



## ABSTRACT

Edible oil constitutes an important component of food preparation in Indian households. It is evident from research studies that Gujarati population consumes highest amount of edible oil in our country. Frequent/high intake of fried foods may be one of the reasons for increased prevalence of nutrition related non-communicable diseases (NR-NCDs). However, there is a need to document the frequency of fried foods intake by Gujarati households.

Frying makes food flavorful, varied and rich. Fried foods exhibit various quality characteristics such as unique appearance, texture, odor etc. Oils and fats used for frying gradually undergo certain chemical changes commonly known as oxidation, hydrolysis and polymerization. In India major portion of vegetable oils are used for frying foods. Deteriorated oils are not only insidious cause of cancers, hypertension and coronary heart diseases but also results in low nutritional quality and inferior sensory characteristics. Sensory assessment of foods fried in repeated heated oils may limit number of fryings in reused oil. Most of the studies have been carried out with intermittent time periods of 80-90 h and little attention is given to researches where the intermittent frying time matches the duration used at households and restaurants level.

Thus the present study was undertaken in 5 phases with a broad objective of studying the "Occurrence of chemical and sensory changes during intermittent frying of french fries and bhajias in groundnut and cottonseed oil and studying the association between the fried food intake by the Gujarati housewives and non-communicable diseases". As part of extension activity of research on fried foods a case study was undertaken to study the prevailing food safety and frying practices in Jan aahar- A Government run food outlet at Vadodara railway station and developing the Nutrition Health Education (NHE) material on intake of edible oil, types, and on choices of oils for healthy living and correct practices of using edible oil for frying purposes and its storage.

The fried food intake by Gujarati households was collected using food frequency questionnaire; knowledge on edible oil intake and frying practices was collected with the help of semi-structured questionnaire. The sensory quality assessment of intermittently fried french fries and bhajias was done by 9-point hedonic scale (Joshi VK, 2006). Determination of chemical quality of intermittently fried cottonseed oil (CSO) and groundnut oil (GNO) was done by standard AOAC, 1995; AOCS, 1998; AOCS, 1974; Lab manual 2 (7.0) GOI, 2005 and information on food safety and frying practices of Jan aahar kitchen staff was collected using a semi structured questionnaire.

The results of phase 1 showed that deep and shallow fried products prepared at home were consumed by 5% and 43% of Gujarati households on daily basis respectively. Maximum (58.8%) housewives were obese and prevalence of other co-morbidities such as hypertension and diabetes was 16% and 8% respectively. Significant association was found between obesity and diabetes; shallow fried food consumption and prevalence of diabetes. Many families reported daily use of saturated fats such as *vanaspati* (26%), ghee (100%) and butter (76%). Approximately 60% housewives did not know about the recommended daily intake allowances of oil. Fewer house wives had knowledge on *trans* fats and oil blends.

In phase 2, french fries and bhajias fried intermittently at 0, 6, 11, 16 and 21 h in CSO and GNO were evaluated for their sensory qualities. French fries fried in CSO were inferior at 21 h of intermittent frying than GNO fried fries. Bhajias showed no significant change during and at the end of 21 h intermittent frying in both the oils. As per hedonic scale both french fries and bhajias fried in two oils were acceptable up to 21 h of intermittent frying. Bhajias and french fries fried in GNO showed higher oil uptake than CSO.

Phase 3 was designed to study the occurrence of chemical changes in GNO and CSO used for frying french fries and bhajias at intermittent (0, 5, 10, 15, 20, and 25 h) frying durations. A significant ( $p < 0.001$ ) rise in oxidative

parameters (PV, p-AV and TV) was observed in both the oils at 25 h of intermittent frying of french fries and bhajias. Decrease in iodine value of CSO was significant ( $p < 0.01$ ) during french fries and bhajias frying. Total polar components of CSO and GNO showed 83.8% and 89.4% increase during french fries frying. A higher increase (257.5% in CSO and 142.9% in GNO) in polar components of bhajias fried oils was observed. French fries frying showed significant decrease ( $p < 0.01$ ) in linoleic/palmitic acid ratio in CSO (25%) and GNO (33.8%). No significant change was seen in linoleic/palmitic acid ratio of both the oils during bhajias frying. CSO showed less stability in terms of overall chemical quality during 25 h of intermittent frying as compared to GNO.

Results of phase 4 revealed that knowledge on food hygiene of Jan aahar staff was 75% whereas nutrition and health knowledge was only 40.7%. 100% scores were obtained by most of the staff on personal hygiene. Lack in infrastructural facilities was observed. Cooks had good frying knowledge and practice discarding/use for sautéing of fried oil at the end of each day.

Thus it can be concluded that frequent intake of shallow fried food by Gujarati housewives is a contributing factor for occurrence of diabetes. There is lack of knowledge amongst them on quantity and quality of edible oil intake. Both french fries and bhajias were acceptable up to 21 h of intermittent frying for most of the sensory attributes. However, the chemical quality of both the oils deteriorated up to 25 h of intermittent frying. Between the two oils CSO was more unstable than GNO especially in terms of p-anisidine value, total polar components and linoleic/palmitic acid ratio. The case study of Jan aahar showed good knowledge regarding food safety and frying practices of kitchen staff.