Conclusions & Recommendations: Coconut oil dominates household use. Despite good practices, significant knowledge gaps and unsafe behaviours persist. Targeted awareness programs are recommended to promote healthier oil usage.

Key words: Cooking oils and fats, Household use, Associated factors

Introduction

Fats and oils have a similar chemical structure and are named as “triglycerides” chemically (1). The physical status of triglycerides of being a liquid (oil) or solid (fats) is decided by the nature of the fatty acids. Therefore, both fats and oils are called ‘dietary fats’ nutritionally. Unhealthy intake of dietary fats includes increased consumption of foods having trans fats, reheating/reusing oils multiple times, poor storing of unused or pre-used oils for future use, overheating oils and fats up to their smoke points, frequent use of deep-fried foods and the high intake of oils and fats especially saturated and trans fats exceeding recommendable amounts. Further, it includes unhealthy practices related to production of cooking oils at the community level.

Using different types of oils and fats for cooking has been a common practice all over the world. Its consumption differs between countries and even within a country, with many factors influencing the selection and patterns of use, such as social, cultural and familial beliefs, local availability and advertising along with several other less discussed factors (2). In Sri Lanka, there is a wide variation in the type and amount of fats and oils used. At present, coconut and coconut oil are the main sources accounting for the highest portion of their daily calory intake (2-4). However, with the introduction of new varieties into the market, several other types of cooking oils and fats are being used widely in households (3, 5).

Reducing unhealthy types and amounts of dietary fats reduces the risk for cardiovascular diseases (6-7). In addition, there are adverse health effects including cancers and diabetes mellitus associated with the incorrect use of cooking oils and fats (8-9).

Different issues related to production, transport, sale and use of cooking oils and fats have been raised by many parties including the health sector, media and the general public due to its significance in health, financing as well as cultural aspects over many years. These issues have led to different directions

including a political decision to ban palm oil importation and production in Sri Lanka. In this context, the importance of a fresh analysis is identified as vital with the vast array of oils available in the market and sub-optimal/unhealthy practices reported among consumers, according to non-scientific publications such as radio programmes and newspaper articles published frequently (10). Furthermore, the consumption pattern of oil and fats among Sri Lankans has not been studied adequately in previous studies particularly at the household level. Identifying unhealthy practices and underlying knowledge gaps among the public is important to identify appropriate public health strategies and interventions for NCD control and nutrition promotion, both nationally and regionally. The objective of this study was to describe the household behaviour related to consumption of cooking oils and fats and their associated factors in an MOH area in Colombo District, Sri Lanka.

Methods

This study was conducted as a community-based cross-sectional study with an analytical component, in the MOH area Padukka in Colombo District from February 2021 to April 2021. Household members aged above 18 years who were involved in cooking and taking decisions related to selection of cooking oils/fats were eligible for the study. Residents who were unable to communicate, households conducting commercial level food preparations and COVID-19 affected/quarantined households were excluded.

The sample sizes were estimated using available evidence on coconut-oil use, which was 91.2% (11) and 79% (4) in previous studies. However, no robust evidence existed on consumers’ knowledge levels, related practices or perceptions regarding the use of cooking oils and fats. To obtain an adequate sample size for assessing these factors, a conservative estimate of 50% correct practices was assumed and calculations were performed accordingly. After accounting for the cluster effect (design effect of 2.9)

and 10% non-response, the final required sample size was 1237.

The sampling involved selecting 62 clusters of 20 households each, from 46 *Grama Niladhari* divisions (GND; the smallest administrative unit in Sri Lanka) in the MOH area using multistage cluster sampling, with clusters chosen proportionally to their population. The first household within each cluster was randomly selected from the voters list. Subsequent households were systematically sampled by selecting every second house from the index household, ensuring spatial separation between clusters. Within each selected household, a random selection process was followed in the presence of more than one eligible member. The clusters were mapped within GND boundaries to maintain appropriate distance and accuracy.

An interviewer-administered questionnaire (IAQ) was developed and validated to assess household consumption of cooking oils and fats. Construction of the IAQ followed a modified Delphi method, incorporating literature review, focus group discussions and key informant interviews with 17 experts. The validation process included face, content and consensual validation carried out by an expert committee and pre-testing. The questionnaire was translated into local languages (Sinhala and Tamil) using forward and backward translation method. The final IAQ consisted of 15 domains on knowledge, consumer perceptions on safe and healthy use, and practices related to use of cooking oils and fats.

Unhealthy practices related to cooking oils and fats were assessed using six key practices, namely reusing unclean containers, direct exposure to sunlight or heat during storage, deep frying, reuse of oils, heating oils to the smoke point and topping up reused oils. A scoring system, developed through a modified Delphi process, was used to categorize participants as 'healthy users' or 'unhealthy users',

for which 3 was the cut-off value decided after the consensus reached in Delphi process.

Participants' knowledge regarding the production, selection and use of cooking oils and fats was evaluated using 26 items in the questionnaire. Seven specific items focused on assessing knowledge about adverse health practices, such as the safety of reusing oils, the consequences of heating oils to the smoke point, and the effects of topping up used oils. The level of knowledge was identified as satisfactory or unsatisfactory, based on allocation of marks and taking 60 % as the cutoff point based on the consensus reached through Delphi process.

Participants' perceptions on the use of cooking oils and fats were measured using 18 items. These items explored their views on the nutritional benefits of oils and fats, the potential health risks of misuse, and the impact of product labelling on purchasing and usage decisions. Responses were categorized into favourable or neutral perceptions, providing insight into participants' attitudes towards improving their practices.

Data analysis

All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 22.0 software. Descriptive statistics were used to summarize socio-demographic characteristics and cooking oil usage patterns. Bivariate analysis, including chi-squared test and odds ratio, was used to examine associations between categorical variables. Multivariate analysis was performed to identify independent predictors of healthy oil use, knowledge levels, and perceptions.

Results

Out of the 1012 households reached, 904 household members responded, giving a response rate of 89.3%. Among the non-respondents, 88 households refused to participate and 30 households were not accessible even at the second visit. The age of participants

ranged from 19 to 80 years, along with mean and median ages of 42.2 years (SD=12.46 years) and 40 years (IQR=18), respectively. The basic socio-

demographic characteristics of the sample are given in Table 1. Hypertension (43.8%) was the commonest NCD in households.

Table 1: Socio-demographic characteristics of the participants (N=904)

Characteristic	No.	%
Sex		
Male	241	26.7
Female	663	73.3
Ethnicity		
Sinhala	867	95.9
Tamil	14	1.5
Muslim	23	2.6
Religion		
Buddhist	796	88.1
Catholic/Christian	66	7.3
Islam	23	2.5
Hindu and others	19	2.1
Current marital status		
Married/ Living together	752	83.2
Single	99	11.0
Separated/Divorced	20	2.2
Widowed	33	3.6
Current employment status		
Unemployed	185	20.5
Employed	685	75.8
Retired	34	3.7
Highest education qualification		
Up to GCE Ordinary Level	142	15.8
Passed GCE Advanced Level (AL)	114	12.6
Up to AL	202	22.3
Passed AL	199	22.0
Tertiary education	247	27.3
Monthly family income (LKR)		
<25,000	52	5.7
25,000 - 74,999	448	49.6
75,000 - 149,999	321	35.5
≥150,000	83	9.2

Coconut oil was the most frequently used cooking oil (97%) (Table 2), with 92.1% using it as their first choice. Of cooking fats, equivalent percentages of households used butter (75.9%) and margarine

(77.1%). Only 21.1% (n=191) members from the households stated that they produce cooking oil at home, while 97.2% of the households (including a proportion who produce oil at home) were

purchasing cooking oils and fats from market. Most frequently reported source of purchase was close-by stores (52.7%) or supermarket chain stores (52.9%). On average, 32.5% of the households used 250-500 ml of coconut oil per week for food preparation. Out of the households which have used fat spreads

(margarine), majority (n=370; 40.9%) had consumed only <250 g during the previous week, compared to 39.8% (n=360) among those who used butter. Most households (n=495; 54.8%) prepared two food items/curries and another 19.8% (n=179) three food items per day using cooking oils or fats.

Table 2: Types of oil/fats used for preparation of food among participants (N=904)

Oil/fats	No.	%	95% CI
Type of oil			
Coconut oil	877	97.0	95.7, 98.0
Palm oil	73	8.1	6.4, 10.0
Sunflower oil	175	19.4	16.4, 22.0
Olive oil	199	22.0	19.3, 24.8
Soya oil	52	5.8	4.3, 7.5
Sesame oil	64	7.1	5.5, 8.9
Mix vegetable oil	209	23.1	20.4, 26.0
Corn oil	29	3.2	2.2, 4.6
Canola oil	8	1.4	0.4, 1.7
Other oils	25	2.8	1.8, 4.0
Type of fat			
Ghee	98	10.8	8.9, 13.0
Butter	686	75.9	72.9, 78.6
Margarine	697	77.1	74.2, 79.8
Cheese	8	0.9	0.3, 1.7
Curd or yoghurt	3	0.3	0.07, 0.9
Peanut butter	2	0.6	0.03, 0.8
Other fats	23	2.5	1.8 to 4.0

* Total exceeds 100% as multiple responses were allowed

Regarding unhealthy practices, 61.4% (n=555) stated that they heat oils/fats up to smoke point; 54.3% (n=491) reused cooking oils; 27.4% (n=248) topped up the burnt cooking oil and reused; and 42.0% (n=380) had bought oils to pre-used bottles. Out of respondents, 78.7% (n=711) mention that they deep fry foods using oils, as a routine method of cooking. Another 15.4% (n=139) stated that their cooking oils (either purchased or produced at home) are exposed to high temperatures due to the place of storing. Based on overall scores, 66.4% (95% CI: 63.3, 69.5%) participants were identified as safe users.

With regard to knowledge on production, the majority were unaware or had poor understanding on

wrong practices (Table 3). Based on the overall scores, it was identified that 58.8% (n=532; 95% CI; 55.6, 62.1%) of the participants had a satisfactory level of knowledge. In relation to perceptions among respondents, most (n=455; 50.4%) are in the opinion that the nutritional benefit obtained from oils and fats are more important than a potential health risks of misuse. A 43.1% (n=390) held a neutral stance and 293 (32.6%) were in agreement about the influence of labels on their decision to purchase. Out of the total, 70.4% (95% CI: 67.3, 73.3%) of participants had favourable perceptions related to general use and improving their consumption of oils and fats.

Table 3: Knowledge on adverse practices among participants (N=904)

Knowledge	No. (%)		
	Correctly answered	Incorrectly answered	Do not know
Any type of oil can be reheated safely	752 (83.2)	19 (2.1)	133 (14.7)
Oil can be re heated any number of times, if colour or nature appears to be fine even after using	714 (79.0)	39 (4.3)	151 (16.7)
Re-using cooking oil can produce bad chemicals like trans fats	525 (58.1)	78 (8.6)	301 (33.3)
Heating oils for longer will damage its nutritional value	534 (59.0)	100 (11.1)	270 (29.9)
When smoke arises, it produces bad chemicals like trans fats and free radicals	418 (46.2)	91 (10.1)	395 (43.7)
Smoke point is equal in all types of oils	187 (20.7)	89 (9.8)	628 (69.5)
No harm in topping up for burnt amount of oil	495 (54.8)	63 (7.0)	346 (38.2)

Multivariate analysis identified six factors as having associations with satisfactory level of knowledge;

four factors with safe use of cooking oils and fats; and six factors with favourable perception (Table 4).

Table 4: Factors underlying safe practices, satisfactory level of knowledge and favourable perceptions in the multivariate regression analysis

Characteristic	B	SE	p-value	Exp (B)	95% CI	
					Lower	Upper
<i>Safe practices related to use of cooking oils and fats</i>						
Employment status: Being employed	1.47	0.51	0.04	4.36	1.6	11.84
Employment category: Government & Cooperate	0.71	0.2	<0.001	2.03	1.36	3.03
Income category: Higher income	0.96	0.25	<0.001	2.61	1.6	4.27
Dyslipidaemia: Present	-0.44	0.18	0.01	0.64	0.4	0.91
Constant	-1.33	0.26	0.00	0.26		
<i>Satisfactory knowledge in using cooking oils and fats</i>						
Sex: Female	1.04	0.18	<0.001	2.81	1.97	4.0
Ethnicity: Sinhalese	1.79	0.47	<0.001	6.02	2.37	15.27
Education: Higher education	1.24	0.22	<0.001	3.44	2.25	5.29
Employment category: Government & Cooperate	0.45	0.19	0.02	1.57	1.07	2.31
Income level: Higher income	0.44	0.22	0.04	1.55	1.01	2.39
Dyslipidaemia: Present	0.44	0.17	0.01	1.55	1.11	2.19
Constant	0.25	0.45	0.57	1.29		
<i>Favourable perceptions towards improving knowledge and adhering to correct practices</i>						
Marital status: Ever married	0.60	0.24	0.01	1.83	1.14	2.94
Religion: Buddhists	0.85	0.26	0.00	2.35	1.42	3.40
Employment: Employed	0.47	0.19	0.01	1.6	1.10	2.34
Income: >LKR 100,000 per month	-0.55	0.23	0.02	0.58	0.37	0.91
Dyslipidaemia: Absent	0.43	0.19	0.02	1.54	1.07	2.22
Heart disease: Absent	0.44	0.24	0.06	1.55	0.97	2.47
Constant	0.65	0.41	0.12	0.52		

Discussion

The study revealed that almost all households (97.0%) use coconut oil as the cooking oil, while 92.1% had reported it as their first choice. The findings are comparable with the findings of Peris et al. (11) study that reported 91.2% and 86.8%, respectively. As their first choice, only 2.7% and 2.5% reported olive oil (second commonest) and mixed vegetable oils, respectively. In comparison, a previous study conducted by Peiris and others have reported that 3.2% use poly unsaturated oils as the first choice and another 5.6% other oils. These findings suggest that a similar consumption pattern had been reported in two studies done approximately two decades apart, despite popularizing and marketing of other cooking oil and fats by the industry among communities in Sri Lanka. Frequently rising product prices with economic regression, reduced availability of certain products along with banning of palm oil imports, certain allegations on its healthiness (12) and concerns about oil adulterations (10) could have intensely influenced the pattern of consumption in different ways.

According to Samarajeewa et al. (13), there are higher levels of aflatoxins detected in locally produced coconut oils due to the deficiencies in the domestic/local methods of processing, which has also been a priority concern over the years (14). Present study reports that 13.7% of the participants produce oils at home, while another 14.7% use oil produced in local oil mills. These people are potential candidates to raise their awareness on safety of materials used for oil preparation, considering the higher cancer risk of aflatoxins (15) that could find in the copra/ dried coconut used for the purpose.

It is mentioned that coconut oil compared to oils rich in polyunsaturated fatty acids, and other saturated fatty acids, significantly increased HDL levels (2.27

mg/dL; 95% CI: 0.93, 3.6; $I^2=0\%$ versus 1.3 mg/dL; 95% CI: 0.65, 1.95; $I^2=73.1\%$, respectively) and further reports that the replacement of butter with coconut oil had increased HDL significantly (1.55 mg/dL; 95% CI: 0.2, 2.9) (16-17). These findings are in line with the choice of cooking oils reported in this study, although certain health guidelines demote use of coconut oil in diet, broadly labelling it as a saturated oil (18-19).

Although the reported practices showed an overall level of satisfaction among the majority of respondents, higher percentages of people still have reported as they re-use, conduct deep frying and heating. These practices could lead to bad health outcomes including cardiovascular events, cancers, and diabetes mellitus (19-21). Similarly, although the majority had satisfactory level of knowledge, there were gaps, prominently seen on the use of cooking oils in blend and about the characteristics of different types of cooking oils, fats and its safe use.

Conclusions & Recommendations

Most respondents showed healthy practices and adequate knowledge about cooking oils and fats, but notable gaps were apparent especially regarding overheating and repeated use of oils, highlighting the need for targeted health promotion. Limited use of diverse oil types was also evident, influenced by availability, affordability and consumer perceptions. Improving market availability for quality-assured oils, strengthening quality control and enhancing affordability require coordinated action from consumers, policymakers, authorities and the private sector. Ongoing assessment of consumption patterns across communities is also recommended to identify evolving needs and guide interventions.

Public Health Implications

- The study identifies the consistent predominance of using coconut oil as a cooking oil despite the availability of other options including fats such as fat spreads and butter. It further identifies the prevalence of unhealthy practices including re use and topping up on used oils.
- There is a considerable proportion of people still produce cooking oils at household level showing the need to intervene for quality assurance of these products.
- Despite all there are knowledge gaps on selection and proper use of cooking oils and fats, which could limit following correct practice patterns.

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: Ethics clearance was granted by the Ethics Review Committee of the National Institute of Health Sciences, Kalutara, Sri Lanka. Informed written consent was obtained from each participant prior to data collection.

Funding: There was no external funding available for the study, authorship or publication.

Acknowledgements: The authors are grateful to the study participants, Divisional Secretary, Grama Niladhari, the medical officers of health and MOH teams of Padukka, Gothatuwa and Kolonnawa, the expert team involved in the development and validation of the questionnaire, the team of data collectors.

Author contributions: DA coordinated data collection, data analysis, and drafting of the first version of the manuscript. VK and AB were involved in the interpretation of data and read and approved the final version of the manuscript. SD conducted the data analysis and supported the manuscript writing.

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