

Review Report



Effects of Financial Status on Nutrigenomics and Personalized Diet

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Abstract: The study investigated Meta-analysis on the effects of financial status on nutrigenomics and personalized diet in Nigeria. The study was guided by four research questions and three null hypotheses tested at 0.05 level of significance. The designs for this study were systematic review and meta-analytic. The study has infinite population. However, 53 studies on the effects of financial status on nutrigenomics and personalized diet in Nigeria were identified. Out of the 53 studies identified, only 31 studies which met the requirements for meta-analysis were used as the sample. The sampling techniques were purposive and snowballing. A pro-forma was used for data collection. The instrument was validated by experts and the internal consistency reliability value of 0.97 was obtained using inter-rater agreement. Data collected with the instrument were analyzed with effect size, average weighted mean Z, Winer combined test and Fisher statistical transformation tables. The findings of the study revealed: moderate effect size on lower and upper financial status on nutrigenomics and personalized diet, small effect size on upper financial status on nutrigenomics and personalized diet, large effect size on lower financial status on nutrigenomics and personalized diet and variation on effect sizes of lower and upper financial status on nutrigenomics and personalized diet and significant effect sizes on upper, lower and consequently on lower and upper financial status on nutrigenomics and personalized diet 464 at Z-critical value of 1.96 at the 0.05 level of significance.

Keywords: Nutrigenomics, Nutrigenetics, Personalized Diet, Meta-Analysis, Financial Effects

1. Introduction

Human health constantly requires improvement for the enhancement of constant living in live scenarios. According to Collins et al. (1999), the human genome effort offers life science a roadmap that outlines the objectives of fundamental research as well as chances to apply that research to enhance human health. As a branch of genomics, nutrigenomics actively investigates the genetic underpinnings of food response and, concurrently, the genotype-assignable differences in dietary responsiveness in people. The establishment of a more individualized approach to diet and health is the logical translation of nutrigenomics, both in theory and in practice, much like pharmacogenomics sees its logical translation personalized medicine. However, the purpose of nutrition goes well beyond only treating illnesses with curative measures. As the foundation of a person's entire environment, diet has a significant impact on health in a variety of ways, including performance, enjoyment, and general quality of life in addition to disease prevention. Once research has linked nutrition to many aspects of health, foods will be the carriers of this value. Comprehending the interplay between nutrition and genetics in the diverse ways that a genome is expressed and responds to food is essential to comprehending human health.

It is well known that different people react differently to the same food consumption. For instance, it has been established during the previous 20 years that dietary cholesterol can alter plasma cholesterol levels, however this varies from person to person (Boqué, et al., 2013; Glatz et al., 1991; Kesäniemi & Miettinen, 1987). It has really been demonstrated that genotype influences some variation in the response to dietary cholesterol (Ordovas et al., 2018). Establishing these fundamental links and using them to improve everyone's health at every age, with the clear objective of actively preventing disease, will be nutrition's greatest opportunity and greatest challenge. However, nutrigenomics can only offer a portion of the solution when it comes to customizing nutrition. A person's phenotype, health, and the likelihood and course of various disease states are all strongly influenced by other nongenetic factors. Comprehending the postgenomic and posttranscriptional processes ranging from individual cells to the behavior of the entire body will contribute to the scientific basis for customizing nutrition and wellness. Foods must be the primary providers and value creators of this systems approach to individualized diet and health once diet and health are established. Based on this, so many researchers have investigated the needs to improve the human diets in concomitant with their financial status.

All these investigations and researches have come up with divergent findings without any generalized conclusion on how individuals with differential financial status will go about their diets to derive the appropriation nutrition for healthy living. These discrepancies in human nutritional diets are conspicuous in the studies and findings of Ordovas et al. (2018), Kesäniemi and Miettinen (1987) and Glatz et al. (1991) among others, that nutritional dietary based on financial status influences cholesterol (positively or negatively) in humans' health that nutritional dietary improves humans' healthy living (positively), irrespective of financial status. This means that the effect sizes of these divergent findings have resulted into a chaos and conflicting state. Hence, there is need to harmonize these disorderliness on financial nutritional dietary effects from different research findings based on financial status into a general conclusion.

Harmonizing these findings to a general conclusion requires the application/adoption of a statistical tool called meta-analysis. Meta-analysis helps to examine broad varieties of questions where large amount of primary studies exist. Meta-analysis is used to analyze the quantified results from the individual studies. Meta-analysis is a statistical technique that is used to amalgamate,

summarize and review previous quantitative research (Busham & Wells, 2001). When the data from the primary studies are collected, the data are entered into data bases which result to meta-data for meta-analysis and inferentially to test certain already existing hypotheses from the primary studies. In this study, all the primary studies on effects of nutrigenomics and personalized diet based on financial status were explored as secondary data for meta-analysis.

1.1. Statement of Problem

Man from origin has been inquisitive in research of how to improve life and standard of living. One of these research include nutritional diets which have long been recognized as a factor in the rising incidence of non-communicable diseases in a population, such as diabetes, obesity, heart disease, and cancer. These illnesses frequently have a significant role in both morbidity and death (Cena & Calder, 2020). Consequently, many researches have been done to positively modify the consequences of the negative effects of nutritional diets to curb these non-communicable diseases. Because modifiable lifestyle-related factors, such as nutritional diet and nutrient intakes based on financial status have induced significant role in the etiology and progression of diseases, current population and individual based approaches aim to prevent and manage risks in populations or individuals (Verma et al., 2018). These lifestyle uncertainties of nutritional diets based on financial status have resulted to various research findings with lambasting individualized decision(s) that is confusion. These decisions are based on the presumption that a nutritional dietary guideline that applies to everyone with different financial status will have a similar or dissimilar effects on each individual and, hence, on the population. But this method is believed to conveniently overlook the increasingly documented inter-individual differences in food response and financial status (Bush et al., 2020). These controversies on nutritional and dietary intakes based on financial status have amid by various degrees of findings that have led to various degrees of conclusions from different researchers. As a result, the need to synthesize, summarize and aggregate these degrees of findings that have led to disordered conclusions into a generalized conclusion, universally acceptable by the adoption and application of meta-analysis. Hence, the study focused on meta-analysis of the effects of financial status on nutrigenomics and personalized diet.

1.2. Purpose of the Study

The study investigated the meta-analysis of financial status on nutrigenomics and personalized diet in Nigeria. Specifically, the study investigated:

- (a) The mean effect size for each of all the studies on nutrigenomics and personalized diet in Nigeria
- (b) The mean effect size for the studies on upper financial status on nutrigenomics and personalized diet in Nigeria
- (c) The mean effect size for the studies on lower financial status on nutrigenomics and personalized diet in Nigeria
- (d) The variation of mean effect size between the upper and lower financial status on nutrigenomics and personalized diet in Nigeria

1.3. Research Questions

The following research questions guided the study

- (a) What is the mean effect size for each of all the studies on nutrigenomics and personalized diet in Nigeria?

- (b) What is the mean effect size for the studies on upper financial status on nutrigenomics and personalized diet in Nigeria?
- (c) What is the mean effect size for the studies on lower financial status on nutrigenomics and personalized diet in Nigeria?
- (d) What is the variation of effect size between the upper and lower financial status on nutrigenomics and personalized diet in Nigeria?

1.4. Research Questions

The following null hypotheses were formulated and tested at the 0.05 level of significance

- (a) The mean effect size for each of all the studies on nutrigenomics and personalized diet in Nigeria is not significant.
- (b) The mean effect size for the studies on upper financial status on nutrigenomics and personalized diet in Nigeria is not significant.
- (c) The mean effect size for the studies on lower financial status on nutrigenomics and personalized diet in Nigeria is not significant.

1.5. Theoretical Framework

Chaos Theory was propounded by Loren (1960). The tenet of the theory is that situations or findings are bound to be confusing or diverse randomly without a verifiable conclusion. By all conventional ideas of the time, this study is therefore very significant to Edward's Chaos Theory, since it provided the variations in findings (previous studies) and accumulates the findings as data on the results of nutritional and personalized diets based on individual financial statuses. The successful integration of these findings with meta-analysis provided a clear summary of what is attainable in nutritional and personalized diets based on individual financial statuses.

2. Materials and Methods

The researchers adopted systematic review and meta-analytic designs in this study. The researchers examined the empirically accessible studies on the effects of financial status on nutrigenomics and personalized diet in Nigeria. However, 53 studies on the effect of financial status on nutrigenomics and personalized diet in Nigeria were identified but 31 studies which met the requirements for meta-analysis was used as the sample. The researchers adopted two types of non-probability sampling techniques namely: purposive and snowball to collect secondary data using a pro-forma instrument developed by the researchers and validated by experts. The internal consistency reliability of the instrument was computed by inter-rater and 0.97 as obtained. The data collected were analyzed with the application of statistical tools like: effect size, average weighted mean Z, Winer combined test and statistical transformations. Research questions one to three were analyzed with average weighted Z, Fisher statistical transformation, effect size using Cohen's interpretation while Winer combined test was used to test the null hypotheses one to three, at the 0.05 level of significance. These effect sizes determined the strength of effect of the independent variable (financial status) on the dependent variable (nutrigenomics and personalized diet) using Cohen's (1992) guideline for effect size interpretation. That is, effect size $d < 0.2$ implies small effect on the dependent variable, $0.2 \leq d \leq 0.49$ implies moderate effect on the dependent variable, $d \geq 0.5$ implies

high effect on the dependent variable and any effect size $d \geq 0.2$ implies a significant effect.

3. Results and Discussion

3.1. Research Question 1: What is the mean effect size for each of all the studies on the effect of financial status on nutrigenomics and personalized diet in Nigeria?

Table 1: Mean Effect Size of all the Studies Investigated on Financial Status Nutrigenomics and Personalized Diet

Number of Studies	$\sum (N - 3)$	\sum Weighted Z	Average Zr	r-value average Zr	d-value of r	(%) Variance	Cohen Result
31	1172	407.171	0.116	0.112	0.237	33.600	Moderate

The results in Table 1 shows the computed mean Cohen's effect size value (d-value) for all the studies investigated (31 in number) on the effect of financial status on nutrigenomics and personalized diet in Nigeria. The results show that the Cohen's mean effect size of 0.237 indicates moderate mean effect size in the positive direction. The table also shows the percentage variance of the effect of financial status on nutrigenomics and personalized diet in Nigeria to be 33.600%, which implies that, 33.600% amount of financial status, is apportion to the nutrigenomics and personalized diet in Nigeria.

3.2. Research Question 2: What is the mean effect size for the studies on upper financial status on nutrigenomics and personalized diet in Nigeria?

Table 2: Mean Effect Size of Studies on Upper Financial Status on Nutrigenomics and Personalized Diet

Number of Studies	$\sum (N - 3)$	\sum Weighted Z	Average Zr	r-value average Zr	d-value of r	(%) Variance	Cohen Result
11	473	180.975	0.043	0.043	0.088	39.000	Small

The results in Table 2 shows the calculated mean Cohen's effect size value (d-value) for all the studies investigated (11 in number) for upper financial status, on the effect of financial status on nutrigenomics and personalized diet in Nigeria. The results reveal that the Cohen's mean effect size of 0.088 shows small effect size in the positive direction. The table again shows the percentage variance of the effect of upper financial status on nutrigenomics and personalized diet in Nigeria to be 39.000%, which means that, 39.000% amount of upper financial status, is attributed to the nutrigenomics and personalized diet in Nigeria.

3.3. Research Question 3: What is the mean effect size for the studies on lower financial status on nutrigenomics and personalized diet in Nigeria?

Table 3: Mean Effect Size of Studies on Lower Financial Status on Lower Financial Status on Nutrigenomics and Personalized Diet

Number of Studies	$\sum (N - 3)$	$\sum Weighted Z$	Average Z_r	r-value average Z_r	d-value of r	(%) Variance	Cohen Result
20	699	226.196	0.341	0.199	0.596	50.467	Large

The results present in Table 3 shows the determined mean Cohen’s effect size value (d-value) for all the studies investigated (31 in number) for lower financial status on the effect of financial status on nutrigenomics and personalized diet in Nigeria. The results show that the Cohen’s mean effect size of 0.596 indicates large mean effect size in the positive direction. Additionally, the table also shows the percentage variance of the effect of financial status on nutrigenomics and personalized diet in Nigeria to be 50.467%, showing that, 50.467% amount of lower financial status, determines the nutrigenomics and personalized diet in Nigeria.

3.4. Research Question 4: What is the variation of effect size between the upper and lower financial status on nutrigenomics and personalized diet in Nigeria?

Table 4: Variation of Effect Size between the Upper and Lower Financial Status on Nutrigenomics and Personalized Diet

Financial Status	Number of Studies	$\sum (N - 3)$	$\sum Weighted Z$	Average Z_r	r-value average Z_r	d-value of r	Cohen’s Interpretation	(%) Variance	Variation (d)	(%) Variation
Upper	11	473	180.975	0.043	0.043	0.043	Small	39.00	0.553	11.467
Lower	20	699	226.196	0.341	0.199	0.596	Large	50.467		
Total	31	1172	407.171							

The Table 4 values of the variations of Cohen’s d effect size of 0.553 and 11.467% surmise that effect size variation from Cohen’s interpretation is large in the positive direction with lesser 11.467% amount of the financial status that is attributed to nutrigenomics and personalized diet in Nigeria. Hence, the variation of effect size of upper and lower financial status on nutrigenomics and personalized diet in Nigeria are slightly significant.

3.5. Hypothesis 1: The mean effect size for each of all the studies on financial status on nutrigenomics and personalized diet in Nigeria is not significant.

Table 5: Winer Combined Test for the Effect Size of the Studies Investigated on Nutrigenomics and Personalized Diet

Number of Studies	$\sum t$	$\sum df / (df - 2)$	Z-calculated	Z-critical	Interpretation
31	49.663	7.465	3.869	1.96	Significant

The results computed in Table 5 show the Winer combined test Z-calculated and Z-critical values of the overall effect size of all the studies on financial status on nutrigenomics and

personalized diet in Nigeria is significant. The results in the table reveal that the Z-calculated of 3.869 at the 0.05 level of significance of 1.96 Z-critical value indicates that the null hypothesis which states that the overall effect size of the studies investigated on financial status on nutrigenomics and personalized diet in Nigeria is not significant in all the studies is rejected ($Z\text{-calculated of } 3.869 > 1.96$ Z-critical value).

3.6. Hypothesis 2: The mean effect size for the studies on upper financial status on nutrigenomics and personalized diet in Nigeria is not significant.

Table 6: Winer Combined Test for the Effect Size of the Studies Investigated on Upper Financial Status on Nutrigenomics and Personalized Diet

Number of Studies	$\sum t$	$\sum df/(df - 2)$	Z-calculated	Z-critical	Interpretation
11	21.432	4.167	4.244	1.96	Significant

The results computed in Table 6 show the Winer combined test Z-calculated and Z-critical values of the overall effect size of all the studies on upper financial status on nutrigenomics and personalized diet in Nigeria is significant. The results in the table reveal that the Z-calculated of 4.244 at the 0.05 level of significance of 1.96 Z-critical value indicates that the null hypothesis which states that the overall effect size of the studies investigated on upper financial status on nutrigenomics and personalized diet in Nigeria is not significant is rejected ($Z\text{-calculated of } 4.244 > 1.96$ Z-critical value).

3.7. Hypothesis 3: The mean effect size for the studies on lower financial status on nutrigenomics and personalized diet in Nigeria is not significant

Table 7: Winer Combined Test for the Effect Size of the Studies Investigated on Lower Financial Status on Nutrigenomics and Personalized Diet

Total Number of Studies	$\sum t$	$\sum df/(df - 2)$	Z-calculated	Z-critical	Interpretation
20	39.263	7.976	5.668	1.96	Significant

The results in Table 7 show the Winer combined test Z-calculated and Z-critical values of the overall effect size of all the studies on lower financial status on nutrigenomics and personalized diet in Nigeria is significant. The results in the table reveal that the Z-calculated of 5.668 at the 0.05 level of significance of 1.96 Z-critical value indicates that the null hypothesis which states that the overall effect size of the studies investigated on lower financial status on nutrigenomics and personalized diet in Nigeria is not significant is rejected ($Z\text{-calculated of } 5.668 > 1.96$ Z-critical value).

This study have found that there are moderate effect size on both the upper and lower financial status, small effect size on upper financial status, large effect size on lower financial status, small variation on the effect size of upper and lower financial status and positive significant effects on both the upper and lower financial status on nutrigenomics and personalized diet in Nigeria. This may have resulted from the upper financial status being able to provide their personal nutrition and diet and the lower financial status have to make choices due to their available financial resources, thereby

causing disorderliness in their health functions. The largest cause of early deaths globally is nutrition disorders, which include obesity, diabetes, and cardiovascular disease. These conditions are primarily brought on by an improper diet and/or result from financial state which becomes a lifestyle (Elia, 2017). Population-level health maintenance requires adherence to dietary recommendations, including the suggested intake of particular nutrients (Cederholm et al., 2017). The one-size-fits-all method fails to take into account inter-individual variances based on financial. Consequently, the solution to this problem has been suggested: individualized nutrition that is tailored to each person's needs without a considerable state of finance. The availability and choice of food/nutritional diet are influenced socioeconomic factors-financial state which can lead to abnormal dosage and undesirable nutritional diets (Naureen et al, 2020).

Variations in how each person reacts to food and nutrients depends solely on how individual is financially disposed to diet that is best suited. This holds that people will be more motivated and equipped to make decisions and alter their eating habits if a suitable intervention is suggested after a review of their present behavior, preferences, and goals that tallies with their financial status (Khan et al., 2022). This would therefore translate into improved adherence to the guidelines. Thus, it stands to reason that personalization in these kinds of interventions would be more advantageous in reaching health objectives (Cederholm et al., 2017). Personalized nutrition can help address a wide variety of health issues, chronic conditions, and health goals among groups of people across various life stages and health conditions. This holistic approach respects diverse dietary traditions and personal tastes, ensuring that the recommended dietary plans are not just scientifically sound but also culturally sensitive and practically feasible for the individual. It relies on the premise that for any nutritional advice to be effective, it must be tailored to align with the individual's unique lifestyles that include financial preferences. Personalized nutrition interventions will certainly increase short-term costs, mainly because they require tests and additional. However, if the personalized nutrition intervention reduces relevant risk factors of diseases, it can reduce long-term healthcare costs by reducing the risk of diabetes and other obesity-related diseases. Moreover, if the risk of diabetes and other obesity-related diseases is reduced, an improvement in healthy life expectancy is expected. This is a win-win situation, since healthcare costs will go down while health will go up. While the initial cost of implementing personalized nutrition may be a consideration, the potential long-term cost savings could be significant. By preventing or better managing chronic diseases, healthcare systems may experience reduced hospitalizations, fewer complications, and lower overall healthcare costs.

4. Conclusion

The fast-moving fields of nutrigenetics have revealed how genetic variation accumulation affects individual responses to dietary consumption, as well as the levels of macro- and micronutrients. These variations are useful for creating tailored dietary treatments that will ensure the shift from general dietary guidelines to nutrition based on genotype. Nutritional studies based on genotypes have demonstrated the importance of SNPs in controlling the amounts of macro- and micronutrients, which

are essential for good health. More genetic variants must be included in personalized nutritional interventions to improve nutrient levels and health outcomes and lessen the financial burden of nutritional disorders on healthcare services, according to current evidence, even though more research is needed to properly integrate personalized nutrition into healthcare research and practice.

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Conflict of Interest

There is no conflict of interest among the authors.

Authors' Contributions

NME and DKI were responsible for the study's conceptualization, methodology, writing, data gathering, analysis, and revision.

Data Availability Statement

The datasets used in this investigation are accessible upon request. Further questions should be directed to the authors.

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