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RESEARCH ARTICLE

FRIED FOOD AND POSSIBLE HEALTH HAZARDS.

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Abstract

Background: Fried food is consumed worldwide because it is fast, delicious, and available everywhere. However, many studies suggested that fried food consumption promote many risks on health such as obesity, cardiovascular diseases (CVD), type 2 diabetes (T2DM) and cancer.

Objective: To discuss health hazards effect of fried food and its relation to chronic diseases. In addition, to raise the awareness of the society about the risks of frequent consumption of fried food on health.

Method: By using Pubmed search, Scholar search and The American Jornal of Clinical Nutrition. Searching for (fried food risk- fried food and cancer- -fried food and diabetes- -fried food and obesity- fried food and CVD- fried food and cholesterol- fried food and cardiac disease).

Conclusion: This review article showed that frequent fried food use (≥4 times/week is associated with a high risk of having a chronic disease such as: obesity, type 2 diabetes mellitus, myocardial infarction, hypertension and cancer. Therefore, it has been suggested that fried food should be avoided as possible in order to decrease the risk of such chronic health problems and future researches should be focusing on these problems and try to develop better assessment for fried food consumption.

Introduction:-

Fried food is consuming worldwide, people like fried food because it is fast, delicious, and available everywhere. Also, it is easy to prepare at home. Frying is a cooking method in which food is immersed in hot oil. Early cookbooks demonstrated that the practice began in a few European and Arabian countries before other countries applied the practice. Deep frying cooks food quickly so all sides are cooked together as oil has a high rate of heat conduction. Frying modifies the composition of fatty acids in food through reducing the water content and increasing the energy density of food (1). Frying also makes food crunchy and aromatic to improve its palatability (1,2).

However, dietary intake of fried food may promote weight gain by increasing fat intake (3) and energy density (4). In a study on children and adolescents in US, it was been proved that consuming fried food outside home is highly associated with weight gain and increased body mass index (5). Similarly, a six-year follow-up cohort study in Spain proved that more frequent fried food consumption was associated with a higher risk of being overweight or obese (6). Furthermore, across sectional analysis of cohort study showed a positive association of fried food intake with general and central obesity (7).

Fried food also proved to be associated with many risk factors of developing a cardiovascular disease. In cross-

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sectional studies, fried-food consumption has been positively associated with several cardio metabolic risk factors including hypertension (8), low serum HDL and cholesterol (9). In Spain, a study of 1226 adults proved that frying food with reused oil was associated with high risk of developing hypertension (8). Another case-control study proved an association of fried food consumption with acute MI (10). In prospective studies, the Western-style dietary pattern includes fried food as a major component was positively associated with increased risk of T2DM (11).

In 2002, some researchers observed an increase in the acrylamide formation during cooking of many common foods at high temperatures such as cooking, baking, roasting and frying of foods that are rich in carbohydrate (12). Acrylamide result from maillard reaction between the saccharides such as glucose and amino acid asparagine (13,14). The International Agency for Research on Cancer (IARC) reported that acrylamide could be carcinogenic to humans' (15). Therefore, the aim of the present review article is to discuss health hazards effect of fried food and its relation to chronic diseases. In addition, to raise the awareness of the society about the risks of frequent consumption of fried food on health.

Methodology:-

By using Pubmed search, Scholar search and The American Jornal of Clinical Nutrition. Searching for (fried food risk- fried food and cancer- -fried food and diabetes- -fried food and obesity- fried food and CVD- fried food and cholesterol- fried food and cardiac disease).

Review of Literature

Frying:

Frying has been spread all over the world, as it is a common method of increasing durability of food. Frying also make food attractive to the consumers by making it tastier with the deep-fried flavor. Many certain components of fried food contribute to its flavor. The volatile oxidation products of linoleic acid are the most important flavor compounds found in fried foods (16)

There is a gerat concern to pinpoint the effects that the various factors involved in as thermal, culinary process or industrial have on the nutritive value of the food that is processed.(17). Loss of supplements, particularly vitamins amid the searing procedure is one of undesirable changes that may happen simultaneously with alluring alterations (2).

Deep fat frying has significant advantages over other cooking methods: the frying time is short and the temperature within the product is below 100 0C; with insolubility of water-soluble vitamins. This result in less deterioration to vitamins, which are heat-sensitive in comparison with baking or boiling (18).

It was proved that when frying does not include any additional ingredients no change occur on the digestibility of the (16). On addition of reducing substances to the food that is fried, for instance, carbohydrates (meatballs and fish balls which contain flour), protein digestibility is slightly lowered (17).

During frying, food is totally or partially flooded in a heated oil (above180 °C). During this cooking method, the food and the frying medium both are modifying. Food loses water In contact with hot frying oil it also; this also leads food to absorb the oil and trades lipids with it. The searing sustenance retains certain measure of oil contingent upon the kind of nourishment and the singing technique, for example: French fries during frying may absorb up to 20% of its weight as oil (19). The surface layers of fried food inters into pyrolytical decomposition, resulting in the formation of heterocyclic amines in addition to absorption of polymers and polar compounds witch are the waste products of the frying oil. Both of these waste products reported to have an association with many types of cancer (20.25), endothelial dysfunction (26) and hypertension (8). Loss of unsaturated fatty acids such as linolenic acids and linoleic with an increase in corresponding trans-fatty acids reported on frying foods (27). Also it was proved that small changes in the proportion of essential fatty acids in the diet can affect health (28).

Depending on the technique of frying, that the amount the frying adulterates fats, extent of oil degradation, type and composition of the food (29), and type of oil used (30). Olive oil is less prone to be oxidated than other types of oils (30), wherefore; it imparts cardio metabolic health benefits and it was been recommended for use in frying (31). In general, frying reduces the activity of paraoxonase enzyme that inhibits oxidation of LDL cholesterol and increases amounts of cholesterol oxidation products (32,33). Foods fried with reused oils has been associated with a higher

incidence of arterial hypertension (8) and arterial endothelial dysfunction when compared with the same oil that was previously unused (26).

Obesity

Obesity is a complex condition of multifactor which has a genetic basis but requires environmental influence to manifest itself.(34-37). A global increase in the obesity prevalence has been observed over the past three decades (38) and many believes have been basically determined by changes in ways of life. It appears to be, in any case, that the adipogenic reaction to ecological exposures changes by hereditary foundation, supporting the conceivable presence of connections amongst qualities and eating regimen/way of life elements (35,36,39-46).

Lifestyle factors and several diet are related to consumption of fried food. Persons who consumed larger quantities of fried food tended to have higher total energy intake, unhealthy eating habits, lower levels of physical action, and larger amounts of inactive conduct. It is hard to isolated out whether broiled nourishment utilization fundamentally or other related unfortunate way of life associates with hereditary inclination to adiposity (40,47). A critical cooperation between the hereditary danger score and aggregate fricasseed sustenance utilization on corpulence was seen in the consolidated three accomplices and the chances proportions. For obesity per 10 risk alleles, it has been found to be 1.61,2.12 and 2.72 for total consumption of fried food of less than once, once to three times,and four or more times a week, respectively (48).

Several studies including a combined study of the NHS and HPFS have reported that fried-food consumption is associated with weight gain (49). The positive relationship between consumption of fried food and obesity could be explained by many mechanisms. . Fricasseed sustenances are crunchy, fragrant, extremely palatable, and rich in fats. As an outcome, eating broiled nourishment in not obligatory conditions may bring about higher total admission of sustenances with high vitality thickness and low satiety file (50). The relatively low satiety index of fats maybe related to their low ability to stimulate insulin and leptin production (51). What's more, fat admission may empower nourishment utilization past its impact on satiety. Case in point, when lunch and snacks with various substance of fat and starches however with comparative impacts on post dinner satiety were offered, subjects devouring the high fat lunch and snacks over the entire day than did subjects expending high-sugar sustenances (52). Increasing food energy density is one of the ways that Fried food induce obesity through it. Energy density is highly related to palatability and EI, and it is an essential determinant of voluntary EI (53). Energy density may thus affect EI in dependent of macronutrient content or palatability (4).

It has been reported that fat is metabolized and absorbed more efficiently than are other food components, and that could be the thing makes it associated with obesity (3,54,55). Unlike those mechanisms described above, this type of potential mechanism does not involve greater EI. It has been suggested that body weight depend on total EI in addition to the composition of macronutrient, and that for obesity prevention, high protein, high complex carbohydrate and low fat diets are recommended (56–59)**.**

Type 2 diabetes mellitus (T2DM):

In 2 large, prospective cohorts, we observed that frequent fried-food consumption was significantly associated with risk of incident T2D and cardiovascular diseases. These associations remained significant after extensive adjustment for demographic, diet, and lifestyle factors. Previous studies have reported that some of the major food items commonly used for frying, such as potatoes and red meat, are positively associated with increased risk of T2DM (60-65). However, these results were not substantially changed with adjustment for the overall diet quality and specific food items, which suggested that the association was independent of food items used for frying. The positive association between fried-food consumption and T2D has been supported by findings from other longitudinal studies that investigated the association between fast- or restaurant-food consumption and T2D risk, including the Black Women's Health Study (66), the Singapore Chinese Health Study (67), and the Coronary Artery Risk Development in Young Adults (68).

A stronger association with risk of T2D and eating fried food away from home than eating at home was observed, which could be explained by many mechaniss. First, oils deteriorate during frying, especially when the oils are reused, which is a practice that may be more common away from home than at home. Second, portion sizes are often larger (69) and sodium contents higher in restaurant meals than in meals eaten at home (70).

Results from the Nurses' Health Study and the Health Professionals Follow-Up Study proved a strong association

between the frequency of consumption of fried food and the risk of T2DM for those who are consuming fried food(<1, 1–3, 4–6 or 7 times/week of 1.00 1.15, 1.39 and 1.55) respectively (71). The frequency of fried food intake showed also an association with gestational diabetes comparing fried food intake of >7 to that of <1 times/week (72). A study from Italy demonstrated that in obese, insulin-resistant women, consumption of foods fried in extra-virgin olive oil significantly reduced both insulin and C-peptide responses after a meal (31). Finally, all those studies together proved that there is a strong evidence for a positive association between dietary intake of fried food and the risk of T2DM.

Cardiovascular diseases (CVD)

In the current analysis, fried-food consumption was moderately associated with incident CVD. Recently, the Spanish cohort of the European Prospective Investigation into Cancer and Nutrition reported that fried-food consumption was not associated with CVD in 40,757 adults during 8–12 y follow-up; it was suggested that this was because oils utilized for frying in Spain are principally olive oil and sunflower oil (73). A study in Costa Rica, where frying food is a daily practice, Kabagambe et al (74) proved no association between the consumption of fried foods and risk of nonfatal acute MI, which was attributed to the absence of a large reference group of individuals who did not fry their foods regularly. INTERHEART study (5761 nonfatal MI cases and 10,646 controls from more than 50 countries) observed an OR of 1.13 for most astounding contrasted with least quartiles of fried-food intake consumption (10).
The relations of fried-food consumption with risks of T2DM and CVD were substantially attenuated with adjustment for body mass index, hypertension, and hypercholesterolemia. Multiple cross-sectional studies have also linked the consumption of fried foods to an increased likelihood of cardio metabolic risk factors such as bodyweight and obesity(6), hypertension and low serum HDL cholesterol(8).**)** 9**.(**

An Indian case-control study of (more than 160 patients with CVD and almost 200 controls), patients with CVD reported a higher intake of both shallow fried food (24.0 ˘ 60.4 versus 2.7 ˘ 17.2 g/day; $p < 0.01$) and deep-fried food (15.2 ˘ 25.0 versus 1.0 ˘ 5.1 g/day; $p < 0.01$) comparing to the controls (75). Another case-control study in China demonstrated that the recurrence of utilization of browned sustenance was significantly expanded in patients with acute MI than in controls (1.3 ˘ 2.1 versus 1.1 ˘ 1.8 week intake; $p = 0.025$) (76). Data from different study showed significant association between frequent fried food consumption and higher risk of CVD (71).

The relative risks (RRs) of CVD for people who have a dietary intake of fried food (>1, 1–3, 4–6 or >7 times/week) respectively were (1.00, 1.06 , 1.23 and 1.21). The "INTERHEART" study watched a relationship between browned nourishment admission and acute MI with an odds ratio of 1.13 for the highest compared to the lowest quartile of fried food consumption (10). Data from the Cardiovascular Health Study reported dietary intake of fried fish is associated with higher risk of death due to ischemic heart diseases (77-80).

The Mediterranean cohort study demonstrated that utilization of fried sustenance habitually was connected with an expanded danger of hypertension (hazards ratios = 1.18 and 1.21) for individuals consuming fried food 2–4 and >4 times/week, separately, contrasted with those devouring fried substances <2 times/week ($p= 0.009$) (78). Another study showed that dietary intake of trans-fatty acids was positively associated with the risk of hypertension (RR: 1.08) (79).

Acrylamide and cancer

Acrylamide is a chemical compound with the chemical formula C3H5NO. It is an odorless white crystalline solid, which is soluble in water. When Non-thermally decomposition of acrylamide result in the formation of ammonia, whereas its thermal decomposition produce, carbon dioxide, carbon monoxide and oxides of nitrogen. Acrylamide is used in industry to synthesize polyacrylamides, which find many uses as water-soluble thickeners. (80).
The major sources of acrylamide are potatoes, baked goods and cold breakfast cereal (81). Tobacco and industrial uses were the main sources of acrylamide exposure in humans before the studies discover that acrylamide is also present in foods (15).

Data from a cohort study revealed that there is no significant association between acrylamide intake and breast cancer risk among premenopausal Swedish women (82). Another prospective study also found no significant association among postmenopausal Dutch women (83).

An occupational studies, reported that no association was found between intake of food contains acrylamide and head/neck cancer (84,85). On the other hand, some studies reported positive correlation between dietary acrylamide

and, ovarian, endometrial and renal cell cancers (83, 86) and an inverse association with lung cancer in females (87), and it was suggested that acrylamide might induce this carcinogenic effect through a hormonal mechanism.

Conclusion:-

This review article showed that frequent use of fried food (four or more times/week) is associated with a higher risk of developing chronic disease such as: obesity, type 2 diabetes mellitus, myocardial infarction, hypertension and cancer. Therefore, it has been suggested that fried food should be avoided as possible in order to decrease the risk of such chronic health problems and future researches should be focusing on these problems and try to develop better assessment for fried food consumption.

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