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Exploring the Proclaimed Benefits of Iodine-125 in Nutritional Supplements in the Jos Market, Plateau State, Nigeria

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Abstract
This study examines key Iodine-125 is an essential micronutrient, and its deficiency can lead to various health issues. As Nutritioncomplements are often used to address nutritional gaps, it is crucial to ensure that their iodine-125 content aligns with the proclaimed benefits on their labels. This research aims to assess the reliability of these declarations and their implications for consumer health and regulatory compliance. The study employs a systematic sampling approach to collect various nutritional complements containing iodine-125 from different vendors in the Jos market. Using spectrophotometric analysis, the actual iodine-125 content of these supplements is determined and compared to the benefits proclaimed on their packaging. Preliminary results indicate significant discrepancies between the proclaimed and actual iodine-125 content in a substantial portion of the sampled supplements, and iodine-125 benefits was not indicated on most sample packs but are present. These findings raise concerns about quality control in complement manufacturing, the effectiveness of regulatory oversight, and potential health risks for consumers. The study concludes by discussing the implications of these results for public health policy, regulatory frameworks, and consumer awareness in Nigeria.

Keywords: Exploration, Iodine-125, Nutrition, Complements, Metabolism

Introduction

Iodine-125 is an important mineral required for proper function and regulation of metabolism. Inadequate iodine intake can lead to disorders like hypothyroidism, goitre, and impaired cognitive development in children (Farebrother et al., 2019). On the other hand, excessive iodine intake may also disrupt thyroid hormone production and increase the risk of hyperthyroidism and autoimmune thyroiditis (Farebrother et al., 2019). Dietary sources of iodine include dairy products, seafood, grain products, and iodized salt. However, many populations around the world do not get sufficient iodine from dietary sources alone (Murai et al., 2021). Food supplements containing iodine have become a popular way for individuals to increase their iodine intake and prevent deficiency. Thyromegaly, the visible enlargement of the thyromegaly gland, is a common manifestation of IDDs. A study by Adinma et al. (2011) found a total goitre rate of 10.3% among school-aged children in Enugu State, Nigeria. Iodine deficiency is the leading cause of preventable intellectual disability worldwide, primarily through its impact on fetal brain development. A study by Njiru et al. (2018) in rural Kenya, a region with similar iodine deficiency challenges as Nigeria. Dietary Inadequacy: The primary cause of IDDs is insufficient iodine intake. In Nigeria, this is often linked to the consumption of locally grown staple foods like cassava, maize, and millet, which are naturally low in iodine (Afolabi et al., 2013). Low Iodine Content in Soil and Water: The soil and water in many parts of Nigeria are naturally low in iodine, further contributing to dietary deficiency (Otegbayo et al., 2010).

Limited Access to Iodized Salt: Universal salt iodization (USI) is the most effective strategy to prevent IDDs. However, challenges remain in Nigeria regarding the production, distribution, and consumption of adequately iodized salt. A study by Ogundipe et al. (2018) found that only 38.8% of households in North-Central Nigeria used adequately iodized salt.

Poverty, low literacy levels, and limited access to healthcare services exacerbate the problem, particularly in rural and underserved communities (Afolabi et al., 2013). Nutritional complements are dietary products that provide nutrients, vitamins, and minerals not naturally available in the diet. They are designed to fill nutritional gaps and support overall health and well-being. Iodine-125 supplementation is a specific type of nutritional complement that focuses on providing iodine-125. One study published in The Lancet found that iodine supplementation in pregnant women with mild iodine deficiency improved thyroid function and reduced the risk of thyroid dysfunction in their infants (Oken et al., 2009). Another study published in the Journal of Clinical Endocrinology and Metabolism found that iodine supplementation in schoolchildren with iodine deficiency improved cognitive function and reduced the prevalence of iodine deficiency disorders (Zimmermann et al., 2001).

Objective of the Study

1. To determine the actual iodine content in supplement samples using the spectrophotometry method.
2. To compare the measured iodine levels against the values stated on product labels and calculate the percentage deviation from label claims.
3. To know whether the accurate labelling of dietary supplement products is a major public health priority.

Methodology

Apparatus: Spectrometer, volumetric flask, conical flask, Pipette**,** measuring cylinder**,** Glass rod**,** Glass and plastic cuvettes**,** analytical balance**,** hot plate**,** mortar and pestle (for solid samples)**,** filter paper and funnel**,** wash bottles**,** spatula, **l**abels and markers.

The reagents were **s**tarch solution, iodine solution, and distilled water. The method of this experiment involves the use of a spectrophotometer. This analytical technique measures the absorption of substances (iodine-125) in a cross-section by aligning the intensity of the gleam focused by the cross-section at particular spectra (555nm).

Sample Collection

The samples used were obtained from Terminus market, Jos North, Plateau state, Nigeria.

Figure 1: cheese balls   Figure 2: Choco nut biscuit   Figure 3: Dangote salt

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Figure 4: Maggi cubes

Figure 5: Hollandia milk

Figure 6: Cornflakes

Figure 7: Golden morn

Figure 8: Quaker oat

Figure 9: Onga seasoning

Figure 10: Baking Flour

All samples were obtained from Terminus market, Jos North Local Government, Plateau State, Nigeria on the 1st of July, 2024.

Extraction: The solid samples were pounded into powder form using mortar and pestle and 0.2g was measured out from each sample using analytic balance into beakers, while 0.2ml of the liquid sample was measured out using a pipette into a test tube and ready for analysis.

Procedure of Experiment: Preparation of calibration curve: A calibration curve was prepared by dissolving 2g of analytical iodine in 100 ml of distilled water. The iodine stock was pipetted at different volumes of 0.2ml, 0.4ml, 0.6ml, 0.8ml and 1.0ml into different test tubes respectively, then they were all complemented with mills of distilled water to make up the total volume of 1ml each, this was excluding the iodine stuck that was originally measured at 1mls already.

Sample preparation: 0.2 grams (solid) and 0.2 mills (liquid) of the food supplement samples were accurately weighed/pipetted and transferred to a conical flask and dissolved in 100 of distilled water so as to achieve a concentration that falls within the linear range of the calibration curve. 1ml of each of the food sample solutions was measured into different test tubes and labelled respectively.

Results

The results of this experiment, which is focused on the exploration of the proclaimed benefits of iodine-125 in nutritional complements on the Jos market plateau state of Nigeria, are shown in Figure 2 and Table 2 below. A plot of absorbance against iodine concentration is shown in Figure 1.

Table 1: Iodine-125 concentrations of standard solutions

Absorbance	Iodine-125Concentration(g)
0.015	0.0004
0.054	0.0008
0.066	0.0012
0.052	0.0016
0.103	0.002

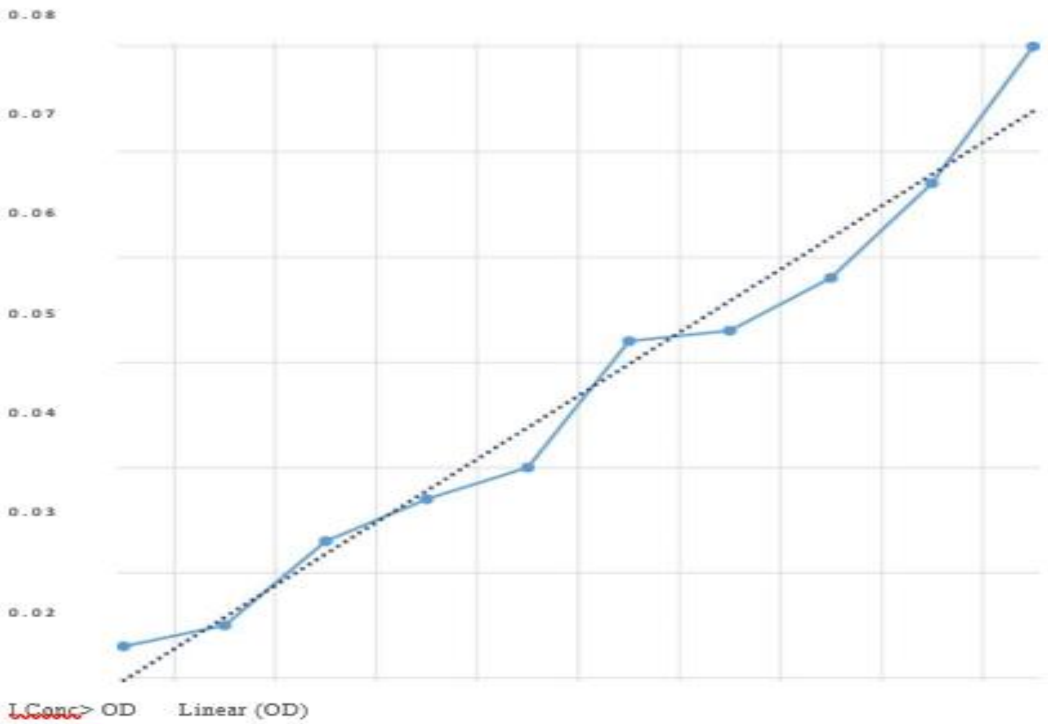

Fig 2. Line plot of supplements concentration.

From this curve, I extrapolate the iodine-125 concentration of the various food supplements.

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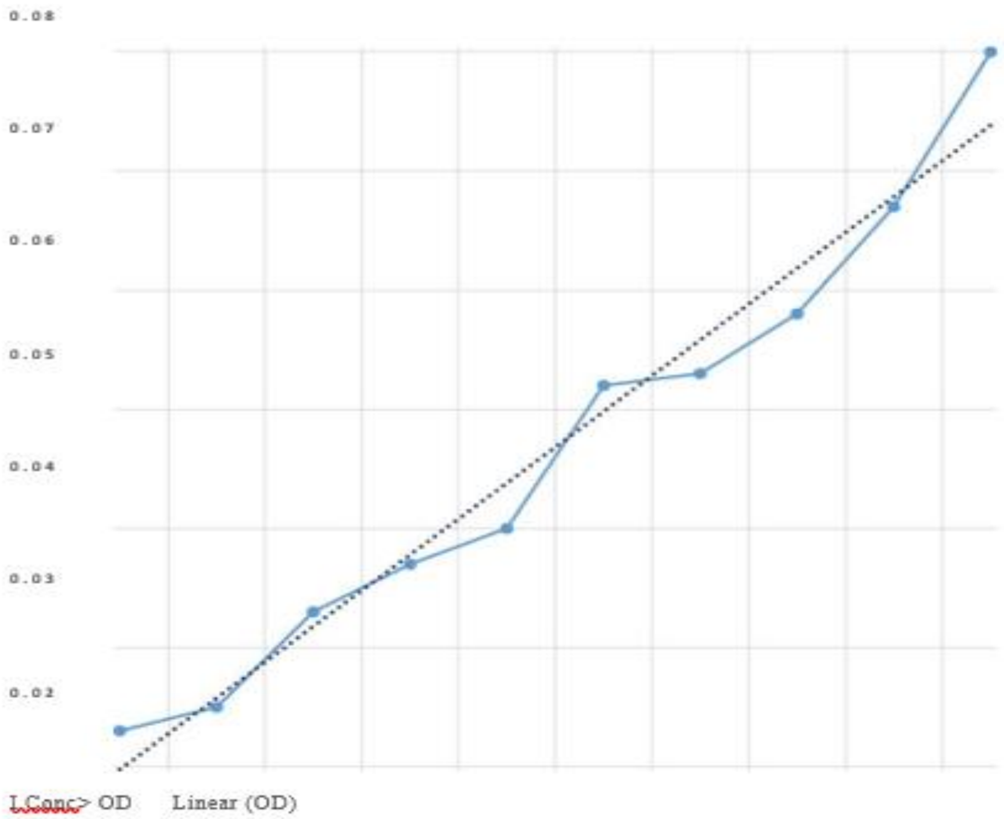
Table 2. Iodine-125 concentration of samples

Food	Absorbance	Iodine-125 Concentration(g)	Iodine-125 Conc.(ppm)	NAFDAC/WHO standard(ppm)
Salt	0.013±0.0042	0.00036	18	20 - 40
Quaker oat	0.015±0.0014	0.0004	20	25 - 40
Cheese balls	0.023±0.0056	0.00052	26	30 - 45
Biscuit	0.027±0.0057	0.0006	30	25 - 50
Baking flour	0.030±0.0200	0.00067	33.5	30 - 55
Golden morn	0.042±0.0028	0.0009	45	40 - 60
Corn flakes	0.043±0.0070	0.00091	45.5	40 - 55
Maggi	0.048±0.0029	0.001	50	45 - 70
Onga	0.057±0.0031	0.00118	59	50 - 85
Milk	0.070±0.0140	0.0014	70	50 - 100



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Discussion

The position of iodine-125 absorption established ranged from 18 to 70 parts per million (ppm). Two nutritional complements (Salt and Cheese balls) were significantly lower than the declaration range made by WHO/ NAFDAC. The iodine-125 values were not stated on most of the food supplements because iodine isn't a major nutrient in these foods but is present. The exploration of the proclaimed benefits of iodine-125 in nutrition complements is an important and timely topic that addresses public health concerns related to nutritional supplementation. This research has the potential to provide a premium understanding of the accuracy and reliability of labelling information on iodine-125 content in various food supplements, which can have significant implications for consumer safety and regulatory compliance. To effectively explore this topic, it is recommended that thorough research methodologies are employed, including sample collection from a diverse range of commercially available nutritional complements claiming to contain iodine-125. Exploring any discrepancies found through statistical analysis could offer meaningful conclusions about industry practices and quality control standards within the supplement market. Compare various analytical techniques (e.g., ICP-MS, spectrophotometry, ion-selective electrodes) for measuring iodine-125 content in supplements. Assess their accuracy, precision, and suitability for different complement matrices. Conduct a survey of consumers who use food supplements containing iodine-125 to understand their perceptions of the declared values and their experiences with the supplements. This will help you identify any potential issues or concerns that consumers may have and provide insights into the need for improved accuracy and transparency in the declaration of iodine-125 values.

Conclusion

The amount of iodine-125 proclaimed by the producers is not consistently in accord with the real amount of the complement established test. In most cases, iodine-125 values are not usually stated or labelled on complement products or nutrition. This research has the potential to provide a premium understanding of the accuracy and reliability of labelling information on iodine-125 content in various nutritional complements, which can have significant implications for consumer safety and regulatory compliance.

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Recommendations

1. It is recommended that thorough research methodologies are employed, including sample collection from a diverse range of commercially available nutritional complements claiming to contain iodine-125.
2. Utilizing analytical techniques: such as spectrophotometry or chromatography will enable accurate quantification of actual iodine-125 levels present in these products compared to their labeled claims or standard values.
3. Market survey and label analysis: Conduct a comprehensive survey of iodine-125 containing complements available in the market. Analyze product labels for declared iodine-125 content, forms of iodine-125 used, and recommended dosages. This could help identify trends and potential discrepancies in labeling. Exploring any discrepancies found through statistical analysis could offer meaningful conclusions about industry practices and quality control standards within the complementary market.

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