

Assessment of Consumers' Perception of Chicken Eggs Consumption and Associated Health Implications in the Volta Region of Ghana

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ABSTRACT

BACKGROUND: Rather erroneously, eggs consumption is linked to increase in plasma cholesterol content and incidents of cardiovascular diseases, cancer, stroke, or diabetes. This misconception which is more pervasive particularly in sub-Saharan Africa, has led to very low patronage of eggs intake. In this study, egg consumption patterns, desired egg characteristics, and the extent to which the perception of eggs consumption as a health risk is entrenched among consumers in the Volta Region of Ghana, were examined.

METHODS: The study used primary data for the analysis and the 2-stage sampling technique was employed. First, 5 districts (Keta, Ho, Krachi East, Nkwanta South and North Tongu) were selected and afterward, a sample was randomly selected from each of the district. A well designed and pretested questionnaires were administered to the respondents.

RESULTS: It was found that cheaper price and deep yellow yolk were the most persuasive parameters that motivate consumer purchase. The relationship between educational level and awareness on cholesterol types was significant. More than half of the respondents held the view that egg intake results in an increase in serum cholesterol and leads to the incidence of serious health problems.

RECOMMENDATION: This study proves the urgent need for a concerted national public education effort to raise awareness about the nutritional and health benefits of eggs intake. Success in such awareness creation will go a long way to greatly minimize acute malnutrition in the Ghana.

KEYWORDS: Egg consumption, health implication, malnutrition, cholesterol, cardiovascular disease, Ghana

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Introduction

Eggs satisfy the essential nutrients important for human growth and development, especially in children and young adults.¹ Eggs are laid by the females of species including birds, reptiles, amphibians and fishes. Among the birds, fowls or chickens were domesticated earlier than any other and served as the main source of eggs for food to humans.² Eggs are a nutrient-dense food and good source of high quality protein, fat-soluble vitamins (A, D, E, and K) as well as water-soluble B vitamins,³ and minerals such as zinc, iron, and copper.^{4,5} The protein content of a diet has long been associated with increased satiety. In this regard, some evidence show that the high protein content of eggs may contribute to greater satiety than, for example, white bread or ready-to-eat breakfast cereals.⁶ There is also evidence that eggs could help promote weight loss in overweight and obese subjects to increasing feelings of satiety and reducing short-term energy intake.⁷ Furthermore, eggs are important in fat digestion which is mediated by bile since eggs

aid in the synthesis of steroids, for example vitamin D—a precursor in bile production.

The nutrient abundance and the great potential of chicken eggs to serve as a whole meal and their popularity promoted the production of chicken eggs to become commercialized and gave rise to egg-based industries with respect to production, processing and marketing. Compared with other type of eggs, fowl or chicken eggs became the most popular and preferred due to the biological cycle of fowls which is characterized by early start in eggs laying right from the fifth month after hatching.² Fowls can lay eggs every day for most part of their reproductive life. Besides, chickens make most efficient use of crude protein in their feed compared with other poultry such as guinea fowls and hence economically cost-effective, most convenient and profitable to produce.⁸ Furthermore, because chickens were domesticated earlier than any other birds, drugs and vaccines were also developed to help prevent and treat poultry diseases in order to prolong their lifespan.²



Available data on maternal and child nutrition show that globally, malnutrition is responsible for nearly half the deaths of children under age 5 years. Malnutrition is asserted to contribute to more than one-third of all child deaths, although it is rarely listed as a direct cause. Child malnutrition was associated with 54% of deaths in children in developing countries in 2001.⁹ The vicious cycle of poverty, disease and illness aggravates this situation. Malnutrition causes children to start life at a mentally sub optimal levels. Lack of education, especially amongst women disadvantages children as far as healthy practices like breast feeding and child's healthy foods are concerned.¹⁰ Research conducted among children in urban areas in Ghana revealed poor economic, cultural, and environmental conditions as the main causes of malnutrition.¹¹ This underscores an urgent need to invest resources and ensure continued efforts to eliminate malnutrition in Ghana.¹² In this regard, eggs contain a cheaper source of protein compared with meat that can help reduce the level of malnutrition in the country, especially among children and young adults.

Unfortunately, the use of eggs for food has been associated with the misconception that egg consumption leads to some serious health associated problems experienced in society.^{11,13} According to Drouin-Chartier et al¹⁴ and Surani,¹⁵ food and health advisors in America relied on such misconception in the 1970s to restrict egg intake. A survey carried out in the Greater Accra region of Ghana indicated that there were serious misconceptions about consumption of eggs within the region.¹² The survey revealed that the perception among the population was that the intake of eggs causes high plasma cholesterol levels and perceived to give rise to high incidence of cardiovascular diseases such as stroke, diabetes, and arteriosclerosis.

Eggs are rich in cholesterol (391 mg per 100 g in a raw egg) which occur in 2 forms—the dietary and blood cholesterol.^{4,5} These types of cholesterol are carried by High Density Lipoprotein (HDL) and Low Density Lipoprotein (LDL). It is, however, notable that the HDL found in eggs have been scientifically proven to be the good type whereas the LDL mostly in diets have been found to be the bad type. A study by Shin et al¹⁶ suggested that high levels of LDL cholesterol may impact atherosclerosis development. Nevertheless, Kim and Campbell¹⁷ and Rehault-Godbert et al¹⁸ stressed the significance of the nutritional value of eggs, indicating that 2 eggs per day could not produce the levels of LDL that will lead to the development of atherosclerosis and other conditions in consumers. Besides, eggs are a nutrient-dense food and contrary to popular opinion, are not high in saturated fatty acid (SFA) or in energy.⁵ However, the total fat and SFA content is not high and the fat in eggs is predominantly unsaturated (44% monounsaturated; 11% polyunsaturated). An egg is also relatively low in energy (896 kJ/214 kcal per 100 g; approximately 335 kJ/80 kcal in a medium-sized egg) compared with meat and is a valuable source of many essential micronutrients.⁵

Egg consumption differs widely among countries, with per capita consumption being high among the developed countries. The misconception of these facts have led to limited egg consumption in many countries particularly, in Ghana. The problem of misunderstanding or misconception about eating eggs among Ghanaians is a long-standing one. Due to this problem, comparatively the per capita consumption for Ghana is low and reported as 12 eggs per year,¹⁹ a rate which is more than 10 times smaller than the world average. It is indeed an urgent problem in Ghana that people do not eat enough eggs for healthy wellbeing because of seeming misunderstanding or misconception of eggs being predisposing factor for ill health. Nonetheless, trends analysis show that global egg consumption is on the increase in over 100 countries. Reports reveal that egg consumption is on the rise at a rate ranging from 2% increase in Benin and Nigeria to 346% in Myanmar.²⁰ This might be due to the increasing education on the benefits of egg consumption in the maintenance of good health. According to FAO,²¹ consistent education dispels the negative perceptions about egg consumption. Subsequently, individuals take advantage of the nutritional benefits of eating eggs and consume more when available.

The previous research by Ayim-Akonor and Akonor¹² concluded that gaps exist between scientific knowledge and consumer perception of egg intake. This pervasive thought, which lacks ample scientific evidence, affects consumption among different age groups. As part of a national program to ascertain this notion with scientific data from the various regions of Ghana, Ayim-Akonor and Akonor initially surveyed the Greater Accra region and reported their findings.¹² Similarly, to expand coverage, this work carried out the Volta regional survey on consumers' perception of eggs and their consumptions. The main research question of this study was whether or not there exist misconceptions or misunderstanding about egg intake that emanates from the notion that egg intake affects human health by way of predisposing people to cardiovascular diseases in the Volta Region of Ghana. This study, therefore, investigated the extent to which misconceptions, misunderstandings or myths surrounding egg consumption are entrenched among people of Ghana with evidence from the Volta region.

The study contributes to knowledge and could as well aid in policy formulation regarding misconceptions or misunderstandings about egg consumption. The findings of this study is also crucial as far as strategies and policies to curb the malnutrition that plague many children and young adults are concerned.²²⁻²⁴ The present research will establish and propose effective ways to encourage the consumption of eggs in order to help reduce the level of malnutrition, especially in Ghana. Moreover, this study extends an existing work by Ayim-Akonor and Akonor,¹² who focused on a similar survey that covered the Greater Accra Region. The present work, however, covered the Volta Region, as part of a national survey program.

Materials and Methods

Study area

The study was conducted in the Volta region of Ghana. Specifically, 5 districts in the Volta region were selected for this survey, namely, Keta, Ho, Krachi East, Nkwanta South and North Tongu. In order to sample views of respondents that are geographically representative, the 5 districts were selected from northern, central and southern parts of the Volta Region. The Volta region has a population of 2 118 252 according to 2010 population and housing census (PHC).²⁵ The region covers the eastern part of the country and shares boundary with Togo. The region is located between latitude 5°45'N and 8°45'N along the southern half of the eastern borders of Ghana with 8 major ethnic groups that speak different languages. The Coastal savannah zone, which includes the Volta region, is a narrow belt paralleling the coast with annual

rainfall ranging from 600 to 1200 mm per year.²⁶ There are 2 distinct rainy seasons in the zone—May-June (major rains) and August-September (minor rains). The major vegetation types are classified as southern marginal forest from Accra Westward, southern outlier forest in the Accra plains and savannah in the Ho plains.²⁷ The major occupations in the region are farming, fishing, and trading.

Sample size, data sources, and collection

According to the 2010 PHC, the population of Ghana and Volta region were estimated to be 24 658 825 and 2 118 252 respectively. The total population of Ghana was subjected to a software called Raosoft program with a 99% confidence level and a 1% marginal error, and the sample size for the entire country was generated as 643. Following this, the sample size for the study was generated as follows:

$$\begin{aligned} \text{Sample size for the study} &= \frac{\text{Population of Region}}{\text{Total national population}} \times 100\% \\ &= \frac{2118252}{24658823} \times 100\% = 8.6\% \\ &= \frac{8.6}{100} \times 643 = 55 \end{aligned}$$

Therefore, a sample of 55 respondents was selected for the study. In order to obtain the 55 respondents from the 5 selected regions and also ensure that they are representative of the selected districts, the total population of the 5 selected districts

was used as the common denominator. The total population of the 5 districts according to the 2010 PHC is 648 908.^{19,20} The required sample size of respondents from each of the 5 selected districts was determined as follows:

$$\text{Sample size from each district} = \frac{\text{Population of District}}{\text{Total Population of 5 Districts}} \times 55$$

Following this, the number of respondents from Keta, Ho Municipal, Krachi East, Nkwanta South and North Tongu were 12, 15, 10, 10, and 8, respectively.

Questionnaires description, organization, and conduct of field research

A 2-stage sampling technique was employed for the data collection and the collected primary data was used for the analysis. At the first stage, 5 districts (Keta, Ho, Krachi East, Nkwanta South, and North Tongu) were selected. These districts were selected from the northern, middle, and southern parts in order to get a good representation of the whole region. These districts have substantial urban and rural dwelling population sizes. The second stage involved random selection of respondents from each district. Open Data Kit (ODK) set of tools was used for the entire data collection process. A well designed and pretested questionnaire with both open ended and close-ended

questions were administered to the respondents. The pretest (which was done in another district other than the 5 selected ones) was done to ensure that relevant variables were included in the questionnaire, while irrelevant ones were discarded. It was also to ensure that the questions to be answered are devoid of any ambiguity. Besides, in order to get rid of bias sample, trap questions were considered and incorporated in the questionnaire to prevent invalid answers. The questionnaire had various sections capturing demographic and socioeconomic characteristics of the respondents. The questionnaire also captured information on egg consumption by the respondents. Both self and assisted approaches to questionnaire administration were employed. In this regard, respondents who could read, understand and write were given the questionnaire to fill themselves. Those who could not read, understand and write in English language (the language used in designing the questionnaire) were interviewed and their responses were used to fill the questionnaire accordingly. These approaches were used

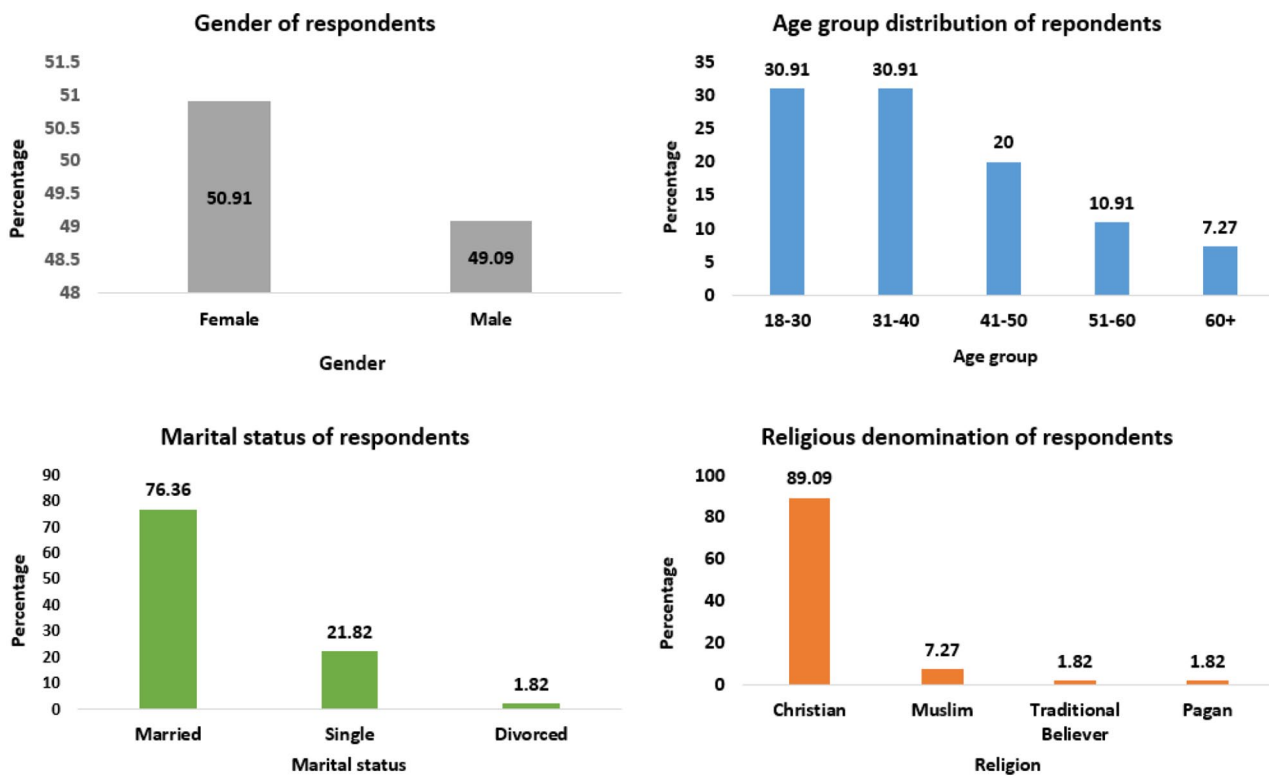


Figure 1. Some demographic characteristics of respondents.

in order not to ignore respondents who could not read, understand and write in English language.

Data processing and analysis

The study used primary data for analysis. Data were analyzed using descriptive statistics: frequency tables, pie charts, and bar charts. Chi square analysis was used to identify cross tabulation of key variables related to egg consumption as well as measurement of the degree of agreement among the respondents.^{12,28}

Survey Results and Discussion

Demographic and socio-economic characteristics of the respondents

Gender, age, marital status, and religious affiliation distribution of respondents. The gender, age, marital status, and religious affiliation distribution of the respondents is shown in Figure 1.

It was revealed that female respondents were 28 and males were 27 representing 50.91% and 49.09% respectively. The sampling was gender fair and balanced with almost equal representation. This further implied that the views of both males and females were equally considered in this study. The results also revealed that majority (61.82%) of respondents at the time of conducting the survey were between 18 and 40 years. The next age group was those between 41 and 50 (20%). Respondents between 51 and 60 years constituted 10.91%. Those who are 60 years and above were 7.27%. With respect to the marital

status of respondents, the survey revealed that 76.36% are married, 21.82% are single and 1.82% are divorcees. Regarding the religious affiliation of the respondents, majority (89.09%) are Christians. Altogether, the other religious denominations Muslims, Pagans and Traditionalists comprised 10.91%. The average household size in each of the sampled districts was also estimated and it was revealed that the average household size for North Tongu was 8. Same was estimated for Krachi East. Ho Municipality and Nkwanta South had the same average household size of 6. The least average household size recorded was 4 and it was for Keta district.

Education, dwelling location, employment status, and average income distribution of respondents. The distribution in terms of education, rural and urban dwelling, employment status, and monthly income is presented in Figure 2.

In Figure 2, it is revealed that greater proportion (87.27%) had some level of formal education (Basic, Senior High School [SHS], and Tertiary). Respondents who had SHS education were 25.45% and 12.73% had no level of formal education (None). Most of the respondents were predominantly rural dwelling and this constituted about 74.55% while 25.45% were urban dwellers. The employment status of respondents showed that majority (61.82%) were self-employed. Public and private sector employees 20%. Unemployed respondents constituted 8.18%. With regard to monthly income, it was shown that the average monthly income ranged between less than GhC500 and a maximum of GhC2000. Specifically, it



Figure 2. Level of education, rural or urban dwelling distribution, employment status, and the average income of respondents.

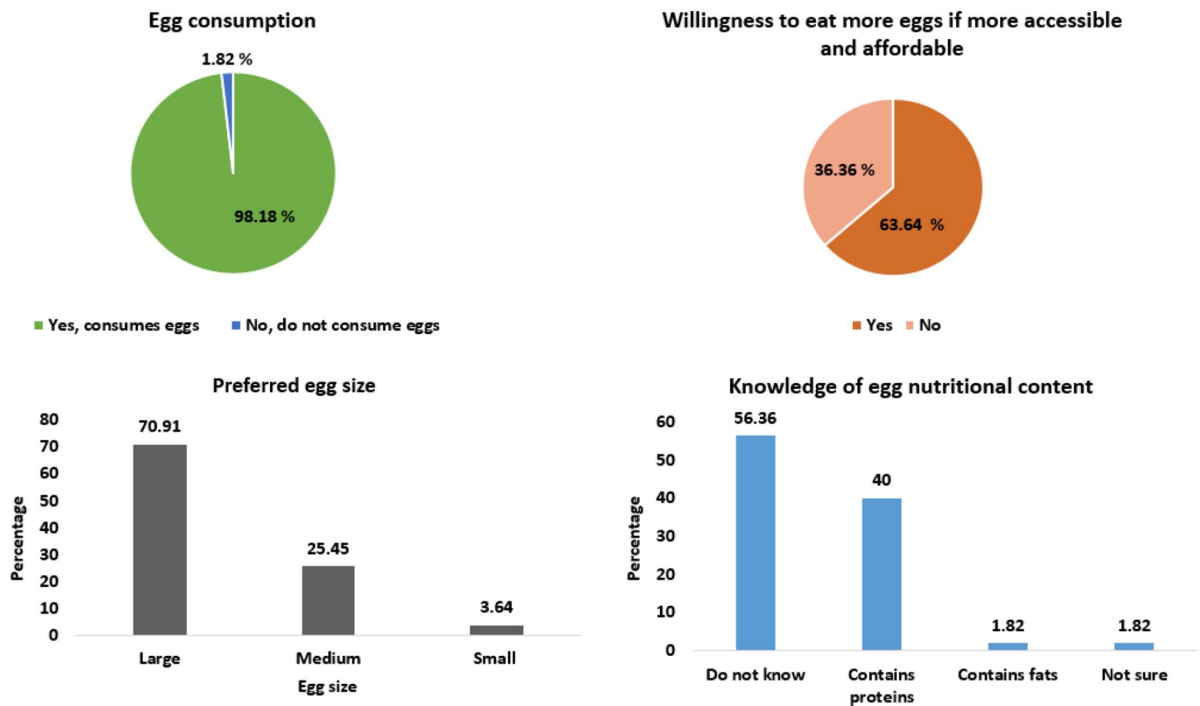


Figure 3. Some factors that influence the consumption of eggs by respondents.

was revealed that majority (63.64%) of the respondents earned average income of less than GhC500. It was shown that 5.45% of the respondents earned between GhC1000 and GhC2000 while 30.91% earned between GhC500 and GhC1000. Generally, it can be concluded that, most of the respondents were low income earners. It was revealed that individuals in the higher income class could afford eggs and other different kinds of proteins such as meat, milk, and fish. This is an

indication that income level of consumers play significant role when it comes to purchasing decision.

Some factors that influence the consumption of eggs by respondents

The factors that influence consumption of eggs by the respondents is presented in Figure 3.

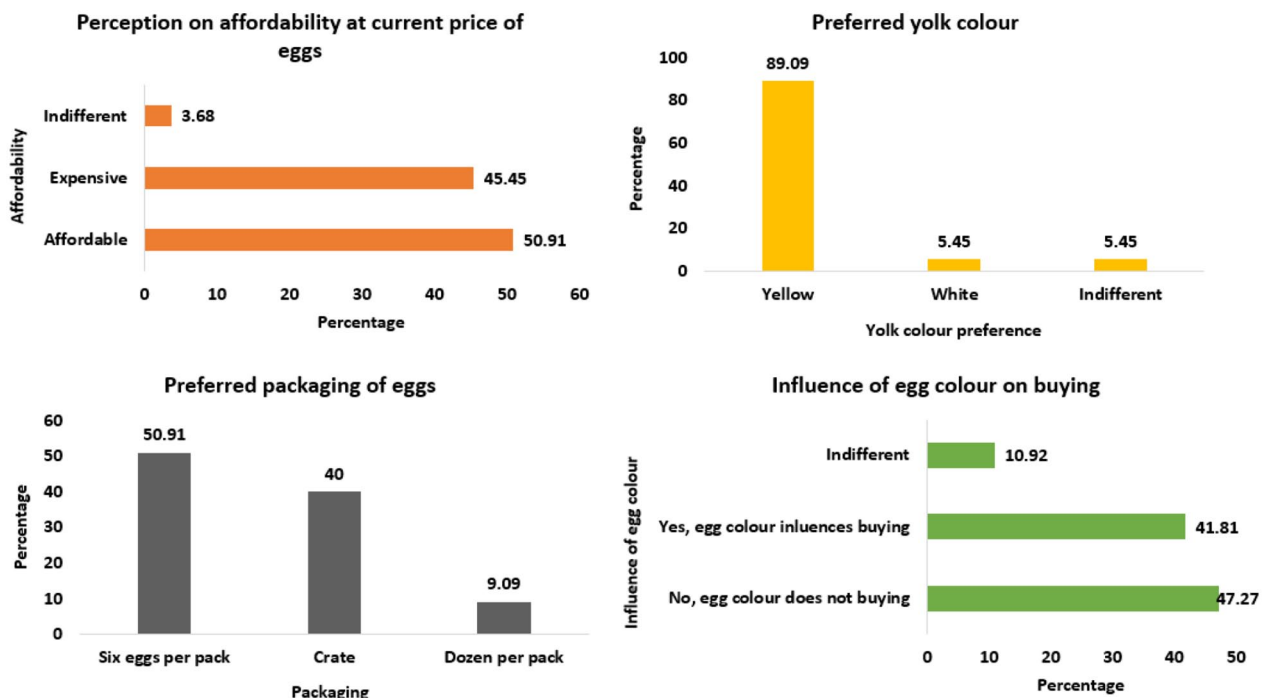


Figure 4. Some factors considered by egg consumers.

From Figure 3, it is observed that virtually all the respondents surveyed consumed eggs. Out of the 55 respondents interviewed, 54 of them (98.18%) take eggs for food. Only one respondent did not consume egg within 3 months prior to the study. Among the egg consumers, it was revealed that most ate an egg only 2 or 3 days in a week. The implication is that, although most of the population in the Volta Region consume eggs, the amount of eggs consumed is very low in the study area. This is because they consume only 1 or 2 eggs in just about 2 or 3 days in a week instead of daily consumption of 2 eggs per day and thus, the quantity of eggs used turns out to be low. Through the interviews, about a third of the respondents were of the perception that eating too much eggs could lead to some ill health implications. This opinion accounts for the low rate of egg consumption. This fear that if too much eggs are eaten, it could pose health risks is, however, unfounded because studies have shown that consuming 2 eggs per day for 6 weeks causes no health related diseases.^{29,30}

Out of the 54 egg consumers, majority (63.64%) of them were willing to consume more eggs if available and affordable. Similar responses have been obtained in past studies.^{12,13,15} This means that egg consumption could be increased if there is access and also affordable. On the contrary, about 36.36% of them will not consume more eggs if available. The reason for this response could be that these respondents hold perception of the ill health conditions associated with more egg consumption. Generally, larger egg sizes are preferred by consumers to medium and small size eggs. A high percentage of respondents (70.91%) preferred larger egg sizes, followed by medium size eggs (25.45%). Only 3.64% of the respondents will choose small size eggs. It can be inferred that most of the respondents

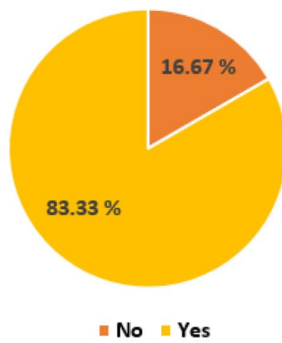
preferred bigger egg sizes which could be attributed the price they pay for the eggs (value for money ideology). In a similar study conducted in Malaysia, large egg size ranked top as the most preferred compared with other attributes such as color and size of packaging.³¹ The preference for large eggs and attributed reasons in the study carried out by Ahmed et al³¹ and Ayim-Akonor and Akonor¹² conform to the findings of the present study.

It was also revealed that most of the respondents did not have knowledge of the nutritional content of eggs. From the responses, more than half of the respondents, 31 (56.36%) were not aware of the nutritional content of eggs. However, a good proportion of 40% (22 respondents) were able to mention protein as the main nutritional content of egg. Most consumers consider egg to be a good source of protein, an observation that is similar to findings by Applegate,³² de Groot et al¹¹ and Ayim-Akonor and Akonor¹² who reported that most consumers consider egg as a top source of protein. Further investigation revealed that 40% of respondent were not aware that there are other nutrients such as calcium, iron sodium, manganese, Vitamins A, D, E, and K in eggs. The knowledge of fat as a component of eggs was extremely low as only 1 (1.82%) respondent indicated in affirmative to such knowledge.

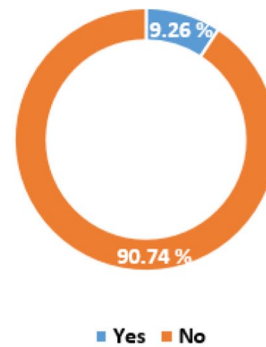
Preferred egg characteristics by egg consumers

The preferred egg characteristics by consumers is shown in Figure 4. Most (50.91%) of the respondents were of the opinion that egg is affordable and a cheap source of protein. However, 45.45% indicated that the prevailing selling price of eggs was expensive. About 3.68% of the respondents were indifferent to

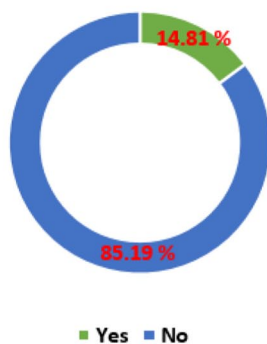
Is egg consumption good for health?



Ever been cautioned medically not to eat eggs?



Awareness of myths associated with egg consumption



Awareness of the existence of low and high quality cooking oils

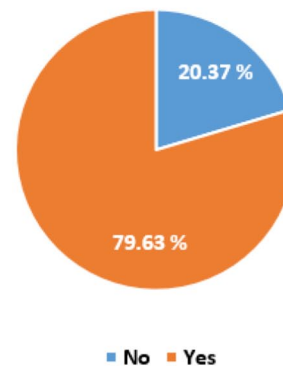


Figure 5. Opinions and experiences that influence patronage of eggs.

the price of eggs. With as high as 45.45% unable to afford eggs, high prices could be one of the very important factors accounting for the low consumption rates. The most preferred yolk color yellow for eggs was chosen by 89.09% of the respondents. Only 5.45% of the respondents chose white as their preferred yolk color with 5.45% also remaining indifferent to both colors. The consumers preferred yellow yolk color because they perceived it to be more tasteful, nutritious, and attractive than others. Though the color of egg yolk does not reflect its nutrient value in any significant way, most of the consumers associated yellow colored yolks with more nutrients. Richer-colored egg yolks are more likely to come from free-range hens.

In a similar study by Senbeta et al²⁸ on the perception of egg consumption in Ethiopia, it was found that majority of respondents preferred yellow yolk to white yolk. Likewise, the perceived richer nutritional content of yellow yolks was the reason for the choice. With respect to the preference for egg packages (package of 6 eggs, a crate and dozen), most (50.91%) of the respondents preferred a package of 6 eggs. Respondents who preferred egg crates made up 40%, while only 9.09% preferred a package of dozen eggs. This finding is contrary to what Ahmed et al³¹ found. The study of Ahmed et al³¹ revealed that both 10 per pack and 30 per pack were the most preferred followed by the 6 per pack.

Respondents' opinions and experiences that influence patronage of eggs

Furthermore, how respondents' opinions and experiences influence eggs patronage were elicited and the responses are reported in Figure 5.

Based on the respondents who indicated "yes" to egg consumption, majority of them (83.33%) were of the conviction that eggs are good, nutritious and can be substituted for meat. The rest of the respondents however responded otherwise. Such opinions against egg consumption emanate from the misconceptions about egg consumption being a predisposing factor for serious health worries in society.¹³⁻¹⁵ Some respondents (9.26%) are also careful of egg intake because they had been cautioned by health workers to restrict or cease egg intake. Such medical advice could be due to some health problems. The results further showed that majority (85.19%) of the respondent are unaware of misconceptions or myths associated with egg consumption. A small proportion of respondents were aware of the myths or misconceptions surrounding eggs intake.

Majority of the respondents (79.63%) indicated knowledge of low and high quality oils. Awareness informed their choice of the type of oils they used for preparing egg-based foods and other foods. The remaining respondents were unaware or have no knowledge of low and high quality oils. The type of oil used

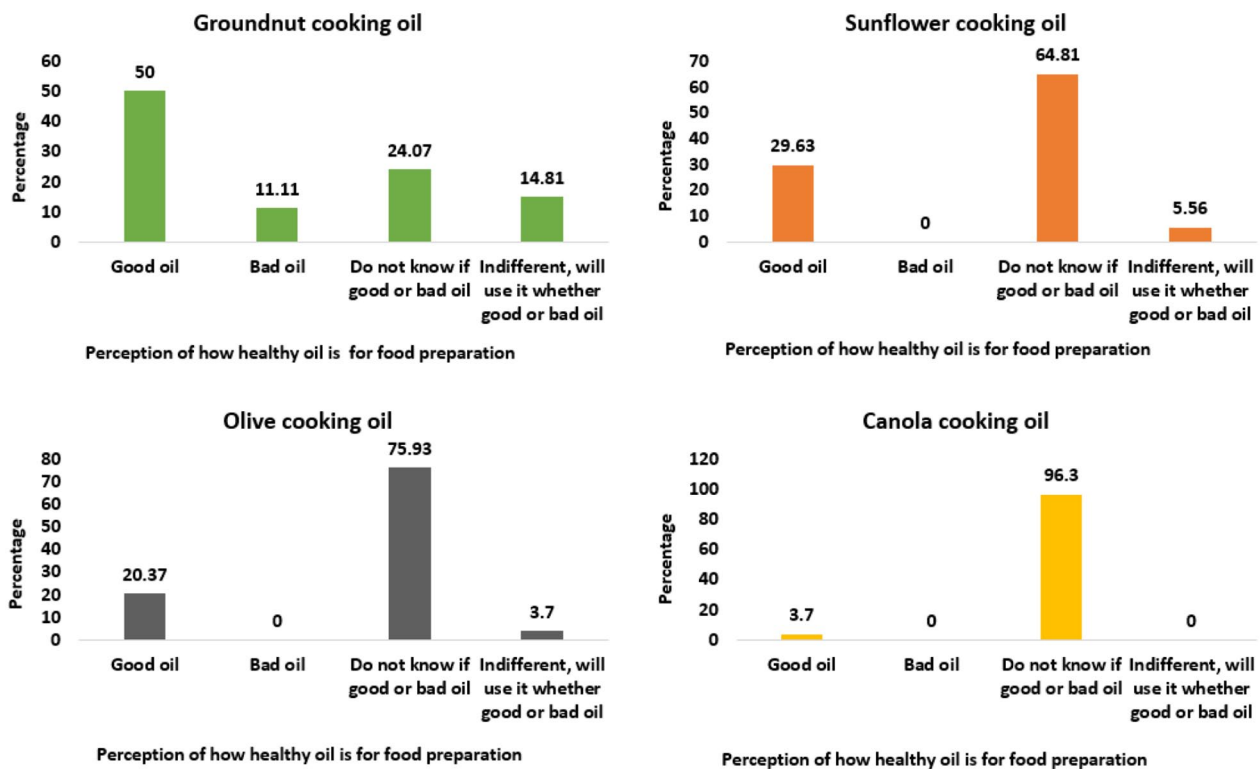


Figure 6. Respondents' perception of how healthy it is to use groundnut, sunflower, olive and canola oils for frying eggs or preparation of egg-based foods.

when preparing egg has become very significant. This is because it has been established that the cholesterol found in eggs is the same as the type of cholesterol the human body naturally produces for its metabolic activities. Therefore, the negative perceptions associated with egg consumption with regard to ill health issues may be attributed to the type of oils used in preparing egg-based foods as documented.³³ Such ill health implications like cardiovascular diseases are more likely to be due to life styles such as smoking, excessive alcohol intake, or not eating on time. Cardiovascular diseases, therefore, may not necessarily be the result of eating eggs or excess of it.^{29,30} Due to the associated cholesterol content of the oils used in the preparation of eggs, boiled eggs were more prevalent among the consumers.

Oils used for frying eggs or preparation of egg-based foods

The survey results (see Figure 6) showed that 50% of the respondents used groundnut oil on regular basis and confirmed it to be good. Groundnut oil is generally used by the respondents because of its popularity among the people in the area. It was revealed further that 11.11% of the respondents were of the opinion that groundnut oil is bad while 38.81% do not know whether the use of groundnut oil for food preparation is good or not (given by "I do not know" and "Indifferent" responses in Figure 6). Majority (64.81%) of the respondents did not use sunflower oil for cooking. However, 29.63% indicated ever using sunflower oil and were of the impression that

it is good. The proportion of respondents who were indifferent regarding the type of oil they used in cooking, could not tell whether or not they have ever used sunflower oil. From Figure 6, 75.93% of the respondents have not used olive oil for cooking. However, 20.37% of the respondents have ever used olive oil and were of the view that it is good as cooking oil. It can be deduced that canola oil is not known among the sampled population. It was revealed that 96.3% of the respondents have never used canola oil. Only 2 (3.7%) of the respondents indicated knowledge of canola oil being good for cooking.

Cross tabulations of key variables in relation to egg consumption

Age group and tendency to consume eggs by consumers. The link between the various age groups and tendency to consume eggs or not by consumers is reported in Table 1. It was revealed that the connection between them was not significant (probability $>.05$). This means that eggs consumption is not restricted to any age group—all age groups consumed eggs. However, people who are quite advance in age (for instance, 50 years and beyond) tend to take less number of eggs. This is because of the perception of eggs containing cholesterol which could predispose older people to cardiovascular related health risks. Besides, older people are usually of the perception that they have reached their peak of growth and that extra intake of protein is wasteful. It is, therefore, more beneficial feeding these proteins to children and young adults who mostly need it.

Table 1. Age group and tendency to consume eggs by consumers.

AGE GROUP (Y)	EGG CONSUMPTION	
	NO	YES (%)
18-30	0	16 (100)
31-40	0	17 (100)
41-50	0	11 (100)
51-60	1 (16.7%)	5 (83.3)
61 and above	0	4 (100)

$\chi^2=8.151$; degree of freedom=4; probability=.86 (insignificant).

Table 2. Educational level and preference of yolk color of egg.

EDUCATIONAL LEVEL	PREFERRED YOLK COLOR		
	INDIFFERENT (%)	WHITE (%)	YELLOW (%)
Basic	2(7.7)	1 (3.8)	23 (88.5)
None	0	0	7 (100)
SHS	0	1 (7.7)	12 (92.3)
Tertiary	1(12.5)	1 (12.5)	6 (75.0)

$\chi^2=3.635$; degree of freedom=6; $P=.726$ (insignificant).

Influence of educational level on preference for yolk color. The link between educational level and preference for yolk color of egg is reported in Table 2.

Educational level does not influence preference for yolk color of eggs. The preference for yolk color was found to be similar for all respondents regardless of educational backgrounds. Most respondents irrespective of educational background preferred yellow yolk color to the white. This preference was based on esthetic considerations. Culturally, yellow yolk color is predominantly consumed. Many people, therefore, per their upbringing, associate the yellow color to more nutritive value compared with the white yolk eggs. By comparison, the nutritional content of the yellow and white yolk are the same. The yellow yolk is more associated with the locally raised birds where due to the free range, these birds pick green leaves, yellow corn, and alfalfa among others that contain essential xanthophyll pigments or vitamins which confer the coloration on the yolk. In addition, under the free range system, the hen mates with the cock to produce fertile eggs whereas birds raised commercially in intensive systems produce mainly table eggs that are not fertile. It is also notable that some color differences could be due to genetic control.

Egg intake and influence on meat consumption

The association between egg intake and meat consumption is reported in Table 3. It was observed that the link was insignificant (probability >.05). Meat consumption among egg and

Table 3. Consumption of eggs and influence on consumption of meat.

EGG CONSUMPTION	MEAT CONSUMPTION	
	NO (%)	YES (%)
No	0	1 (100)
Yes	6 (11.3)	47 (88.7)

$\chi^2=0.127$; degree of freedom=1; probability=.721 (insignificant).

Table 4. Meat consumption and awareness of cholesterol types.

MEAT CONSUMPTION	AWARENESS ON TYPE OF CHOLESTEROL		
	YES (%)	NO (%)	INDIFFERENT (%)
No	5 (10.4)	17 (35.4)	26 (54.2)
Yes	1 16.7)	3 (50)	2 (33.3)

$\chi^2=0.940$; degree of freedom=2; probability=.625 (insignificant).

non-egg consumers did not vary significantly. By implication, egg consumers showed similar tendency to consume meat as did non-egg consumers. Egg consumers appear to make use of other protein sources as well, so long as they are available, accessible, and cheaper.

Meat consumption and awareness of cholesterol types. The link between meat consumption and awareness of cholesterol types is reported in Table 4.

Meat consumption and awareness of types of cholesterol was not significant (probability >.05). The awareness level of the types of cholesterol present in eggs or meat was the same for both meat and non-meat consumers. Thus, whether a respondent consumed meat or not, did not influence or affect his or her knowledge on the types of cholesterol in eggs or meat. Some respondents linked egg intake to coronary heart disease risk. Generally, the survey revealed that knowledge on cholesterol and hypercholesterolemia was limited. A concerted educational campaign is important to alert people about such health condition. An egg is made up of approximately 200 to 300mg of cholesterol. Past studies have rebutted the opinion that this level of cholesterol was detrimental.^{29,34} A study by Ahmed et al³¹ observed no adverse consequence on human endothelial functions with even the consumption of 2 eggs daily. It is also established that taking 1 egg daily does not increase serum cholesterol and presents no risk of cardiovascular disease in healthy people.³⁵

Influence of educational level on awareness of cholesterol types and misconceptions associated with egg consumption. The link between educational level and awareness on cholesterol types was also analyzed and the result is reported in Table 5.

It was shown that the connection is significant (probability <.05). That is, knowledge on types of cholesterol was different among people with different educational background. It can be

Table 5. Education level and awareness on cholesterol types.

EDUCATIONAL LEVEL	AWARENESS ON TYPE OF CHOLESTEROL		
	INDIFFERENT (%)	NO (%)	YES (%)
Basic	16 (61.5)	9 (34.6)	1 (3.8)
None	7 (100)	0	0
SHS	4 (30.8)	7 (53.8)	2 (15.4)
Tertiary	1 (12.5)	4 (50)	3 (37.5)

$\chi^2=18.33$ degree of freedom=6; probability=.005 (significant).

Table 6. Educational level and awareness of misconceptions associated with egg consumption.

EDUCATIONAL LEVEL	AWARENESS OF MISCONCEPTIONS ABOUT EGGS	
	NO (%)	YES (%)
None	25 (96.2)	1 (3.8)
Basic	7 (100)	0
SHS	9 (69.2)	4 (30.8)
Tertiary	5 (62.5)	3 (37.5)

$\chi^2=9.580$; degree of freedom=3; probability=.022 (significant).

said that the level of education in the sampled area is very high that made it possible for some of the respondents to know the types of cholesterol that exist. However, the uneducated respondents lacked complete knowledge on the existence of cholesterol or its classification into good or bad types. This class of uneducated respondents, and the educated who lack knowledge on good cholesterol or eggs containing predominantly good cholesterol can easily fall victim to the misconceptions surrounding eggs consumption. These groups of respondents are more likely to avoid egg intake due to the inaccurate information on the associated health risks of eggs consumption. On other hand, those who are aware of good and bad cholesterol and know that the cholesterol found in eggs are the good type, are more likely to make informed decisions on eggs intake and even increase consumption if available, accessible and cheaper.

The link between education level and the tendency of hearing misconceptions associated egg was also inquired and the result is reported in Table 6.

The results showed that the connection was significant. Most of the respondents were not aware of any misconceptions associated with eggs consumption. The minority of respondents who indicated they had heard of the misconceptions on egg intake, got that information from home and grew up with them irrespective of their educational background; some heard it through print and electronic media. Basically, the main misconception among this group is the issue of the cholesterol content of eggs.

Table 7. Average monthly income and tendency to consume egg.

AVERAGE MONTHLY INCOME	EGG CONSUMPTION	
	NO (%)	YES (%)
GHC1000-GHC2000	0	3 (100)
GHC500-GHC1000	0	17 (100)
Below GHC500	1 (2.9%)	33 (97.1)

$\chi^2=0.599$; degree of freedom=2; probability=.741 (insignificant).

Average monthly income, tendency to consume eggs, and increasing intake if cheaper. Furthermore, the connection between average monthly income and the tendency to consume egg is reported in Table 7.

It became evident that the connection between the average monthly income and egg consumption was insignificant (probability >.05). This means that egg consumption behavior did not vary within the various income brackets. Respondents, in the lower income brackets consumed similar quantity of eggs as those in higher income brackets. However, people in higher income brackets are able to afford other protein sources such as meat in addition to eggs. The tendency to use additional protein sources among higher income earners due to affordability, has the likelihood of exposing this class to meat related health problems. Among the lower income class and poor households, eggs are cheaper proteins compared to the different meat proteins. These people are more likely to experience safer and healthier life style because they will escape from the risks associated with meat intake. It was found that the relationship between average monthly income and impression of egg price is not significant. That is, the impression of egg price is the same across people in the various income brackets. Thus, whether the price of egg was cheap, affordable or expensive was not a function of the average monthly income of the respondents.

Age groups and awareness of egg consumption associated myths

The relationship between age and egg consumption associated myths was also investigated and the result is reported in Table 8. It was revealed that the relationship was not significant (probability >.05). This means that the level of awareness of the myths or misconceptions about eggs intake is the same across all age groups. Therefore, whether a respondent had heard about an egg myths or not, was not influenced in anyway by the age group.

Conclusions

There are some negative perceptions such that cholesterol in egg is seen as the major cause of cardiovascular diseases, such as stroke, and diabetes in Ghana, and particularly in the study area. Sources of misconceptions about egg include the media,

Table 8. Age group and awareness of egg consumption associated myths.

AGE GROUP (Y)	AWARENESS OF MYTHS ABOUT EGGS	
	NO (%)	YES (%)
18-30	12 (75%)	4 (25%)
31-40	16 (94.1%)	1 (5.9%)
41-50	9 (81.8%)	2 (18.2%)
51-60	5 (83.3%)	1 (16.7%)
Above 60	4 (100%)	0

$\chi^2 = 3.201$; degree of freedom = 4; $P = .525$ (insignificant).

relatives, health and food advisers and printed information in the form of flyers, and posters. Some respondents in the study areas still believe that egg consumption leads to health associated problem. Nonetheless, the consumers are willing to eat egg because they are aware of the health benefits. A key socio-economic characteristic that significantly influence egg consumption, awareness of the available types of cholesterol and the awareness of the misconceptions associated with egg consumption was educational level. About 36.04% of the sampled population believed that egg consumption causes health problems. Based on this finding, there is the need for educational campaign through the electronic and print media on the benefits of egg consumption. These campaigns should be in both English and local dialects to ensure that the populace becomes aware of the benefits of eating enough eggs. It is suggested that further studies or research should be extended to different parts of the country in order to obtain a national outlook. Furthermore, laboratory studies should be conducted to determine the level of cholesterol the liver produces in order to enable recommendation to be made on the quantity of eggs that is healthy for wellbeing. This will go a long way to improve the acute malnutrition among children and young adults in the country.³²

Author Contributions

All the authors have contributed equally to this manuscript in terms of idea conception, designing of questionnaire, data collection, coding of questionnaires, data analysis, drafting, editing and proofreading of the manuscript.

Ethical Consideration

Before the commencement of this study, the aim of the study was explained to the respondents and they were assured of the utmost confidentiality regarding the responses that will be provided. The respondents were also informed that they had the right to refuse at any point in time during the filling of questionnaire. The respondents were further assured that their identity or any information that is likely to reveal their identity will not be captured in the analysis. Moreover, in the data

analysis, no information on the respondents which had the potential of revealing their identity was reported in the study.

Availability of Data and Material

The data that support the findings of this study are available from the corresponding author upon request.

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