FOOD ADDITIVES; IT EFFECTS AND BENEFITS ON THE HEALTH OF CONSUMERS

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Abstract

There has been continuous increase in ill-health of people as a result of poor use of food additives. The study examines food additives; it effects and benefit on the health of the consumers. The objectives of the study are to ascertain the health consequences of poor use of additives in foods; and to determine the health benefits of proper use of additives in foods. The study adopted a descriptive cross-sectional approach where data is to be collected at a particular point in time from customers of the selected restaurants. Regression Model was employed using quantitative data. The study revealed that poor use of additives in foods has significant negative health consequences; the opinion of the respondents revealed that where no artificial additives are added to foods, health of the consumer will not be negatively impaired. However, consumers are not satisfied with foods prepared without additives; the study further revealed that in a situation where recommended and regulated measure of additives are added to foods, it will have positive impact on consumers health but on the contrary, it will result into negative impact on consumers health. Arisen from the findings of this study, the study recommended that management of hotel industry should ensure that they are sensitive to customers' needs and complaints regarding food additives. To ensure increase in patronage, proper use of food additives should be encouraged and comply with all the professional requirement of food production in the area of proper use of food additives; and natural food additives should be encouraged in the production of foods.

Keywords: *Food, Additives, Benefit, Health of the Consumer*

INTRODUCTION

The use of food additives is only justified when their use has a technological need, does not mislead consumers, and serves a well-defined technological function, such as to preserve the nutritional quality of the food or enhance the stability of the food (Dusdieker, Getchell, Liarakos, Hausler, & Dungy, 2019). Food additives can be derived from plants, animals, or minerals, or they can be synthetic. They are added intentionally to food to perform certain technological purposes which consumers often take for granted. There are several thousand food additives used, all of which are designed to do a specific job in making food safer or more appealing (George, Wiklund, Anstrap, Pousette, Thunholm, Saldean, Wernroth, Zaren, & Holmberg, 2019). WHO, together with FAO, groups food additives into 3 broad categories based on their function. In China, food-safety issues that are related to food additives, such as their misuse or overuse due to anthropogenic stressors, or the reckless use of nonedible chemical substances, have become increasingly prominent. Studies have shown that, between 2006 and 2018, a total of 253,617 food-safety incidents were reported in China, of which 75.5 percent were caused by anthropogenic factors. Moreover, the highest number of food-safety incidents was caused by the illegal use of food additives, which accounted for 34.36 percent of the total. Indeed, the latest information that has been released by China's

State Food and Drug Administration revealed that, out of 257,000 batches of food samples that were collected nationwide, there were 8224 batches of substandard food, 33.6 percent of which was caused by the misuse or overuse of food additives by food production and processing organizations (Gupta, Seth, Bassin, & Gupta, 2019).

What is worse, some illegal enterprises used nonedible chemical substances in order to pursue their economic interests, which have caused real or potential damage to consumers' health. A typical example is when an infant formula was contaminated with melamine, which occurred in October 2008 and resulted in 296,000 infants and young children having varying degrees of a urinary-system abnormality. The social impact of this incident was devastating in China, and, as a result, many customers have become increasingly worried about the safety of food additives. Indeed, there is a great amount of evidence that has repeatedly shown that food-safety incidents occur frequently in China, which is mainly due to the abuse of food additives (The abuse of food additives refers to the practice of misuse or overuse of food additives, as well as the use of fake, shoddy, or expired food additives.) by food-production operators, whose goal is to pursue economic benefits regardless of their moral duty. It is therefore not surprising that such illegal practices have become one of the most worrying aspects of food-safety risks in the country (Hatcher, Planalp, Cho, Torti, & Torti, 2018).

In Nigeria, most people tend to eat the ready-made foods available in the market, rather than preparing them at home. Such foods contain some kind of additives and preservatives, so that their quality and flavour is maintained and they are not spoiled by bacteria and yeasts (Khanavi, Hajimahmoodi, Ranjbar, Oveisi, Ardekani, & Mogaddam, 2020). More than 3000 additives and preservatives are available in the market, which are used as antioxidants and antimicrobial agents. Some of the commonly used food additives and preservatives are aluminium silicate, amino acid compounds, ammonium carbonates, sodium nitrate, propyl gallate, butylated hydroxyl toluene (BHT), butylated hydroxy anisole (BHA), monosodium glutamate, white sugar, salt, potassium bromate, potassium sorbate and sodium benzoate. Some artificial colours are also added to the foods to give them an appealing look. Some of these colouring substances are erythrosine (red), canthaxanthin (orange), amaranth (Azonic red), tartrazine (Azonic yellow) and annatto bixin (yellow orange) (Ito, Hirose, Fukushima, Tsuda, Shirai, & Tatematsu, 2021).

Most death and illness in the world especially in some part of Nigeria are traceable to poor usage of additives. Excessive use of additives becomes poisonous and could lead to untimely death. The reduction in life expectancy among Nigerians are traceable to what they consumed due to the additives that are used to preserved the foods most of which are not properly measured (Mohamed, Attia, Mahmoud, Somaia, Samar, & Gihan, 2019). This study hereby examines the of effects and benefit of food additives on the health of the consumers.

OBJECTIVES OF THE STUDY

The objective of the study is to examines the effects and benefits of food additives on consumers health. The specific objectives are to:

1. Ascertain the health consequences of poor use of additives in foods;
2. Determine the health benefit of proper use of additives in foods.

HYPOTHESES

H_{01}: Poor use of additives in foods does not have negative health consequences.

H_{02}: Proper use of additives in foods does not have significant effects on health benefit.

CONCEPTUAL REVIEW

Effects of Food Additives

According to Virtanen, et.al. (2019), some people are sensitive to particular food additives and may have reactions like hives or

diarrhoea. This doesn't mean that all foods containing additives need to be automatically treated with suspicion. All foods are made up of chemicals and food additives are not always 'less safe' than naturally occurring chemicals (Ward, Wen-Ham, Yu-Juen, Feng-Hui, Louise, Chien-Jen, Mow-Ming, I-How, Paul, Czau-Siung, & Allan, 2019).

Many of the food additives used by the food industry also occur naturally within foods that people eat every day. For example, MSG is found naturally in parmesan cheese, sardines and tomato in significantly greater quantities than the MSG present as a food additive. People with food allergies and intolerances are also often sensitive to chemicals found naturally in certain foods, such as nuts or shellfish (FDA, 2018).

Many people view food additives as a major food threat. However, in terms of health risk, food additives would come in at the end of the line, after food-borne microorganisms (like salmonella), inappropriate hygiene and eating habits, environmental contaminants and naturally occurring toxins (Whysner, Wang, Zang, Iatropoulos, & Williams, 2019).

Types of Food Additives

According to Tuormaa (2019), the different types of food additive and their uses include: Anti-caking agents – stop ingredients from becoming lumpy; Antioxidants – prevent foods from oxidising, or going rancid; Artificial sweeteners – increase the sweetness; Emulsifiers – stop fats from clotting together; Food acids – maintain the right acid level; Colours – enhance or add colour; Humectants – keep foods moist; Flavours – add flavour; Flavour enhancers – increase the power of a flavour; Foaming agents – maintain uniform aeration of gases in foods; Mineral salts – enhance texture and flavour; Preservatives – stop microbes from multiplying and spoiling the food; Thickeners and vegetable gums – enhance texture and consistency; Stabilisers and firming agents – maintain even food dispersion; Flour treatment – improves baking quality; Glazing agent – improves appearance and can protect food; Gelling agents – alter the texture of foods through gel formation; Propellants – help propel food from a container; Raising agents – increase the volume of food through the use of gases; and Bulking agents – increase the volume of food without major changes to its available energy (Floch, 2021).

Food Additives and Processed Foods

There is a common misconception that processed foods automatically contain food additives. Foods like long-life milk, canned foods and frozen foods are all processed, yet none of them need extra chemicals (Floch, 2021). If someone is unsure whether or not a product contains an additive, check the label. However, some listed ingredients may contain food additives without mentioning them on the label. For instance, 'margarine' might be a listed ingredient and margarine contains food additives (Gan, Sun, Wu, Jing, & Yu, 2021).

For most people, additives are not a problem in the short term. However, 50 of the 400 currently approved additives in Australia have been associated with adverse reactions in some people (Haley, & Lyn, 2021). Some food additives are more likely than others to cause reactions in sensitive people. It is often the additives that are used to give a food a marketable quality, such as colour, that most commonly cause allergic reactions. Some of these hypersensitive reactions include: Digestive disorders – diarrhoea and colicky pains; Nervous disorders – hyperactivity, insomnia and irritability; Respiratory problems – asthma, rhinitis and sinusitis; Skin problems – hives, itching, rashes and swelling (Hallagan, Allen, & Borzelleca, 2021).

It is important to realise that many of the symptoms experienced as a result of food sensitivities can be caused by other disorders. Medical diagnosis is important. If someone try to diagnose itself, the person may restrict its diet unnecessarily and neglect an illness (Halldorsson, Strom, Petersen, & Olsen, 2021).

Some food additives that may cause problems for some people include: Flavour enhancers – monosodium glutamate (MSG) 621. Food colourings – tartrazine 102; yellow 2G107; sunset yellow FCF110; cochineal 120; Preservatives – benzoates 210, 211, 212, 213; nitrates 249, 250, 251, 252; sulphites 220, 221, 222, 223, 224, 225 and 228; Artificial sweetener – aspartame 951 (Wu, et.al, 2020).

If someone think he/she may have a food additive sensitivity, it's important to seek professional help since all of the symptoms you may be experiencing can also be caused by other disorders. It may help to keep a food diary and note carefully any adverse reactions. In the case of a sensitivity being identified, the usual practice is to eliminate all suspect foods from the diet and then reintroduce them one by one to see which additive (or additives) causes the reaction (Xing, et.al., 2020). This should only be done under medical supervision, since some of the reactions – such as asthma – can be serious.

Health Benefits

The essential health benefits are a minimum federal standard and states may require that qualified health plans sold in state health insurance exchanges also cover state-mandated benefits. The act gives "considerable discretion" to the Secretary of Health and Human Services to determine, through regulation, what specific services within these classes are essential. However, the Act provides certain parameters for the secretary to consider. The secretary (Haley & Lyn, 2021) must "ensure that such essential health benefits reflect an appropriate balance among the categories ... so that benefits are not unduly weighted toward any category"; (Hallagan, Allen, & Borzelleca, 2021) may "not make coverage decisions, determine reimbursement rates, establish incentive programs, or design benefits in ways that discriminate against individuals because of their age, disability, or expected length of life; (Halldorsson, Strom, Petersen, & Olsen, 2021) must take into account "the health care needs of diverse segments of the population, including women, children, persons with disabilities, and other groups"; and (Feng, et.al., 2019) must ensure that essential benefits "not be subject to denial to individuals against their wishes on the basis of the individuals' age or expected length of life or the individuals' present or predicted disability, degree of medical dependency, or quality of life (Ghoreishi, Behpour, & Golestaneh, 2019).

Food Production in Hotels

Food production is the transformation of raw ingredients by food production staff into final dishes and meals (Hoover & Milich, 2019) and takes place in the food production area (Gupta, Gupta, & Gupta, 2019). A complete kitchen in a large hotel involves a hot section (stock kettles, broilers, grills, steamers, fry kettles, and roasting ovens); the garde-manger (cold food) sections; the pantry (salad) area; the butcher shop; the pastry shop and sometimes a bake shop; the scullery (dish and pot washing) area; an employees' cafeteria; banquet kitchen(s); and room service kitchen (Kashanian, & Zeidali, 2019). Most kitchens involve two production areas: a central production area in which basic preparation of food is undertaken and satellite kitchens for the final preparation of foods in which foods are finished immediately before service (Knobeloch, 2019).

The food production area is headed by an executive chef or food production manager who carries out various duties (Knobeloch, 2019). Louis and Botulism (2019) argued that the chef profession represents the most stressful profession amongst hospitality industry careers. The head chef should not spend all his/her time cooking in the kitchen and s/he requires skills beyond technical skills to undertake administrative work, management, developing staff training, purchasing functions, stock control, staff selection, supervision through good communication and leadership, designing menus, and overall maintaining the quality of the food leaving the kitchen. Thus, the main

duties of the head chef are organizing, supervising and administering not cooking (Ward, 2018). The responsibility of developing and changing menus is ascribed to the executive chef who in turn identifies which items are in demand and should be left on the menu and which items are less popular and should be removed from the menu (Whysner, J., Wang, Zang, atropoulos, & Williams, 2019). The majority of restaurants change their menus every three to six months - no less - to ensure stability. Williams, Iatropoulos and Whysner, (2021) contended that to improve commitment and motivation amongst people in the kitchen, the head chef should motivate and support those in his charge, e.g., giving tangible support (technical help or information) and acknowledging good work. Good communication between kitchen staff and management and cross training directly reduced the level of work stress and increased job satisfaction.

According to Winter (2019) since food production has a very short operational cycle providing little time to correct mistakes, it is critically important to achieve quality food right first time. To discuss this further, Wu, Lin, Lin, Ken, and Wen, (2020) listed the following principles which should be taken in mind to achieve excellent food production: Develop a proper attitude towards cooking; Use standard recipes; Use the right technique and equipment; Train employees accurately; Supervise employees properly; Maintain production equipment; Schedule food production according to needs; Have variety of menu items.

The Theory of Consistent Quality

Wu, et.al., (2020) stated that quality management should involve measures to achieve a consistent level of quality. Haley and Lyn (2021) shed light on the importance of consistent quality products through documenting work flow and issuing standards as evidence to conforming to standards. Yet, consistency is a big challenge (Xing, Meng, Xue, Zhang, Yin, & Xi, 2020).

From an operational perspective, consistency is recognized as a significant factor for delivering quality and meeting customer expectations. Yang, (2021) emphasized the importance of detailed standards underpinned by an effective system to make sure that all staff produce a consistent level of quality. According to Yang, Qin, Gao and Zhang (2019) inconsistent quality products are a significant barrier to quality in organizations.

Haley and Lyn (2021) emphasized the importance of delivering consistent quality as vital amongst eight critical factors relating to the design of operating system in hospitality organizations. Moreover, Hatcher, Planalp, Cho, Torti, and Torti (2018) pointed out through a review of quality practices in British hotels that functional dimensions which involve consistent quality provide competitive advantage. Furthermore, Haley and Lyn (2021) stressed the consistent quality as a key feature of the services provided in hospitality operations.

METHODOLOGY

This study research focus on the food additives; it effects and benefit on the health of the consumer, a case study of two (2) restaurants in Ishaga/Ogba axis of Ikeja, Lagos state, Nigeria, namely: Unique Grills and Hangout foodie Restaurants. The study adopted a descriptive cross-sectional approach where data is to be collected at a particular point in time from customers of the selected restaurants. The population of study consists of all the customers of the two selected restaurants located at Ishaga/Ogba axis of Ikeja, Lagos state, Nigeria. A total of about 95 customers visits the restaurants on a daily basis, hence, these categories of customers shall form the population of the study on the day the researcher visit the restaurants to administer questionnaire. In order to draw a precise inference about the population, a simple random sampling shall be used. The researcher obtained the sample frame of 77 respondents using Taro Yamani sample size determination formula.

Method of Data Collection

Primary data provided by the respondents constitute the main source of data. As stated earlier, the respondents for this study comprise of customers of the selected restaurants from the study area. A total of seventy–seven (77) structured questionnaire was distributed and Sixty-three (63) was completed and returned

Method of Data Analysis

This study uses a cross-sectional and quantitative approach to achieve the study objectives. Therefore, Regression Model was employed using quantitative data. Quantitative data analysis involved descriptive zero order correlations and Regression Modelling using SPSS version 25.

Model Specification

Regression model was employed for this study as stated below:

$HC = \alpha + \beta_1 (PADD) + e. \ldots 1$

$HB = \alpha + \beta_1 (NADD) + \beta_1 (RecADD) + \beta_1 (HADD) + \beta_1 (NaADD) + e. \ldots 2$

Where:

HC = Health Consequences
PADD = Poor use of Additives
HB = Health Benefits
NADD = No Food Additives
RecADD = Recommended or Normal Food Additives
HADD = High Food Additives
NaADD = Natural Food Additives
α = Intercept
β = Beta Value.

DATA PRESENTATION

Out of the targeted sample size of 77, those who responded to the administered questionnaire were 63. The high response rate (82%) is attributed to fact that a personal (self-administered) approach was employed in collecting data. More so, the researcher maintained useful contacts with the respondents (Customers of the Restaurants), which were instrumental in identifying the relevant sampled respondents and maintaining good relationships with them, which yielded excellent response rates.

Table 1: Response Rate

	No. of respondents	**Percentage**
Questionnaires Issued	77	100
Responses Received	63	82%
Responses Discarded	2	3%
Responses Used	61	88%

Source: Field Study 2021.

Table 2: Multi-collinearity Results Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	.841	.114		3.24	.002		
Proper use of food additives	.77	.061	.133	2.11	.001	.411	2.51
Health benefits	.130	.047	.177	2.33	.007	.433	2.61

Source: Field survey, 2021.

KMO and Bartlett's Sphericity Test

To evaluate the feasibility of the study, the Kaiser-Meyer-Olkin sampling adequacy index and Bartlett's sphericity test were conducted; both methods suggested the existence of an acceptable inter correlation. The Maximum extraction method was performed because it best reproduces the population values when the data has normal, multivariate distribution and the statistical significance of the extracted factors can be calculated. The results for all the five variables show the KMO values are

above 0.7 (table 3). This implies that the items in our questionnaire correlate well with other items within their respective clusters to measure the underlying dimension, hence, adequate to continue with further analysis.

Table 3: KMO and Bartlett's Results

Variable	KMO	Bartlett's test			No of factors
		χ^2	df	Sig	
Proper use of food additives	0.877	541.214	15	.001	2
Health benefits	0.744	784.362	21	.001	2

Source: Field survey, 2021.

TEST OF HYPOTHESES

Hypothesis One

H_{01}: Poor use of additives in foods does not have negative health consequences.

Table 4 Model Summary for Hypothesis One

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.631a	.721	.545	32151477.321	2.54

a. Predictors: (Constant), Poor use of food additives

b. Dependent Variable: on health consequences

Source: Field survey, 2021.

Table 5 Coefficients for Hypothesis One

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3624151	12121		2.201	.001
Poor use of food additives	-3.3621	32161	-2.144	-3.177	.006

a. Dependent Variable: health consequences

Source: Field survey, 2021.

The relationship between the use of food additives and health consequences/benefits is about 63%. R being the determinant of correlation explains the extent to which the independent variable could explain the dependent variable. R square as shown in model summary is about 72%, this implies that the independent variables can predict or determine dependent variables up to 72%. This simply means that poor use of food additives can determine the health consequences/benefits up to about 72%. This study revealed that poor use of food additives account for about -2.14-unit change in health consequences/benefits. Meaning that poor use of food additives has negative impact on the health of consumers. This study revealed that poor use of food additives has negative significant health consequences, the p value is higher than 0.05 level of significant (0.001 > 0.05 p). Since p value (0.001 < 0.05), we hereby reject the null hypothesis and conclude that poor use of additives in foods has significant negative health consequences.

Hypothesis Two

H_{02}: Proper use of additives in foods does not have significant effects on health benefit.

Table 6 Model Summary for Hypothesis Two

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.661a	.617	.625	324154.21	2.51

a. Predictors: (Constant), No Food Additives;
b. Dependent Variable: health benefits.
Source: Field survey, 2021.

Table 7 Coefficients for Hypothesis Two

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	362577	321		2.36	.021
	No Food Additives	2.24	.311	2.341	3.33	.145
	Recommended or Normal Food Additives	1.24	.451	1.241	2.11	.001
	High Food Additives	2.31	.324	-2.314	-1.21	.002
	Natural Food Additives	1.11	.241	2.113	1.14	.001

a. Dependent Variable: Health benefits
Source: Field survey, 2021.

As shown in the coefficients table (table 9), the beta value of 2.341 implies that in a situation where no artificial additives are added to foods, there will be about 2.24 positive unit impact on health, meaning that the opinion of the respondents revealed that where no artificial additives are added to foods, health of the consumer will not be negatively impaired. However, the p-value of 0.145 which is higher than 0.05 level of significance implies that consumers are not satisfied with the food prepared without additives. Meaning that though food prepared without artificial additives has positive impact on health of the consumers, they are not satisfied with the tastes of the foods, hence, appropriate measure of additives is required. The table further revealed that in a situation where recommended and normal measure of additives is added to foods, it will have positive impact on health of consumers. The beta value of 1.24 implies appropriate use of additives will translate into positive impact on health of consumer, this is found significant at 5% level of significance (0.001 < 0.05). However, in a situation whereby high food additives are added to foods, it will result into negative impact on the health of consumers (b = -2.314, t = -1.21, and p = 0.002 < 0.05), which is highly significant at 5% level of significance.

The table further revealed that in a situation where natural food additives is added to foods, it will result into positive health benefits (b = 2.133, t = 1.14, and p = 0.001 < 0.05). This finding therefore encourages the use of natural additives.

CONCLUSION

Many different food additives have been developed over time to meet the needs of food production, as making food on a large scale is very different from making them on a small scale at home. Additives are needed to ensure processed food remains safe and in good condition throughout its journey from factories or industrial kitchens, during transportation to warehouses and shops, and finally to

consumers. The use of food additives is only justified when their use has a technological need, does not mislead consumers, and serves a well-defined technological function, such as to preserve the nutritional quality of the food or enhance the stability of the food.

Food additives can be derived from plants, animals, or minerals, or they can be synthetic. This study concluded that poor use of additives in foods has significant negative health consequences; where no artificial additives are added to foods, health of the consumer will not be negatively impaired. However, consumers are not satisfied with the food prepared without additives; in a situation where recommended and normal measure of additives is added to foods, it will have positive impact on health of consumers; however, in a situation whereby high food additives are added to foods, it will result into negative impact on the health of consumers. The study further revealed that in a situation where natural food additives are added to foods, it will result into positive health benefits.

RECOMMENDATIONS

Arisen from the findings of this study, the study recommended that:

1. Management of Hotel industry should ensure that they are sensitive to customers' needs and complaints regarding food additives.
2. To ensure increase in patronage, proper use of food additives should be encouraged and comply with all the professional requirement of food production in the area of proper use of food additives.
3. Natural food additives should be encouraged in the production of foods.

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