

A Survey on Consumer Awareness on Proper Usage of Edible Oils in North-Western and Western Provinces in Sri Lanka

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Received: 15th February 2022 / Accepted: 04th November 2022

ABSTRACT

Purpose: Lack of the consumer awareness on edible oil usage is an important question to be addressed since the awareness on preserving the quality of oil assists in preventing harmful health effects. The main objective of this study was to determine consumer awareness on storage conditions and proper usage to preserve the oil quality. Moreover, the study evaluated the consumers' awareness on the health effects of edible oils.

Research Method: An online survey was conducted using 295 participants from North-Western and Western provinces, Sri Lanka. The data was analysed using Pearson correlation, chi-square and factor analysis.

Findings: The main findings suggested that a majority of respondents (96.6 %) used coconut oil as the frying oil. The respondents showed inadequate knowledge on proper storage: 12 % did not practice any precautionary storage methods, while 53 % of the respondents were particularly aware on common health effects and 58 % was aware on proper usage of oil. The results showed that consumers from North-Western and Western provinces in Sri Lanka were not sufficiently knowledgeable on proper storage of edible oil which can lead to adverse health effects.

Research Limitations: It is beyond the scope of the study to address the awareness of the consumers on proper usage of oil in other provinces in Sri Lanka.

Originality/ Value: The study facilitates identifying the misconduct of consumers in using edible oil and thereby obtains the status of consumer awareness on proper usage practices of edible oil.

Keywords: consumer awareness, edible oil, frying, health effects, proper storage

INTRODUCTION

Edible oil is an indispensable nutrient type in the diet, which yields 9kcal/g from complete oxidation of fatty acids. Therefore, it acts as a vital source of energy (Chowdhury *et al.*, 2007). Oils are explicated as a blend of triacylglycerides collected with one glycerol molecule and three groups of fatty acids which can be saturated, monounsaturated or polyunsaturated fatty acids (Zhang *et al.*, 2012). Vegetable oils are major type of edible oils which are extracted from the seeds of plants. They are popular all over the world as frying oils or cooking oils. Sunflower oil, soybean oil, groundnut oil, mustard oil, olive

oil, canola oil and cottonseed oil are well known examples for vegetable oils. Coconut oil and palm oil are two prominent edible oil types. According to the global market analysis done by Foreign Agricultural Service/USDA, global consumption of coconut oil and palm oil are reported as 3.67 and 75.45 million tons, respectively. When considering Sri Lanka, Food and Agriculture

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Organization (FAO) has reported that per capita consumption of coconut oil as 4.15 g/capita/day and for palm oil it is 3.63 g/capita/day in 2019. Fried food consumption is the foremost way which is responsible for edible oil consumption as it is the frying medium of food (Goswami *et al.*, 2015) as well it contains a considerable amount in the fried product (Matthaus, 2007). Frying oil contributes as the heat exchange medium of fried food while enhancing sensory properties, developing physical structure and increasing nutritional value. Besides its beneficial impacts, it is crucial to be apprehensive on harmful health effects of frying oils (Goswami *et al.*, 2015).

During frying and storage of oils, oxidation reactions take place imparting several adverse health effects to the consumer. Rancidity is a common quality defect which occurs due to the accumulation of reaction products such as free fatty acids. Even though the inherent factors cannot be altered, the quality of the oil can be preserved by controlling storage conditions and proper usage of edible oil including, devoid of reusing oil and controlling the temperature and time during frying (Syed, 2016). The occupancy of free fatty acids in oil is due to the heat, light, moisture and presence of transition metals which accelerate oxidation reactions in edible oil during storage (Henry, 2016). Therefore, proper storage conditions such as using dark packaging to avoid exposure to light are crucial to assert the quality of edible oil during storage (Gizachew, 2019). According to the World Health Organization (WHO) website <https://www.who.int/news> (2020), around 600 million people all over the world are affected with food related health problems per year. Consumption of the recommended amount of fried food makes less probability of having health problems (Goswami *et al.*, 2015). The recommendation by WHO for fat intake is less than 30 % of the total energy intake. As well, it is stated that unsaturated fats found in sunflower oil, olive oil, canola oil are favoured over saturated fats for a healthy diet (WHO, 2020). When considering Sri Lanka, a survey study conducted to evaluate the food consumption behavior of Sri Lankan adults has suggested that as a result of unhealthy

eating habits, including the failure to consume recommended dietary portions, the Sri Lankan population has faced several nutrition-related health issues. Non-communicable diseases are common in Sri Lanka where the partial causative factors are believed to be unfavourable food intake patterns (Jayawardena *et al.*, 2013). Maintaining a riskless ratio of saturated and unsaturated fatty acid in our daily diet is essential to avoid non-communicable diseases such as cardiovascular diseases and obesity (Vaskova and Buckova, 2015). In this context, consumers should be more attentive on their food consumption patterns (Jayawardena *et al.*, 2013) and proper general usage of food to prevent unpropitious health conditions.

A study conducted by Samarajeewa and Gunathilaka (2002) in Sri Lanka has shown that increase in income affected the decrease in coconut oil consumption as they tend to purchase higher quality edible oil types. Another study conducted in Gampaha and Anuradhapura districts has implied that demographic factors such as gender, community and monthly income have significantly influenced the purchasing decision of coconut oil (Amarathunga *et al.*, 2008). Several studies have done all over the world to investigate the consumer buying behaviour, factors affected in purchasing oil, brand preferences, label reading etc., however, very limited studies have been conducted to evaluate the consumer awareness in purchasing as well as proper usage of cooking oil including appropriate storage conditions, avoidance of repeated usage of oil etc. Furthermore, most of the consumers' recognition is limited only to flavor, price, brand name, expiry date etc. Awareness on selecting cooking oil is crucial for a consumer to evade long term and short term health effects. Therefore, this study is specially aimed to fulfil that literature paucity on the awareness on proper general usage practices to preserve the quality of edible oil in order to avoid health complications. This study will help to identify the changes occurred in consumer preference with close attention to palm oil and coconut oil. Furthermore, this study facilitates identifying the misconduct of consumers in using edible oil and

thereby obtains the status of consumer awareness on proper usage practices of edible oil.

METHODOLOGY

Population and sampling technique

The target population of the study was vegetable oil consumers of North-Western and Western provinces. In order to fulfil the objectives of this study, a sample size of 295 was selected using the simple random sampling technique. Convenience sampling technique was further used to facilitate collection of the required data more practically and conveniently (Ibrahim *et al.* 2020). Descriptive and inferential statistics were used for the research. The independent variables were demographic factors of the consumers. The dependent variables were consumer buying behaviour and consumer awareness on using edible oil.

Data collection

The survey engaged primary data collection method. Primary data was gathered by a structured online questionnaire prepared using a Google form. There were 40 closed-ended questions in the questionnaire to evoke quantitative data. Before conducting the main study, a pilot test was carried out using 15 representative respondents of the target population. A pilot study is beneficial to recognize deficiencies and possible issues before conducting the survey (Hassan *et al.*, 2006). Based on the feedback of the pilot test, the questionnaire was edited. A consent form was included prior to the questions, comprising the information about the research, research purpose, duration of participation and the statement that the participation is voluntary. The survey questionnaire consisted of 34 multiple choice questions and 6 questions with a 5-point Likert scale responses. The questions were presented in the same order to achieve consistency and reliability. The questionnaire

was comprised of four sections. The first section focused on collecting the demographic factors of the respondents. The second section evaluated the general usage of frying oil. The third section examined the palm oil and coconut oil usage among the respondents. The final section aimed at evaluating the awareness of the respondents on health effects of frying oil, proper storage conditions and awareness on preserving the quality of frying oil. The statements of 'strongly agree' to 'strongly disagree' were used to depict the extent of agreement or disagreement in the Likert scale. Questionnaires were sent through online platforms to collect the responses. The response rate was 99.7 %.

Data analysis

The collected data was analysed using statistical software, Statistical Package for Social Science (SPSS) version 21 and Microsoft office excel. Descriptive statistics, Pearson correlation, chi-square tests and factor analysis were used to analyse all the data. Among them, to interpret the main findings Pearson correlation and percentage analysis were used. Correlation was used to examine the relationship between demographic factors and general practices with respect to use of edible oil. Descriptive analysis method was used to depict the results. Orderly in analysing the Likert scales, Percentage analysis was used.

RESULTS AND DISCUSSION

Demographic characteristics of the respondents

Table 01 gives a summary of demographic characteristics of the respondents. Among total responses, 79.7% of the respondents were females and 20.3% were males. Accordingly, a great portion of the responses was represented by female. The findings illustrated that majority of the respondents were between 26-33 years of age and majority were educated. Most of the respondents have an income level of Rs. 30,000-60,000.

Table 01: Demographic profile of the respondents

Demographic factor	Characteristic	Frequency	Percentage (%)
Age	18-25	96	32.5
	26-33	151	51.2
	34-41	9	3.1
	42-50	15	5.1
	Above 50	24	8.1
Education level	Ordinary level	16	5.4
	Advance level	37	12.5
	Graduate	94	31.9
	Undergraduate	135	45.8
	Other	13	4.4
Income level	Rs.30,000-60,000	117	39.7
	Above Rs.90,000	80	27.1
	Rs.61,000-90,000	64	21.7
	Below Rs.30,000	34	11.5

General usage information of edible oil among respondents

The findings illustrated that an outstanding majority of the respondents used coconut oil at the household level. This was 15 times higher than the palm oil usage among respondents. The findings are consistent with the previous studies done in Sri Lanka, that vast majority indicated coconut oil as their cooking oil (Amarathunga *et al.*, 2008; Peiris *et al.*, 2004, Samarajeewa and Gunethilaka, 2002). Considering the amounts of usage, most of the respondents used 2.5 L of oil per month followed by 1 L per month. The majority of the respondents consumed edible oil daily.

The impact of demographic factors in using edible oil

There are several factors which influenced the purchasing of edible oil and these affect the customers in different ways. In Table 02, correlation between different demographic characteristics of respondents and factors affect

in purchasing of edible oil are given. The data was obtained through a Likert scale. Results indicated that education level has a significant ($P < 0.05$), strong positive correlation with label reading and concern for ISO/SLS certification in edible oil. Gender was significantly ($P < 0.05$), weakly and negatively correlated with concern for ISO / SLS certification in edible oil indicating that females were more concerned on ISO and SLS certification than males. There was no significant ($P > 0.05$) relationship between package quality and demographic characteristics. The age of the respondents showed a significant ($P < 0.05$), weak and positive correlation with label reading, brand loyalty, concern on nutritional facts and ISO/SLS certification of edible oil when purchasing. Contrary to the above findings, a study done by Peiris *et al.* (2004) suggested that use of coconut oil is influenced by education level and income of the consumers in Sri Lanka. According to the results, the use of coconut oil was significantly higher in low educated householders than high educated householders. The same trend was observed between monthly income and the use of coconut oil by the householders (Peiris *et al.*, 2004)

Table 02: Correlation of demographic characteristics and factors affecting purchasing edible oil

	Package quality	Healthiness	Label reading	Nutrition facts	SLS and ISO certification	Brand loyalty
Gender	-0.038	-0.03	-0.031	-0.01	-0.130*	-0.01
Monthly income	0.057	0.003	-0.088	-0.022	-0.1	0.06
Education level	-0.053	-0.07	0.713*	0.092	0.683*	0.004
Age	0.095	0.025	0.19*	0.151*	0.211*	0.132*

*correlation is significant at the level of 0.05

Factors influenced on consumer choice in using edible oil

Consumer choice for selecting the edible oil type is greatly influenced by organoleptic characteristics and several other factors such as price, quality, healthiness, label reading etc. As the results illustrated in Fig.01, respondents who selected palm oil as their frequent source of edible oil, flavor was the most affected factor followed by the overall quality of fried food product and level of rancidity. Among the respondents who selected coconut oil as their frequent source of edible oil, the overall quality of the fried food product was the most influenced factor followed by the healthiness and flavor of the oil. The least affected factor for selecting coconut oil was level of rancidity. As depicted by a previous study, the tradition was ranked in first place for the use of

coconut oil followed by health and price. The main reason revealed for the dissatisfaction in coconut oil usage was adulteration with different other edible oils such as palm oil in Sri Lanka (Peiris *et al.*, 2004). For both palm oil and coconut oil, two of the least affected factors were brand name and the quality of the package. Respondents who had the experience in using both coconut oil and palm oil were asked to indicate the preference for palm oil over coconut oil in a scale of ‘strongly agree’ to ‘strongly disagree’. The preference in terms of colour, odour, texture, cost-effectiveness and overall acceptability are shown in Fig.02. Odour was the most affected factor for the preference for palm oil over coconut oil. Color and texture were depicted as similarly affected. The least affected factor for the preference for palm oil over coconut oil was cost-effectiveness.

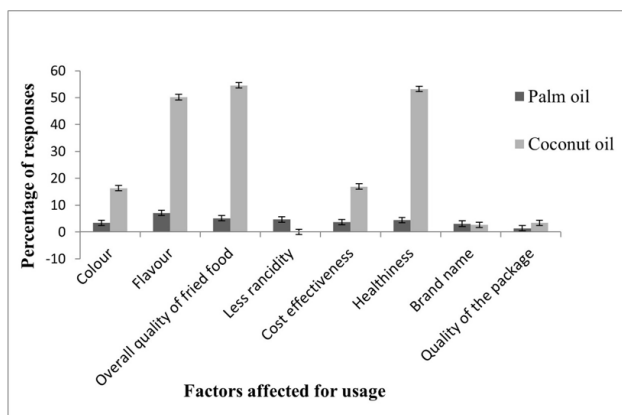


Figure 01: Factors affecting the selection of palm oil or coconut oil as cooking oils

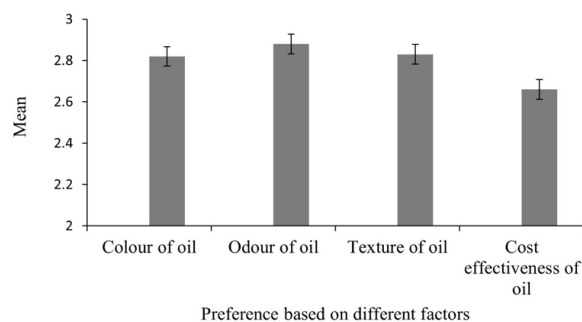


Figure 02: Comparison of the mean values for selection of palm oil and coconut oil

Awareness of the consumers on health effects of edible oil

Here, it was focused on how well the consumers were aware on the health impacts of edible oil. Risk of heart diseases, cholesterol elevating effect and the presence of carcinogenic chemicals were mainly considered as the health effects in the survey. Edible oil is considered as one of the prominent factors in the causation, management and prevention of cardiovascular diseases (Manchanda and Passi, 2016). Generation of Poly-Aromatic Hydrocarbons (PAH) which is a carcinogen is another significant health issue in smoking of copra (Wijeratne *et al.*, 1996).

As the findings illustrated in Table 05, respondents were particularly agreed on the increasing risk of heart diseases associated with edible oil and the possibility of containing carcinogenic chemical compounds when processing oil. The respondents were not properly informed on the impact of edible oil on the cholesterol level. In line with the findings, a previous study disclosed that 80 % of the surveyed sample claimed that coconut oil is unhealthy because of cholesterol (Peiris *et al.*, 2004). The edible oil consumers were asked to indicate whether they suffer from health implications. The frequency distribution of the respondents with different non-communicable diseases is shown in Fig.03. According to the results, a prevalence of non-communicable

diseases was showed among coconut oil users. The highest observed non-communicable disease was high blood pressure. A study done more recently in Brazil has strongly declared that the previous studies which have been done to evaluate the health effects of coconut oil were not based on long-term human- based clinical trials. Therefore, it is not possible to decide the exact health effects of coconut oil since it is still inconclusive (Lima and Block, 2019). However, the results are consistent with the studies done in Sri Lanka to investigate the reasons for the high prevalence of coronary heart diseases concerning the high SFA content in the Sri Lankan diet (Mendis *et al.*, 2001).

The palm oil consumers did not report any of the non-communicable diseases, which can be due to only a few number (6.4 %) of palm oil users among the respondents. The consumers who used palm oil and coconut oil reported the similar prevalence of high blood pressure and high cholesterol. Coconut oil consumers have reported high blood pressure as the most prevalent disease, followed by diabetes and high cholesterol. Ibrahim *et al.* (2020) suggested that there was no definite association found between palm oil consumption and risk of cardiovascular diseases. Previous studies reported that consuming any oil in excess amounts may lead to health implications (Ambujakshi, 2016; Lockyer and Stanner, 2016).

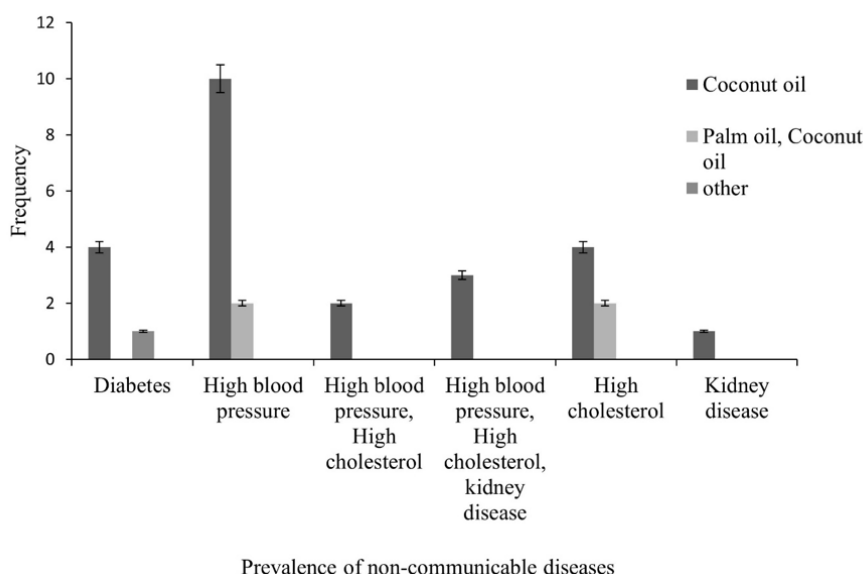


Figure 03: Prevalence of different non-communicable diseases among the respondents

Awareness of consumers on storage conditions, proper usage and preserving the quality of edible oil

Storage is a principal consideration in preserving the quality of edible oil while usage. During storage, it is important to maintain low moisture content to avoid hydrolytic rancidity since alterations can occur in the presence of moisture which caused by lipase enzymes. In addition to this, oxidative changes can take place during storage. They are caused by oxygen molecules which are activated by increased temperature conditions and by exposing to light. Therefore, storage at low temperature conditions, avoiding exposure to light and oxygen and adding antioxidants are desirable to preserve the quality and acceptability of oil (Oke *et al.*, 2018).

As one of the main objectives of our study, the consumer awareness on the general usage practices including temperature and time control during cooking, reuse of oil and storage condition of reused oil is depicted in Table 03. Based on the results, 68 % of the respondents were concerned about controlling the temperature and time during cooking. The respondents' awareness was consistent with the existing evidence that proves the importance of controlling temperature and time. Pardeshi (2020) suggested that increased temperature during frying reduces oil stability and is subject to oxidation while degrading the quality and effectiveness of naturally present antioxidants of oil. The resulting chemical compounds act as severe health hazards.

Reuse of edible oil was prevalent among 43 % of the respondents and 37 % of the respondents agreed on filtering reused oil before usage. Respondents showed a neutral response to storing the oil in dark containers. The findings are consistent with a study done in Sri Lanka that revealed that reusing the oil is highly practiced among coconut oil users because of its high SFA content (95 %) and stability at higher temperature conditions in contrast with other vegetable oils (Peiris *et al.*, 2004). The correlation of demographic factors with the awareness of the respondents on edible oil usage is given in Table 04. The results indicated a significantly ($P < 0.05$) weak negative correlation between education level and storing in dark containers. The majority of the respondents stored oil in an open place. However, previous studies have revealed that the quality of edible oil can be well preserved by storing it in dark packages, which protect the oil from light (Gizachew, 2020). Packing the edible oil in transparent plastic bottles facilitates light exposure, which cannot be recommended, especially for oils with high unsaturated fatty acid content. There was a significantly ($P < 0.05$) moderate positive correlation between age and temperature and, time control during frying. There was no significant ($P > 0.05$) correlation of gender, education level, age and monthly income with the knowledge about identifying the quality of edible oil. There was a significant ($P < 0.05$), weak and positive correlation between gender and the knowledge on temperature and time control where males have shown an increased awareness on temperature and time control than females.

Table 03: Awareness of the consumers on the general usage practices of edible oil

Statement	SA (%)	A (%)	N (%)	D (%)	SD (%)
Concern on controlling the temperature and time when using oils for cooking	20	48	26	4	1
Reuse of oil	10	33	17	23	18
Filter oil before being reused	6	31	22	22	19
Store reused oil in dark colored bottles	8	21	43	16	11

SA= Strongly Agree, A= Agree, N= Neither agree nor disagree, D= Disagree, SD= Strongly Disagree

Table 04: Correlation of demographic factors and awareness on edible oil usage

Demographic factor	Identifying the quality	Storing in dark	Filtering oil	reusing oil	Temperature and time control
Education level	0.025	-0.188*	0.02	-0.015	-0.059
Age	0.041	0.065	0.041	0.059	0.583*
Gender	0.011	0.025	-0.015	0.013	0.112*
Income level	-0.005	-0.059	-0.002	-0.028	-0.047

*Correlation is significant at the level of 0.05 (2-tailed); (-) mark indicates there is a negative relationship between two variables

Respondents were asked to indicate the preventive measures practiced to preserve the quality of edible oil during storage. Precautionary storage methods practiced by the respondents are given in Fig.04. The majority of the respondents practiced only air-tightening of the container, followed by both air-tightening and avoiding the light and heat conditions during storage. The least number of respondents stored edible oil in the refrigerator. Twelve percent of the respondents did not practice any of the precautionary measures to avoid quality deterioration of the oil. Notably, a lack of awareness was reported in precautionary methods to avoid rancidity in edible oil. The findings should be taken into account when considering the importance of preserving the quality of edible oil to extend shelf life and avoid evolving health hazards. Quality deterioration

is mainly due to lipid oxidation. Absorption of oxygen causes to generate hydroperoxides in oil result in rancidity (Sanmartin *et al.*, 2018). The place of edible oil storage is given in Fig.05. The majority of the respondents stored oil in an open place. The amount of respondents who stored oil in a cupboard was twice lower than the respondents who stored oil in an open place. One tenth of the respondents didn't have a specific place to store edible oil. The importance of avoiding light during edible oil storage was proven by a study done by Gizachew (2020), comparing the oxidative stability of sunflower oil samples under dark and daylight storage conditions. An increment in acid and peroxide values was observed in oils stored in light than dark conditions. Therefore, it was recommended to store edible oil in dark places (Henry, 2016).

Table 05: Awareness on general health effects of edible oil

Statement	SA (%)	A (%)	N (%)	D (%)	SD (%)
Increasing the risk of heart diseases	26	52	18	2	2
Presence of bad cholesterol in edible oil	24	50	18	5	3
Possibility of containing carcinogenic chemicals (polyaromatic hydrocarbons formed when smoking copra)	26	49	22	1	2

SA= Strongly Agree, A= Agree, N= Neither agree nor disagree, D= Disagree, SD= Strongly Disagree

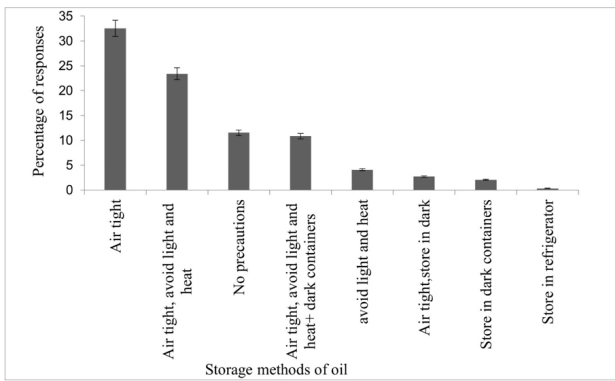


Figure 04: Storage practices of the respondents to avoid quality deterioration of edible oil

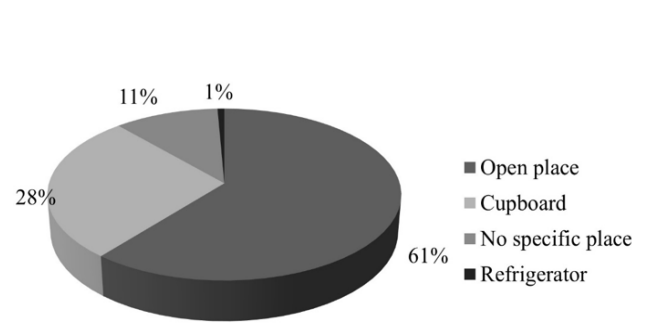


Figure 05: The place of oil storage of the respondents

CONCLUSIONS

The quality of the oil was the most influential factor, followed by the healthiness in purchasing edible oils by respondents. Majority of the respondents were coconut oil users and both coconut oil and palm oil consumption was higher in the North-Western province than Western province in Sri Lanka. Moreover, non-communicable diseases were reported among coconut oil users. The respondents had a deficit of knowledge on proper storage conditions, revealing the misconduct of the edible oil users. Respondents were not aware of the association between improper storage and usage practices of oil and the possible indirect health implications such as cancers and atherosclerosis. The education level was weakly and negatively correlated ($P < 0.05$) with the awareness on dark storage of oil. Further, majority of the respondents stored oil in an open place. The study highlights the significance of avoiding exposure of oil to air, light and heat during the storage, considering the existing knowledge on literature. Respondents were particularly aware of the common health effects of using edible oil even though it is still inconclusive about the scientific evidence on

exact effects on the cardiovascular diseases, especially regarding coconut oil. Based on the responses of the participants of this survey, it reveals the lack of awareness of edible oil users on the proper usage and storage of edible oils which needs to be addressed to avoid negative health impacts.

Conflicts of interests

The authors declare that there is no conflict of interest.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to the Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka for facilitating this research study. We would also like to acknowledge the contribution from Lanka Spice (Pvt) Ltd., Sri Lanka

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