

Fried Food Safety Practices of Street Food Vendors in Delhi, India

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ABSTRACT

Food or drink prepared or cooked and sold by vendors on streets or other public locations, usually for immediate consumption is known as 'street food'. Street food vendors (SFV's) represent the unorganized food sector in most of the countries and are very popular in India. Therefore, ensuring safety of street foods is very important. The purpose of this study was to evaluate the attitude and practices of FV's regarding fried foods in Delhi. A cross-sectional study was conducted on 100 food vendors representing the five zones of Delhi. Quantitative and qualitative data were collected through questionnaire cum interview method on socio-demographic profile and practices related to food safety of fried foods. The finding of the research showed that majority of the FV's used palm oil followed by soyabean oil, sunflower oil and vanaspati for frying activities. On an average 83% of the vendors stored the left-over oil after frying out of them (64 %) of the vendors re-used the left-over oil for preparing non fried side dishes such as *chole* and pickles and only 13% of the vendors used the left-over oil for frying *bhaturas* on the subsequent days. The level of awareness and attitude on the practices adopted by fried food vendors regarding oil quality and process of frying needs to be improved.

Keywords: Street food vendor, Edible oil, Fried food, Health, Attitude, Vendor practices

INTRODUCTION

Street foods are ready to eat foods and beverages, prepared and / or sold by vendors and hawkers, especially in streets and similar public places (FSSAI, 2019). India has a rich history of street food vending reflecting the traditional local culture. Variety, taste, low cost and easily availability have made street foods popular with all sections of the society (Jahan *et al.*, 2018). There has been no census of street food vendors so far in India. The ministry of Urban Poverty Alleviation, Government of India, has estimated that in 2020 there are about 100 lakh street vendors in the country; of which about 20% are expected to be related with street food vending. The street food vendors are often poor, uneducated, and lack an appreciation for quality of fats/ oils, safe food practices. Frequent consumption of street foods can consequently increase the risk of major public health problems (Azanaw *et al.*, 2022; Gameda *et al.*, 2023).

Frying is one of the earliest forms of food preparation. Fried foods are popular around the globe because they have desirable flavor, color and crisp texture. It is a cheap and quick method of simultaneous heat and mass transfer that changes sensory and nutritional characteristics due to dynamic interactions between food and oil (Ziaifri and Achir, 2013). Repeated- fat frying results in foam formation, darkening of color, viscosity, density, specific heat as well as increase in the content of free fatty acids (FFAs), polar material, and polymeric compounds in oils (Choe and Min, 2007; Hong *et al.*, 2013). It also results in decrease in the level of unsaturated fatty acids in oil. Fried food vendors also frequently use the same frying oil repeatedly to save money, which can harm health. Frequent consumption of foods (*i.e.*, four or more times per week) fried in abused oil has been found to be associated with a higher risk of cancer, type 2 diabetes, obesity, hypertension, asthma, damage to the mucosal lining of eyes, throat and lungs (Chauhan and Suri, 2020).

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Apart from affecting health, incorrect disposed of re-used frying oil is also affecting environment. Disposed of used-frying oils in lakes, drainages, open ground and use as feed for animals is a matter of serious concern because it can result in the return of harmful compounds back into the food chain. It is therefore necessary that discarded fried oil is recycled carefully and efficiently (Hemasaki *et al.*, 2021). This study aimed to assess the practices of food vendors belonging to the unorganized sector with special reference to deep fat frying and fried foods.

METHODOLOGY

The study was conducted to gather information from street food vendors regarding their practices associated with frying oil. The data were gathered with the help of self- designed and pretested questionnaire. Questionnaire was coupled with interview and observation method. Salient information gathered through the questionnaire included personal and demographic data, deep fat frying practice, and handling practices of used oil by vendors. Additionally, data were collected through personal observation, including but not limited to utensils used for frying, storage containers, serving of fried food etc.

Location and sample size:

The present study was cross- sectional. It was conducted in Delhi, India. Based on the suitable statistical

formula for a cross- sectional study. A sample of 100 vendors were randomly selected from five zones of Delhi, namely North, South, East, West, and Central to ensure that the sample is geographically representative of the food vendors from unorganized food sector population in Delhi, and frying food at the point of sale. 20 street food vendors from each of the five zones of Delhi were selected purposively based on accessibility, availability and willingness to participate in the study. To avoid any variation vendors frying *bhatura* at point of sale were chosen for the study.

Bhatura is large puffy fermented fried bread made from refined wheat flour and yeast. It is usually served with whole *bengal gram* (spicy chick peas curry). The dish is commonly known as *chole-bhatura*. It is a popular breakfast food item of North India. It is a snack food sold by vendors on the street (Sharma *et al.*, 2017).

Statistical Analysis:

Data obtained from the study were analyzed using the statistical software SPSS version 20.0 and Microsoft excel; data analysis was done using mean and percentages.

RESULTS AND DISCUSSION

Socio- economic profile of street food vendors:

The socio- demographic profile of street food vendors, given in Table 1, indicates that majority (98 %)

Table 1 : Socio Economic Profile of Street Food Vendor

Charterstics	Categories	West Zone (%)	East Zone (%)	Central Zone (%)	South Zone (%)	North Zone (%)
Age	18-30	50	30	20	20	15
	31-44	25	40	70	50	40
	45-60	25	30	10	15	45
	61 and above	0	0	0	5	0
Gender	Male	100	100	95	100	95
	Female	0	0	5	0	5
Educational Qualification	Illiterate	45	60	45	15	35
	Primary School	40	35	45	60	50
	High School	5	0	5	20	15
	Graduation	10	5	5	5	0
Work Experience	Less than one year	5	5	0	10	0
	1-2 years	10	10	10	10	15
	3-4 years	5	40	35	30	25
	5 years and above	80	45	55	50	60
Daily Earning	INR 500 and below	0	10	0	5	0
	INR 501-1000	15	55	35	40	45
	INR 1001-1500	55	15	40	40	50
	INR 1501-2000	20	20	10	10	5
	INR 2001 and above	10	0	15	5	0

of the respondents were male. Similar findings have been reported in a study conducted by Kangate and Pawar (2022) wherein 93.84% men were reported to be involved in street food vending in Akola city of Maharashtra. The food vendors in our study were of diverse age. The mean age was 38.5 ± 11.6 ; the youngest and oldest being 18 and 67 years of age, respectively. It was found that 40% of the vendors were illiterate. Level of literacy of the food vendors was found to be highest in south zone (85%) and lowest in east zone (40%).

The study also indicated that majority (58%) of the street food vendors had 5 years and above experience in fried food vending, only 4% were new (less than one years) to the business of mobile food vending through unorganized sector. Majority (40%) of the food vendors reported average daily sale between INR 1000-1500. The highest sale as reported was of SFVs belonging to south Delhi. The lowest sale was reported by East Zone vendors. It was alarming that 98% SFVs had not registered their business with the FSSAI- the Food regulatory authority of India nor were they aware of the registration process. All food vendors brought ready to use dough for frying *bhatura*. Thus, only frying was done at the point of sale.

Frying practices of the food vendors:

Fats/ oils used for frying:

As shown in Fig. 1, majority (77%) of the SFV reportedly used refined palm oil (rich source of saturated

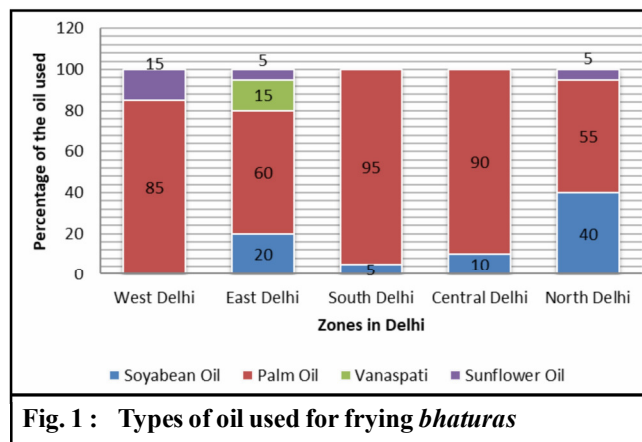


Fig. 1 : Types of oil used for frying *bhaturas*

fatty acid) for frying. However, only some vendors used other types of oil for their deep-frying practices such as soyabean oil (15%), sunflower oil (5%) and vanaspati (3%). A study conducted by Emelike and Achinewu (2020) reported that food vendors (66.6%) mainly used palm oil for their frying fried food in D/line- Port Harcourt, Nigeria.

Frying cycles and fried food turnover rate influences the quality of oil being used for frying. Majority (56%) of vendors were frying 51 to 100 *Bhaturas* followed by (27%) 101 to 151 number of *bhaturas* in a day (Table 2). On an average majority of the vendors used to fry *bhaturas* over a period of 6 to 8 hours in a day which involved intermittent heating and cooling.

The price of the *chole-bhatura* varied in different zones; ranging from INR 20 to 50 per plate. Each plate

Table 2 : Practices related to deep fat frying amongst vendors (as declared by Vendors)

Vendor's practices		West Zone	East Zone	Central Zone	South Zone	North Zone
		%	%	%	%	%
Average no. of <i>bhatura</i> fried in a day	• 50 and below	5	25	15	15	00
	• 51-100	40	55	70	40	75
	• 101-150	45	20	10	35	25
	• 151-200	5	00	5	10	00
	• 201 and above	5	00	00	00	00
Price of the dish (Chola- <i>Bhatura</i>) (INR)	• 20	20	10	30	15	5
	• 25	45	30	10	10	45
	• 30	35	50	50	45	50
	• 35	00	5	5	10	00
	• 40	00	5	5	15	00
	• 50	00	0	0	5	00
Average utilization of oil per day (Liters)	• ? 5	45	60	60	60	60
	• >5to ? 10	55	35	25	25	35
	• >10 to ? 15	00	5	15	10	5
	• >15	00	00	00	5	00
Packaging material of oil	• Metal (tin plated container)	50	65	40	10	45
	• Flexible/ semi regid plastic pouches	50	35	60	90	55

comprised of two *bhtura*'s, *chole*, pickles (carrot and green chili) and onion as salad. Average price of the *chole* –*bhatura* was 27.9 ± 5.37 per plate.

Table 2 indicates that, majority (57%) of the vendors were using ≤ 5 liters oil per day for frying as declared by the vendor. However, when actually measured at the site of frying it was found that on an average 6.81 ± 3.15 liters oil was being used per day by the FVs for frying activity. The highest amount used was 14.50 liters oil per day to lowest 2.50 liters oil per day used for frying.

The packaging material of fats/ oil used for frying was made up of metal (tin plated containers) (42%) and flexible plastic pouches (58%). Fats and oils are packaged in a variety of packaging materials such as tin, glass jar, PET bottle, flexible plastic pouches etc. Food packaging materials may contain chemical (organic or inorganic) such as phthalates which can migrate from packaging material to food which can adversely affect the health of the consumers. Phthalate esters, also known as phthalates, are a group of xenobiotic potentially hazardous compounds. They are the most common type of plasticizers used to soften plastic so that it can be easily molded in desired shapes (Schechter *et al.*, 2013; Zota *et al.*, 2014). These compounds have frequently been found in samples of different edible fats/oils (Babalola and Adeyi, 2018; Bi *et al.*, 2013; Hua *et al.*, 2016). Exposure to phthalates of adults is associated with increase in obesity, insulin resistance, diabetes, impact on production of

reproductive hormones, abnormal duration of pregnancy, preterm birth, increased risk of breast cancer (due to exposure to DEP), influence on normal pulmonary function for males and androgen-responsive brain development (Harunarashid *et al.*, 2017).

Handling practices of used oil by vendors:

On an average 83% of the vendors stored the left-over oil after frying; out of them (64 %) of the vendors re-used the left-over oil for preparing non fried side dishes such as *chole* and pickles and only 13% of the vendors used the left over-oil for frying *bhaturas* on the next days. This practice was observed highest among vendors of west, north zones of Delhi and lowest *i.e.*, 5% in south Delhi. Few vendors (17%) reported that they threw the leftover oil; majority of them threw it in open ground (Table 3)

Similar results have been reported by Fekadu *et al.*, (2023) wherein the vendors of Harar city, Ethiopia were found to reuse the same oil for frying fried food frequently till the oil colour turned black. Reusing used oil multiple times can affect the physical and chemical properties of the oil, making it unfit for human consumption. It was surprising to know that some vendors 15 % (south zone); 5% (North zone) sold their used frying oil to other food vendors; majority to *momo* selling vendors.

The possibility of hydrolytic degradation is more when the oil is used for frying for a longer time as the

Table 3 : Handling practices of used oil by vendors

Handling practices of used oil by vendors		West Zone	East Zone	Central Zone	South Zone	North Zone
		%	%	%	%	%
Oil measured at the beginning of the day (Liters)	• 5 and below	30	60	70	40	50
	• 6-10 L	70	25	15	45	35
	• 11-15 L	00	15	15	15	15
	• 16 L and above	00	00	00	00	00
Oil measured at the end of the day	• 500ml and above	55	60	50	25	15
	• 501-1000 ml	45	25	30	40	50
	• 1001ml- 1500ml	00	10	15	20	20
	• 1501ml and above	00	5	5	15	15
What is Done with the Leftover Oil?	• Store it for the next day	70	95	85	70	95
	• Throw away	30	5	15	30	5
	• Given to the recycling unit	00	00	00	00	00
	• Reuse for frying	20	10	10	5	20
Various ways of Reusing Stored Oil?	• Reuse for making other dishes (<i>Sabji</i> / Pickles)	50	85	70	45	70
	• Sell it to other vendors	00	00	00	15	5
	• Throw	30	5	20	35	5
	• Drainage	00	00	15	25	00
Used oil disposal site	• On open ground	30	100	85	50	100
	• Garbage Bin	70	00	00	25	00

Table 4 : Observed practices of Vendors in five zones of Delhi

Observation practices of Vendors	Vendors Responses	West Zone	East Zone	Central Zone	South Zone	North Zone
		%	%	%	%	%
Material of Fryer (Kadhai)	• Non- stick	00	00	00	00	00
	• Iron	55	90	70	80	80
	• Aluminum	00	00	5	20	5
	• Steel	45	10	25	00	15
Material of ladel	• Iron	80	75	85	70	30
	• Steel	20	25	15	30	70
Used oil strained before storage/ re-use	• Yes	20	45	25	25	35
	• No	80	55	75	75	65
Used oil stored in sealed container	• Yes	45	35	35	25	40
	• No	55	65	65	75	60
Storage container integrity (rusted)	• Yes	25	65	60	55	75
	• No	75	35	40	45	25

food releases water. This results in loss of oxidative stability of oil (Corsini and Jorge, 2006). Continuous frying results in formation of by- products such as trans fatty acids and cyclic polar compounds (Xian *et al.*, 2008). The replenishment of the used oil with the fresh oil was a common practice amongst all the vendors included in the study. This practice leads to deterioration in the quality of fat/ oil further (Gupta *et al.*, 2015)

In addition to the frying conditions, the type of utensils used for deep frying also contributes to the formation of trans fatty acids (TFA) and polar compounds in the oil (Mcsavage and Trevisan, 2001). In this regard, the current study found that majority (75%) of the vendors were using *kadai* (frying utensil) made of up iron followed by 23% steel and 2% aluminum (Table 4). Used iron fryers have been found to cause highest increase in TFA content on heating (Kala *et al.*, 2012; Gupta *et al.*, 2015). Majority of the vendors (64.2%) did not strain the used oil before storing or reusing which could hasten the deterioration process of the oil. Most of the vendors (64%) did not even cover their stored oil container. This would have further intensified the oxidation process due to light and air exposure (Corsini and Jorge, 2006).

Conclusion:

The frying practices by fried food vendors in Delhi need to be improved. The study outcomes revealed that the vendors need to be made aware of the proper use of oil throughout the frying process and thereafter. The vendors need to learn about the storage of reused oil, frequency of oil use, and filtering of cooking oils after the frying operation. Vendors must be trained appropriately by food, nutrition and health professionals

and other stakeholders. Government of India under the Swach Bharat Abhiyan and the Food Safety and Standards Authority of India under its EEE (Education, Enforcement, Ecosystem) strategy are increasingly emphasizing upon the use/recycling of food waste by employing economically productive and sustainable solutions. Recycling and upcycling of discarded frying oil for the manufacture of biodiesel is one possible solution to sustainable development. Since a large number of vendors are illiterate, awareness generation needs to be in the form of pictorial presentations such as videos, jingles and posters. Various studies across the world are indicative enough that we need to have stringent laws which prevent the use of micro contaminants such as phthalates which can leech into the edible oil/ fats through packaging material. A strong food quality surveillance system can support immensely the economic growth and curtail health expenditures which are of utmost importance for under developed and developing nations. This study has therefore provided reliable and useful baseline data of current takeaway practices that can be compared with future monitoring surveys in response to interventions and training programs.

Conflict of Interest:

The authors declare that they have no competing interest.

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