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Nutritional considerations and benefits associated with consumption of catfish in South-West Nigeria

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ABSTRACT

In many parts of Nigeria, consumption of catfish has been regarded as part of exclusive delicacies for the upper class, although, the cost is within the reach of the majority. Catfish is one of the major sources of omega-3 fatty acids, which is a very important nutrient that protects the body against some of the most common deadly non-communicable diseases, especially cardio-vascular diseases. Omega-3 fatty acids consist of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), which are essential fatty acids that need to be supplied regularly in human diets. This retrospective and descriptive cross-sectional survey among 259 consenting respondents and 50 catfish farmers reflected the level of acceptability of consumption of catfish and the challenges being confronted by catfish farmers. Poor awareness of the potential health benefits associated with consumption of catfish has contributed to lack of interest among the general populace. In addition, low production leading to poor availability plays a crucial role in the consumption pattern of catfish. It is important for stakeholders in catfish production to create more awareness on the potential health benefits associated with its consumption as a means of promoting public health through diets.

Key words: Catfish consumption; health benefit; omega-3 fatty acids and cardio-vascular diseases.

INTRODUCTION

There is no doubt that the foods we eat influence our health. Different food items contain different nutrients in various proportions and they all contribute to human health in one way or another. Fish, which is one of the food items people consume contains protein and other nutrients such as vitamin D and selenium and a specific type of fat, especially omega-3 fatty acids among other nutrients. Omega-3 fatty acid is of public health significance because it has the potential to reduce the risk of developing heart disease and other medical problems. Therefore, regular consumption of catfish has great potential to prevent against some of the non-communicable diseases, which is becoming common, even, among young Nigerian adults. However, production of catfish looks relatively low compared with the growing population. In addition, little information on health benefits of catfish is available to prospective consumers. Many of these consumers do not know much about health potentials embedded in consumption of catfish. Most families are used to consumption of frozen fish, especially mackerel or any other types, which are sometimes preserved with chemicals that may be injurious to health. The majority of fish farmers sometimes lack technological know-how on modern methods of fish processing that can improve the shelf-life and nutrient content, thereby contributing to the economic value of the product.

Although, consumption of fish has many health benefits, some types of fish may also be sources of potential dangers to consumers if some precautions are not taken before eating such fishes. Catfish contains fresh and potent omega-3 fatty acids in a better form than frozen fish that are more commonly available in many Nigerian markets today. However, the preservation methods used on catfish may undermine the nutrient content. The need for creation of awareness on fish consumption in relation to health is becoming of paramount importance to public health.

MATERIALS AND METHODS

A retrospective and descriptive cross-sectional survey was conducted among consenting 259 respondents, using a pre-tested questionnaire. Fifty catfish farmers were also engaged in interviews. Archival literature search was conducted to determine documented evidence on the potential benefits associated with consumption of catfish globally. Observational study using a checklist, Focus Group Discussion and Open Space Technology were used to obtain qualitative information from catfish consumers and farmers

Findings

Respondents were made up of 201 women (77.6%) and 58 men (22.4%), who consumed fish regularly but not catfish in many cases. Only a range of 10.0-25.0% consumes catfish at least once in a month.

Importance of Fish in Human Diets

Fish is a high-protein, low-fat food that provides a range of health benefits. White-fleshed fish, in particular, is lower in fat than any other source of animal protein, and oily fish are high in omega-3 fatty acids, or the "good" fats. Since the human body cannot make significant amounts of these essential nutrients, fish consumption becomes an important part of the diet. Also, fish is low in the "bad" fats commonly found in red meat, called omega-6 fatty acids. Regular consumption of fish can reduce the risk of various diseases and disorders. Many studies have been conducted on fish or fish oils and their roles in the prevention or treatment of heart disease. A review in the British Medical Journal recommends fish or fish oil supplements to prevent heart attacks, particularly in people with vascular disease. The process through which omega-3 fatty acid reduce heart disease is not known, but they are known to lower blood triglycerides and blood pressure, prevent clotting, are anti-inflammatory and reduce abnormal cardiac rhythms.

Selected research findings from archives of literature on benefits of fish consumption in relation to some disease conditions include:

Asthma - Children who eat fish may be less likely to develop asthma [1]

Brain and eyes - Fish rich in omega 3 fatty acids can contribute to the health of brain tissue and the retina (the back of the eye) [2].

Cancer - The omega-3 fatty acids in fish may reduce the risk of many types of cancers by 30 to 50 per cent, especially of the oral cavity, oesophagus, colon, breast, ovary and prostate.

Cardiovascular disease - Eating fish every week reduces the risk of heart disease and stroke by reducing blood clots and inflammation, improving blood vessel elasticity, lowering blood pressure, lowering blood fats and boosting 'good' cholesterol.

Dementia - Elderly people who eat fish or seafood at least once a week may have a lower risk of developing dementia, including Alzheimer's disease [3].

Depression - People who regularly eat fish have a lower incidence of depression (depression is linked to low levels of omega-3 fatty acids in the brain) [4].

Diabetes mellitus - Fish may help people with diabetes manage their blood sugar levels [5].

Eyesight - Breastfed babies of mothers who eat fish have better eyesight, perhaps due to the omega-3 fatty acids transmitted through breast milk [6]

Inflammatory conditions - Regular fish consumption may relieve the symptoms of rheumatoid arthritis, psoriasis and auto-immune disease [7].

Pre-maturity - Eating fish during pregnancy may help reduce the risk of delivering a premature baby [8].

While it is recommended to eat one to two fish-meals a week, it is wise to avoid fish high in mercury. Excess mercury appears to affect the nervous system, causing numbness or tingling fingers, lips and toes, developmental delays in walking and talking in children, muscle and joint pain and increased risk of heart attack [9].

If catching and eating your own catfish, it is safer not to fish in polluted waters, especially streams, lakes and rivers where effluents from industries have been discharged. Bottom feeder fish species, such as catfish, may ingest more pollutants.

Nature of Omega-3 Fatty Acids in Fish Oil

Omega-3 polyunsaturated fatty acids (n-3 PUFAs) consist of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). EPA and DHA can decrease metabolism of eicosanoid in blood platelet which may inhibit incidence of atherosclerosis and hypertension [10].

Many studies have shown that omega-3 fatty acids are very important to life development because docosahexaenoic acid (DHA) was found in brain and retina. It was believed that brain and visual development of infant relates with DHA. Therefore, it was recommended that infant milk should be supplemented with omega-3 fatty acids. In addition to the importance of omega-3 fatty acid for life, the experts from many countries concluded that omega-3 fatty acid must be consumed in adequate quantity. Public Health Ministry of England defines dietary reference value of omega-3 fatty acid not less than 0.2 percent of energy intake [11]. The recommended daily amount of omega 3 fatty acids from fish is 200-600mg.

Omega-3 fatty acids found in fish (EPA and DHA) are of immense health benefits. Fish with high content of omega-3s, low in environmental contaminants and eco-friendly include:

- Wild salmon (fresh, frozen and canned)
- Atlantic mackerel (not King mackerel)
- Sardines
- Catfish

Other Sources of Omega-3 Fatty Acids

Alternative sources of omega-3 fatty acids come from terrestrial sources like flaxseed, walnuts and wheat germ. While still beneficial, these do not appear to provide as a great a health benefit as the omega-3s found in catfish, shellfish and marine algae.

Caution on Fish Oil as Food Supplement (Functional Food)

Besides eating fish, another way to consume omega-3 fatty acids is by taking store-bought supplements. Fish oils come from both fish caught as food for humans and from small fish caught for animal feed, such as Peruvian anchovies.

A word of caution: contaminants such as PCBs accumulate in fish oil just as they do in fish, it is therefore being preferable to purchase capsules made from purified fish oil.

Consumption Patterns of Catfish in Southwest Nigeria

Consumption rate of catfish among the general population in Southwest Nigeria is currently low, between 10-25% [12]. Catfish is generally considered exclusively a delicacy for the rich by 92.5% of respondents. Majority (78.4%) consume frozen fish because of its availability and affordability. Some (47.1%) of respondents submitted that texture of catfish is too soft and sometimes nauseating. Soups or stew of catfish was labeled as having short shelf-life when compared with that made from frozen fish by 89.7% of respondents. There was a general poor awareness on the potential health benefits from consumption of catfish among 84.2% of respondents. Result from the survey showed that 69.7% of catfish farmers lack basic information on how to promote marketing of their product. This has affected sales negatively, leading to financial losses. It was obvious from the interviews conducted with catfish farmers that they need enlightenment as to the worth of their product, marketing skills and opportunity for financial support in terms of access to loan. The need for proper coordination of the activities of catfish farming was also emphasized during the qualitative interviews.

Healthy Methods of Preparing Catfish for Consumption

Preparation methods may influence the nutrient content and palatability of catfish. Observational study has shown that many do not know the best procedure to prepare catfish for consumption [12]. After cutting to remove the intestine and the gills, catfish should be thoroughly washed to reduce the slimy nature. Different methods are used to do this; while some use alum others may use lime ash. Catfish is best prepared by seasoning with tomatoes and

onions with little salt and/or bouillon cubes and boiled in very little water until the flesh is done, without blood. This can now be eaten this way or transferred to any sauce or fried depending on an individual's preference. Addition of tomatoes and onions increases the nutrient content of the flesh of catfish, especially the anti-oxidant micronutrients. Other means of treating catfish after seasoning include:

- **Baking** - make shallow cuts along the top of the fish. Put into a greased dish and cover with foil. Flavour with herbs, lemon juice and olive oil. Bake at around 180°C and baste frequently.
- **Shallow frying** - dry and flour the fish. Place a small amount of oil or butter in the pan. Fry the fish at a medium heat.
- **Grilling** - cut slashes into whole fish to help the heat penetrate the flesh. Place fish on a preheated grill. Baste frequently.
- **Poaching** - not suitable for flaky varieties. Place fish in gently simmering stock. Whole fish should be placed in a pan of cold stock, which is then slowly brought up to a gentle simmer.
- **Steaming** - put fish in a steamer or on a plate over a saucepan containing gently boiling water.

Preservation of Catfish

Catfish begins to spoil immediately after harvesting, unless it is treated in very clean water and refrigerated. This is reflected in gradual developments of undesirable odour, softening of the flesh and eventually substantial losses of fluid containing protein and fat. By lowering the temperature of the dead fish, spoilage can be retarded and, if the temperature is kept low enough, spoilage can almost be stopped.

Rigor mortis, over a period of hours or days soon after death, can have a bearing on handling and processing. In some species, the reaction can be strong, especially if the fish has not been chilled. The muscles under strain tend to contract, therefore, some of the tissue may break, especially if the fish is roughly handled, leaving the flesh broken and falling apart. If the muscles are cut before or during *rigor*, they will contract and in this way fillets from fish can shrink and acquire a somewhat rubbery texture. In many species, however, *rigor mortis* is not strong enough to be of much significance.

The freezing process alone is not a method of preservation. It is merely the means of preparing the catfish for storage at a suitably low temperature. In order to produce a good product, freezing must be accomplished quickly. A freezer requires to be specially designed for this purpose and thus freezing is a separate process from low temperature storage.

Nutrient Composition of Catfish Flesh

Average nutritive values of catfish from proximate analysis conducted by various researchers show fatty acid profile (especially omega-3 fatty acids, EPA: eicosapentaenoic acid; DHA: docosahexaenoic acid), amino acid contents, vitamins and minerals content. The nutrient composition of dried catfish was determined using the AOAC standard method. The results showed that percentage of protein in fresh and dried catfish were: 18.43, 65.99, fat-68.80, 4.93: moisture-22.40 and 7.78 respectively. Fatty acid contents, especially eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in dried catfish (0.4256, 1.7472 g/100 g) were also found to be higher than those in other fishes (0.0467, 0.1011 g/100 g respectively). The results of this study indicated that dried catfish was high in nutritive values especially, omega-3 fatty acids (EPA, DHA). As an inland fish, it was also found to have higher omega-3 fatty acids than marine fish, sardine.

Caution on Preservative Chemical (Malondialdehyde (MDA) in Frozen Products in Nigerian Markets

Laboratory analysis results obtained from randomly selected samples of frozen turkey, chicken and fish including imported catfish; sold in Benin City markets, Nigeria, were screened for lipid peroxidation by colorimetric estimation of their malondialdehyde (MDA) contents by a group of researchers [13]. All samples contained extremely high levels of MDA. The order of MDA profiles was fish > turkey > chicken. MDA levels within chicken and turkey samples varied from market to market, while values for each of the 5 fish species studied were fairly comparable. Ingestion of high dose of MDA from these frozen products has implication for consumers' health due to well-known mutagenic and cytotoxic effects of MDA [13].

In developed countries, especially the US, the issue of fish contamination has been given due attention. A report by Exponent Incorporation Center for Chemical Regulation and Food Safety in the US has raised new worries over the potential long-term consumer health risks of imported catfish grown in contaminated water and treated with drugs

banned for use in US fish farming. Eating contaminated imported fish could have serious long-term human health consequences, including longer-lasting illnesses due to antibiotic build-ups that leave people less responsive to antibiotic medications and an increase in drug-resistant pathogens that can be transmitted to humans via the food chain, the report warns. Analysts also cited dangerous short-term health impacts, finding that imported catfish are twice as likely to be contaminated with salmonella as domestic fish [14]. The report stressed the importance of identifying risks and imposing appropriate controls before consumers will contract illnesses that could frighten them from eating fish.

Effects of Different Fish Processing Methods on Nutrient Content

The effects of two different drying methods (smoking kiln and electric oven) on proximate compositions of catfish (*Clarias gariepinus*) were determined by Ogbonnaya and Ibrahim in 2009 [15]. Purchased quantities of catfish were shared into two parts: one part was used to determine the proximate compositions of the raw fish and the other part was sub-divided into two; a part was dried using smoking kiln at a temperature range of 60°-70°C for 24 hours and the remaining one was dried using electric oven at a temperature range of 120 °C for 30 minutes.

The results indicate that drying methods have effects on the proximate compositions of catfish. Based on this experiment, electric oven drying is recommended for healthy eating and for longer shelf-life of dried fish [15].

CONCLUSION

Much awareness is required to promote consumption of catfish in the study area. Catfish farmers need aggressive marketing strategies to promote awareness on the health benefits of consumption of catfish. Government should assist in catfish production and contribute to promoting its consumption as a preventive way against some non-communicable diseases. Soft loan and materials can be made available to farmers to encourage more production of catfish in addition to supporting media advertisement on health benefits of catfish. Lastly, health safety of some imported fish may not be guaranteed and therefore the line agencies should be more stringent in the determination of obnoxious chemicals used in preserving frozen products, especially fish and poultry.

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