Ibadan Journal Of Agricultural Research(IJAR)

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A publication of the Faculties of Agriculture and Renewable Natural Resources, University of Ibadan, Ibadan Nigeria

Acceptability of Egg Powder among Nursing Mothers in Rural Areas of Ijebu North Local Government Area of Ogun State, Nigeria

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Abstract

Eggs are among the most nutritious foods, cheapest source of protein, vitamins and minerals. However, fresh egg is fragile and its quality deteriorates easily. Egg powder adds consistent performance to the list of attributes of the commodity hence the need to evaluate the acceptability of egg powder among nursing mothers as a source of protein. The study was carried out in rural areas of Ijebu North Local Government Area of Ogun State. Random sampling technique was used to select 120 respondents across five maternity health centres. Interview schedule was used to collect data. Data were analysed using both descriptive and inferential statistics at $\alpha_{0.05}$. Findings revealed that 62.5% of the respondents had low level of awareness about egg powder, more than half (55.8%) had unfavourable disposition towards egg powder, resulting in 60.0% of them having low acceptability for its use. Non-availability of egg powder (50.8%) and lack of information on egg powder (50.0%) were major constraints to egg powder consumption in the study area. Significant relationship existed between respondents' income ($\chi^2 = 0.184$), level of education ($\chi^2 = 0.233$), awareness ($r = 0.229$), perception of egg powder ($r = 0.246$) and the level of acceptability of egg powder. There was a low level of egg powder acceptability in the study area. Hence, there is a need to create awareness on the nutritive value of egg powder in the study area.

Keywords: Acceptability, Baby food, Egg powder, Nursing-mothers.

Introduction

Hunger and malnutrition are among the most devastating problems facing the majority of the poor and needy in resource-poor countries of the world (WHO, 2000; FAO, 2005). This problem is mostly felt by a large proportion of people in the rural areas whose inhabitants constitute over 70% of the Nigerian population and forms over 85% of the extremely poor in the country (Chukwuji *et al.*, 2006). Although efforts have been made by successive governments at tackling this problem, not much has been achieved as many families cannot make up to the recommended level of energy and protein requirements (Inyang *et al.,* 2014). In line with this assertion, a review of the data of food supplies available for consumption in different countries showed that the per capita protein intake in developing countries, Nigeria inclusive, is comparatively low (FAO, 1990; Awosanmi, 1999; Evbuomwan, 2005; Doublegist, 2013). Both the total protein supply and the quality of dietary protein available has been found to be

inferior to that consumed in developed countries (Brawn, 2005). Most of the foods consumed in Nigeria are carbohydrates which are obtained mainly in the form of starch (Oloyede, 2005).

Proteins are essential as, they constitute building blocks of human life which are essential for normal growth. Protein is 90% of the dry weight of blood, 80% constituent of enzymes, hormones and antibodies (Marchuk, 1992; Blake, 2005; MCES, 2017). Proteins encompass many important chemicals including immunoglobulin and enzymes. They also form the foundation of muscles, skin, bone, hair, heart, teeth, blood, brain and billions of biochemical activities. According to Robert *et al.* (2000), pregnant and lactating females need the highest quantities of protein due to the physiological state of their body. Similarly, WHO (2007) stated that lactating women require an average of 19 g protein/day. However, it has been observed that most rural dwellers in Africa feed more on staple grains such as maize, millet, rice etc. with low nutritional supplements. These staples do not provide adequate protein or micro nutrients such as vitamins and iron (Morna, 1993; Robert *et al.,* 2000). Thus, dependence on these staples or sometimes a lack of the staples could pose adverse effects on the health of nursing mothers.

Animal protein has been found to be rich in amino acids and is, therefore, described as first class or good quality protein (WHO, 2007). This has informedreasons for the acceptability of animal protein. Poultry egg is the cheapest source of animal protein and being a perfect food, it contains a little of almost every nutrient needed by humans. Whole eggs are among the most nutritious foods on the planet with 77 calories, 6 g of protein and 5 g of healthy fats (Varinder, 2015). It is rich in vitamins like A, B, D, E and minerals that can sometimes be difficult to obtain from other foods.

The major problem associated with poultry egg is glut, resulting from high rate of production particularly during the dry season. There is scarcity of the product during the early rainy season (Oguntunji *et al.,* 2015) which is consequent to the fact that it has a short shelf life and its fragility makes the product prone to cracks during transportation. In order to prevent these problems and to make eggs available all year round, processing of fresh eggs to powder became an option for increasing the shelf life of the product.

Powdered egg provides a convenient alternative to fresh eggs. The advantages of powdered eggs over fresh eggs are enormous ranging from reduced weight per volume of whole egg equivalent; longer shelf life, it can be stored up to a year or longer under proper storage conditions; needs less storage space; needs no refrigeration; reduces the risk of bacterial contamination due to improper handling (Honeyville, 2013). Egg powder further reduces the cost associated with fresh eggs. It can be incorporated into the diet of different age groups, especially nursing mothers (WHO, 2000). In addition, egg powder can have a significant effect on the nutrition of families with low income. It will make eggs available, accessible, and cheaper.

The awareness of nursing mothers as well as their dispositions towards egg powder and its uses could reflect in the nutritional value and quality of food they prepare for their family members, especially their children after weaning.

Awareness of sources of nutritious food can guard against malnutrition and reduce child mortality. Despite all the potentials accruable from the use of egg powder, little or no studies have been carried out on its acceptability. Hence, this study was set to determine the acceptability of egg powder among nursing mothers in rural areas of Ijebu North Local Government. The specific objectives were to (i) assess nursing mothers' level of awareness of egg powder, (ii) determine the perception of nursing mothers on egg powder, (iii) identify the constraints to the use of egg powder by nursing mothers and (iv) ascertain the level of acceptability of egg powder among nursing mothers.

Materials and Methods

The study was carried out in Ijebu North Local Government Area of Ogun state due to the presence of the egg powder company in that area. The area is located between latitudes 6^{o} 52' and 7^{o} 10'N and longitudes 3^{o} 45' and 4^{o} 12'E with a population of 284,386 (National Population Census, 2006). The population of the study comprised of nursing mothers in Ijebu North Local Government Area of Ogun State.

Five primary health centers out of twenty-four were randomly selected from the Local Government Area. The population of nursing mothers in each of the selected health centres was 120, 122, 121, 118 and 118. Random sampling was also used to select 20% of nursing mothers (24 nursing mothers) from each of the population to make a total of 120 respondents. Respondents' awareness of egg powder was measured on two- point - scale of aware and not aware and scores of 1 and 0 assigned, respectively. Constraints were measured on a three point scale of major constraint, mild constraint and not a constraint with scores of 2, 1 and 0 assigned respectively. Likert-scale of Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree with scores of 5, 4, 3, 2 and 1 assigned respectively for positive statements and vice versa for negative statements were used to measure perception on egg powder.

Acceptability of egg powder was measured on three point's scale of acceptable, partially acceptable and not acceptable with scores of 2, 1 and 0 assigned respectively. Mean was computed and used to categorizeawareness into high and low, perception into favourable and unfavourable and acceptability into high and low. Data were analysed using descriptive (frequencies, percentages and mean) and inferential (Chi square and Pearson product moment correlation) statistics at $\alpha_{0.05}$.

Results

Personal characteristics of respondents

The study revealed that the modal age range was between 25-32 years; accounting for 45.0% of the respondents (Table 1). A larger proportion (92.5%) of the nursing mothers had one form of education or the other with 49.2% having secondary education, while 15.8% attained tertiary education. Majority of the respondents were married (77.5%), with family sizes ranging from less than 5-12 people, while respondents with 4-6 people had highest percentage (65.0%). Table 1 also shows that morethan half (56.7%) of the respondents engaged in farming, while 26.7% and 15.0% were traders and artisans, respectively. Most of the respondents (78.3%) earned between N20,000 - N50,000 per month while 14.2% earned more than N50,000.

Table 1: Distribution of respondents by personal characteristics (N = 120)

Variables	Freq.	%
Age (years)		
17-24	5	4.2
25 – 32	54	45.0
33-40	49	40.8
41-48	12	10.0
Mean ±SD	29.3±6.8	
Marital status		
Married	93	77.5
Divorced	10	8.3
Widow	17	14.2
Household size		
1-3	15	12.5
4-6	78	65.0
7-9	22	18.3
10-12	5	4.2
Mean ±SD	5.85 ± 2.10	
Level of education		
No formal education	9	7.5
Primary education	33	27.5
Secondary education	59	49.2
Tertiary education	19	15.8
Occupation		
Farming	68	56.7
Civil Servant	2	1.6
Trader	32	26.7
Artisan	18	15.0
Income		
< 20,000naira	9	7.5
20,000-50.000naira	94	78.3
>50,000naira	17	14.2

Freq. = frequency; SD= Standard Deviatio

Table 2a shows that most of the nursing mothers (64.2%) were aware that turning fresh egg to powdered egg makes it last longer. Similarly, 41.7% of the respondents were aware that processing fresh eggs into powdered form ensures its availability all year round, which is consequent on the reduced moisture content of the product. Majority of the respondents (86.7%) indicated that they were not aware that fresh egg could be processed into egg powder; similarly a high percent (71.7%) indicated that they were not aware that powdered egg is cheaper than fresh egg. Table 2b shows the categorical distribution of nursing mothers on their level of awareness on egg powder. Most of the nursing mothers (62.5%) had low awareness on egg powder, while 37.5% had high level of awareness.

Perception of egg powder

Table 3a shows that majority of the respondents agreed that egg powder is likely to be a good initiative ($\bar{x}$ = 4.53). Similarly, they agreed that packaging of egg powder in smaller form like powdered milk might make everybody benefit from it ($\bar{x}$ = 4.43) and that egg powder most likely can be used in the preparation of baby food ($\bar{x}$= 4.30). Also, respondents agreed that egg powder will likely improve the nutritional value of food consumed by people ($\bar{x}$= 4.23) and that egg powder is more durable than fresh egg ($\bar{x}$= 4.15). They disagreed that adding small amount of egg powder into ones food intake may not supply the same nutrients one will get from fresh egg ($\bar{x}$ = 2.58). Also, that egg powder may not have the same nutrient content with fresh egg ($\bar{x}$= 2.47) and that egg powder may not be economical ($\bar{x}$= 2.97). On the overall, Table 3b shows that 55.8% of nursing mothers in the study area had unfavourable perception towards egg powder, while 44.2% had favourable perception towards egg powder

Table 2a: Respondents' awareness of egg powder

Awareness	**Yes**		**No**	
	Freq	%	Freq	%
Are you aware that fresh egg can be turned to powder?	16	13.3	104	86.7
Are you aware that processing of fresh egg to powdered form make it available all year round?	50	41.7	70	58.3
Are you aware that powdered egg is cheaper than fresh egg?	34	28.3	86	71.7
Are you aware that turning of egg to powdered form makes it last longer?	77	64.2	43	35.8
Are you aware that powdered egg can be used just like fresh egg?	52	43.3	68	56.7
Are you aware that no additive is added to egg powder?	19	15.8	101	84.2

Freq= Frequency

Table 2b: Distribution of respondents by level of awareness on egg powder

	Frequency	**%**
Low (1-2.2)	75	62.5
High (2.3-5.0)	45	37.5
Total	120	100
Mean ± SD	2.30± 1.03	

SD= Standard Deviation

Constraints to consumption of egg powder

Non-availability of egg powder (50.8%) lack of information on egg powder (50.0%) and lack of access to egg powder (46.7%) were the major constraints to egg powder acceptability (Table 4).

Table 3a: Perception of Respondents towards Egg Powder

Statement	SA	A	U	D	SD	Mean
Egg powder may reduce protein deficiency	55.8	26.7	3.3	0.8	13.3	4.11
Packaging of egg powder in smaller form like powdered milk may make everybody benefit from it	63.3	25	6.7	1.7	3.3	4.43
Egg powder will likely improve the nutritional value of food consumed by people	50	31.7	10	8.3		4.23
Egg powder may not be economical	22.5	9.2	22.5	40.8	5.0	2.97
Egg powder most likely can be used in preparation of baby food	70.8	12.5	1.7	5.8	9.2	4.30
Egg powder may be a good initiative	64.2	27.5	5	3.3	0	4.53
Egg powder may be used in preparing our local soup and dishes	14.2	12.5	10.0	26.7	36.7	2.41
Adding a small amount of egg powder into ones food intake may not supply the same nutrients one will get from fresh egg	23.3	33.3	14.2	20.0	9.2	2.58
Egg powder most likely may be more durable than fresh egg	54.2	24.2	5.0	15.8	0.8	4.15
Egg powder may not have the same nutrient content with fresh egg	30	35	7.5	12.5	15	2.48

SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strong Disagree

Table 3b: Distribution of respondents by level of perception of egg powder

Scores	**Frequency**	**%**
Unfavourable (27-35)	67	55.8
Favourable (36-45)	53	44.2
Total	120	100.0
Mean ±SD	36.0±4.4	

SD= Standard deviation

Table 4: Distribution based on constraints to consumption of egg powder

Variables	Not a Constraint		Minor		Major		Rank
	Freq.	%	Freq	%	Freq.	%	
Low income	50	41.7	18	15.0	52	43.3	5th
Inaccessibility	19	15.8	45	37.5	56	46.7	3rd
High cost of egg powder	33	27.5	32	26.7	55	45.8	4th
Unavailability of egg powder	15	12.5	44	36.7	61	50.8	1st
Lack of knowledge on the benefit and uses of egg powder	52	43.3	23	19.2	45	37.5	6th
Unacceptability of egg powder by my religion	120	100.0	0		0		7th
Lack of information on egg powder	33	27.5	27	22.5	60	50.0	2nd

Table 5a: Distribution of respondents based on acceptability of egg powder

Uses	Not acceptable		Partially acceptable		Acceptable	
	Freq.	%	Freq.	%	Freq.	%
Baking	21	17.5	18	15.0	81	67.5
Soup preparation	65	54.2	40	33.3	15	12.5
Dish/meal preparation	36	30.0	59	49.2	25	20.8
Preparing baby meal	19	15.8	15	12.5	86	71.7
Making moin-moin	29	24.2	47	39.2	44	36.7
Making akara	29	24.2	50	41.7	41	34.2
Diets	43	35.8	47	39.2	30	25.0

Acceptability of egg powder

Table 5a shows respondents' acceptability of egg powder based on its incorporation in preparation of household meals. The highest acceptability of the product was in preparation of baby meal (71.7%) and in baking (67.5%). However, 54.2% of the respondents found it acceptable in soup preparation. On the level of acceptability of egg powder, Table 5b shows that 60.0% of the respondents recorded a low level of acceptability of egg powder, while 40.0% recorded a high level of acceptability.

Table 5b: Distribution of respondents by level of acceptability of egg powder

Scores	**Freq.**	**%**
Low (1-7.6)	72	60.0
High (7.7-12)	48	40.0
Total	60	100
Mean ± SD	7.7± 3.4	

Relationship between respondents' personal characteristics and acceptability of egg powder

Chi-square results reveal that there was a significant relationship between respondents' income (χ^2 = 0.184, p≤ 0.05), level of education (χ^2 = 0.233, p≤ 0.05), age (χ^2 = 0.128, p≤ 0.05) and acceptability of egg powder (Table 6).

Relationship between respondents' awareness, perception and acceptability of egg powder

Table 7 shows that there was a significant relationship between respondents' awareness and acceptability of egg powder (r = 0.229, p≤ 0.05). Table 7 also shows that a significant relationship existed between respondents' perception of egg powder and the level of acceptability of egg powder (r = 0.246, p≤ 0.05).

Table 6: Relationship between respondents' socio-economic characteristics and acceptability of egg powder

Variable	χ^2	Df	p-value
Marital status	0.064	3	0.921
Income	0.184	3	0.023
Level of education	0.233	3	0.006
Age	0.128	3	0.034
Household size	0.131	3	0.550

χ^2= Chi-square value, Df= degree of freedom, p= level of significance

Table 7: Relationship between respondents' awareness, perception and acceptability of egg powder

Variable	**r**	**P-value**
Awareness	0.229	0.012
Perception	0.246	0.007

r= direction of relationship

Discussion

The results on nursing mothers' level of education show possession of one form of education or the other which implies that they will have access to information and know the importance of protein in diets. In addition, being married with moderate household size among the majority of respondents follows that they have the responsibility of catering for the feeding of family members. Findings on respondents occupation is in line with Olayemi (2002) that agriculture is the predominant occupation and principal livelihood activity in rural areas of Nigeria. Fabiyi and Akande (2015) also noted that most rural women are involved in agricultural activities. Findings on respondents' income imply that they engage in one activity or the other (farming, trading, civil servant) that earn them money. Thus, they will have the ability to purchase egg powder for their family.

The respondents were aware that egg powder is a food product with reduced or no moisture and that turning fresh eggs into powder form will improve its preservation. This finding was corroborated by Jay (2000) who reported that the low moisture content in powdered egg helps to extend its shelf life. This is made possible from the fact that the product becomes relatively less vulnerable to microbial and enzymatic spoilage because microbes require moisture for their growth and activity (Guardiola *et al.*, 1995). The reduced spoilage is an advantage of egg powder over fresh eggs. On the other hand, low awareness of majority of respondents that fresh eggs can be processed into powder form might be responsible for its low utilization in the study area. The low level of awareness among respondents could be linked to low level of popularity associated with the product, which may be due to a poor understanding of its economic and nutritional benefits. It could also be linked to poor access to information and or unavailability of egg powder in the study area.

The greater percentage of respondents who had unfavourable disposition towards egg powder may stem from the low level of awareness about the product, coupled with the constraints identified with it. Unfavourable disposition to an innovation is a natural characteristic of human beings and more importantly rural people due to their conservativeness (Rogers, 2003). That is not to say that all the respondents will have favourable disposition even if they are all aware due to individual differences and adopter categories that plague adoption of any innovation.

The constraints (non-availability of egg powder, lack of information on egg

powder and lack of access to egg powder) faced by respondents could further affect the acceptability of egg powder in the study area. Unavailability of egg powder compared to fresh eggs in the respondents' community will likely affect its acceptability. Also, in a situation that egg powder is available but not accessible by respondents due to factors such as distance, market structures and buyers' characteristics could further discourage respondents from accepting egg powder for utilization/consumption.

Many studies have established significant but inverse relationship between constraints and acceptability/adoption of innovation. For example Kuanyi (2013) reported a negative relationship between constraints and adoption of fish farming technologies.Also, a negative but significant relationship was also found between unstable market prices and the adoption of agricultural innovations among women farmers (Ayoade and Akintonde, 2012). Thus, the more the constraints, the less the acceptability of an innovation.

The acceptability variable indicates that the respondents, who were nursing mothers that visited the maternity centres where lectures on child nutrition among other things were given, are expected to know the nutritional benefits of egg powder which could have contributed to the high acceptability of the product in preparing baby meals.

The low level of acceptability offers an indication of the level of use of the product as a result of its unpopularity/visibility in the study area. This is explainable from the point that they would not fully accept what they have not been using or do not know. In line with this, Cerjak *et al.* (2011) observed that currently, consumers are seriously concerned about food safety resulting in increased demand for quality assurance and information about the methods and the nature of food production and product origin.Chi-square analysis shows that income, level of education and age have significant influence on the acceptability of egg powder. Low income farmers may be willing to purchase egg powder but might be limited by the purchasing power (income) while high income earners can accept egg powder without previous knowledge of its usefulness as income is a major factor in adoption of innovation (Kariyasa and Dewi, 2011, Akudugu *et al*., 2012;, Diiro, 2013). In the same vein, lack of knowledge on the nutritional benefits and utilization of egg powder can limit its acceptability while young people who are innovative can give egg powder some trial and if convinced may lead to acceptability of egg powder.

Conclusion and Recommendation

Most of the nursing mothers in the Ijebu Local Government Area had low level of awareness about egg powder. This gave rise to unfavourable perception and low acceptability of egg powder among nursing mothers in rural areas. In addition, non-availability of egg powder, lack of access to egg powder and lack of information on egg powder were major constraints militating against the acceptability of egg powder in the study area.

With this result, more effort is needed to enlighten people in the rural area on egg powder. Hence, policy makers should consider appropriate training programs for nursing mothers to gain more knowledge and improve their disposition towards egg powder. This could potentially increase the

acceptance of egg powder among nursing mothers in the future.

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