# MARKET ANALYSIS OF ANTI-MEASLES MEDICINAL PLANT PRODUCTS IN ONDO STATE, NIGERIA

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## ABSTRACT
This study analyses the marketing structure, concentration and efficiency of anti-measles medicinal plants. The study was conducted in Ondo State in Southwestern Nigeria. The targeted population for the study was the anti-measles medicinal herbs sellers. A three-stage random sampling technique was used to sample 120 marketers. Descriptive statistics, Concentration ratio (CR) analysis, Gini coefficient, Lorenz curve, marketing margin, and efficiency were the analytical tools employed for the study. The study shows that the majority of medicinal plant sellers were female (95%) with an average age of 48 years and were married (61.67%). About 53% had no formal education. The average year of market experience was 14 years and they are mostly traditional health practitioners (50.98%). It was found that the CR for the sellers was 26.02% and the estimated Gini coefficient was 0.486. The market margin per unit was ₦49.09 and the net market margin was ₦19.18. The efficiency of marketing was estimated at 61.22%. Since the market is efficient, anti-measles plants marketers should therefore adopt strategies to meet up with the international market standard. Government policies should also be directed towards improving indigenous markets by providing market facilities to reduce costs and improve their profit.

**Keywords: Anti-measles, Concentration ratio, Market efficiency, Illness, Lorenz curve**
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## 1. INTRODUCTION
From January to August 2021, there were 6.7 thousand cases of Measles in Nigeria. In the previous year, the number of Measles cases reached 9.3 thousand (Statista Research Department, 2022). According to the World Health Organization (2018), about 140 thousand people died from Measles worldwide. The majority of deaths are registered in countries with low income and weak health facilities. For thousands of years, since about 2600 BCE, the healthcare system was dependent on herbal medicine (WHO, 2013; Dar et al., 2017). Plants are increasingly used as a remedy for

several diseases, especially those where synthetic drugs cause side effects. Traditional medicine mostly uses medicinal plants, on which over 3.3 billion people in less-developed countries depend (Awad and Awaad, 2017; Tsabang, *et al*, 2016). Plants have been used since time immemorial for diverse purposes by humankind, particularly as food for nutrition and as medicine for treating diseases in both humans and animals. Plants are used in all cultures worldwide and have been relied upon for several millennia to support, promote, and restore human health (Awuchi, 2019). Health consciousness is growing among people, and people are now more concerned for natural, organic products in their regular use. Medicinal plants have acceptability in different forms, and they contribute to both the national and international economy to a large extent.

In Nigeria, many plant-based drugs are used to treat measles. Some of which are finely powdered particles prepared from the whole plant of *Allium cepa L.* and *Allium sativum L.* which are taken orally with cow's milk to treat measles. Others include powdered leaves of *Citrus aurantifolia* and *Hibiscus cannabinus L*. These leaves mixed with cow's milk are administered orally for a few days to treat measles by the keffi people of Nigeria (Mustapha *et al*, 2013). Further, the succulent fruits of *Nauclea latifolia* Smith are used by the Ibo race of Nigeria in the treatment of the disease. It acts as prophylactic to prevent epidemics. The mixture is prepared by roasting the ripe fruits in a pot over a hot firewood flame till the whole fruit is charred (Okwu, 2009). Researchers have also increased the immunity of mice to measles by feeding them a booster vaccine derived from plants (Mishra & Gupta, 2008). This study, therefore, seeks to examine the marketing structure, concentration and efficiency of anti-measles medicinal plants in Ondo State, Nigeria. The remaining part of this paper is structured as follows: Part 1 is the introduction, Part 2 is the literature review, Part 3 is the methodology, Part 4 is the result and discussion

## 2. LITERATURE REVIEW

### Market Structure, Conduct and Performance (SCP)

The structure, conduct, and performance (SCP) is a basic framework of analysis in market theory analysis. The postulation of the SCP approach follows the path that the deviation of the market structure from the paradigm of perfect competition leads to a decline in the degree of competitive conduct leading to a consequent decrease in output (supply) and allocative efficiency and an increase in prices. This implies that the performance of the market can be assessed based on the level of competition and efficiency in those markets (Williams *et al*., 2006). According to Tirole (1988), the theory is based on industrial organization and price theory. The industrial organization theory proposes the use of the degree of vertical integration, industrial maturity, government participation, cost structure, and diversification in examining how a particular firm behaves. On the other hand, the price theory is concerned with explaining the economic activities that create and/or transfer value in the trade of goods and services between different economic actors (Weber, 2012). According to Edwards *et al*. (2006), there are two competing hypotheses in the SCP paradigm. These are; the traditional structure, performance, and the efficient-structure assumptions. The structure-performance hypothesis postulates that the degree of market concentration has an inverse relationship with the degree of competition because market concentration encourages firms in the market to collude (Edwards *et al*., 2006). This implies that firms operating in more concentrated industries will earn higher profits than firms operating in less concentrated industries, irrespective of their efficiency.

The efficient-structure hypothesis, on the other hand, states that the performance of a firm has a positive relationship with its efficiency (Molyneux and Forbes, 1995). This is because market concentration reduces competition where firms with lower cost structures increase their profits by

reducing prices and expanding their market share. This implies that more efficient firms accumulate more profits because of their high efficiency not because of assumed collusive behaviour. The efficient-structure hypothesis has been given more support in various industries and commodity markets.

The market structure refers to the market organization in terms of firms' concentration or market share. A high market concentration implies low competition and vice versa (Lee, 2008). According to Margetts (2006), there are three market structure models used for categorizing the structure of a market based on the degree of market control by the dominant market player(s). On the supply side, these are monopoly, monopolistic competition and oligopoly. On the demand side such models include monopsony, monopsonistic competition and oligopsony. Lee (2008) further classifies these variables into two main groups namely, intrinsic and derived structural variables. Intrinsic structural variables are those which are determined by the nature of products and availability of production and marketing technologies. Derived fundamental variables, on the other hand, are those that are determined by firms and governments such as barriers of entry, seller and buyer concentration and product differentiation.

According to Tiku *et al*. (2012), market structure is measured by the Gini coefficient and Lorenz curve. The Gini coefficient expresses the extent to which the market is concentrated. It ranges from zero to one, with zero indicating perfect equality in the size and distribution of buyers or sellers, and one implying perfect monopsony/monopoly in the market. The Lorenz curve, on the other hand, is used to represent income distribution by showing the proportion of income that goes to a particular percentage of the population (Onyango, 2013). In the Lorenz curve analysis, high inequality in the distribution of market share reflects high market concentration, which is depicted by a wide gap between the Lorenz curve and the line of perfect equality. This indicates that a few firms control the market (Nellis and Parker, 1992).

Market conduct refers to firm behavior (Lee, 2008). It refers to the price and other market policies which are pursued by market players and how their decisions are coordinated (Haruna *et al*., 2012). The conduct of the actors in a particular market is considered to be a reaction pattern and/or adjustment behavior to the market structure. The key variables used to capture market conduct include the firm's pricing strategies, collusion, advertising, research and development. Market conduct is different from market performance in that it refers to the behavior and strategies of market participants while market performance refers to the outcome of such behavior and market interactions (Haruna *et al*., 2012).

Market performance refers to the outcome or the equilibrium assessed in terms of allocative efficiency (Lee, 2008; Haruna *et al*., 2012). Market performance is the ultimate impact of the market on its participants in terms of pricing, volumes traded, and marketing costs (Onyango, 2013). It is indicated by the profitability and efficiency of firms in the market. Profitability is used as a proxy to assess the performance of a market and to test the two hypotheses in the SCP paradigm; whether profits are accrued because of efficiency of the firms (Efficient-structure hypothesis) or because of market concentration (Structure-performance hypothesis). Several other variables are used to assess the performance of a market is the marketing margin. The other variable most commonly used to evaluate the performance of a market is the marketing margin and efficiency.

Marketing margin is the difference between the farm-gate price and the price paid by the final buyer (retail price) (Abankwah*et al*., 2010). It is a tool for assessing market performance by evaluating the efficiency of price formation and transmission in a marketing system (Tadesse, 2011).

## 3. METHODOLOGY

### Area of Study

The study area was Ondo State of Nigeria. The state was created on 3rd February 1976 from the former Western State by the then regime of General Murtala Mohammed. The state which is located in South Western Nigeria covers 14,606 square kilometers. The state lies between latitudes 5Â°45' and 7Â°52'N and longitudes 4Â°20' and 6Â° 05'E. The boundary of the state includes Edo and Delta States to the East, Ekiti and Kogi States in the North, in the West by Osun and Ogun States and in the South by the Atlantic Ocean. The ethnic composition of Ondo State is largely from the Yoruba subgroups of the Akoko, Akure, Ikare, Ilaje, Ondo, Owo, Arogbos, and Akpois who are Ijaw extraction and are mostly located in the riverine areas of the state.

### Sampling technique

The targeted populations for the study were the anti-measles medicinal herbs sellers. A three-stage random sampling technique was used. The first was the random selection of two communities: Akure and Owo from the communities in the state where the sales of anti-measles medicinal plants are prominent. The second stage was the random selection of 4 markets from the two communities. The third stage was the random selection of 30 medicinal plant sellers (both wholesalers and retailers) from each market in the study area. This gives 120 anti-measles medicinal plants under study.

### Method of data analysis

**Descriptive Statistics**: This was used to describe the medicinal plants available in the study for the treatment of measles and other market structure parameters. This involved the use of mean, frequency and percentages of observations.

**Concentration ratio analysis, Gini coefficient, and Lorenz curve:** These were used to examine the market structure of anti-measles medicinal plants. Concentration Ratio Analysis was used to examine the concentration of the market. This is the proportion of the total sales contributed by the m largest market ranked in order of their market shares (m = 2, 4, 8...) (Korir, 2005).

Concentration ratio = [Cumulative sales of the largest 2, 4, 8 firms / Total Industry sales] ×100

The Gini coefficient measures the statistical dispersion, which is the equality among values of a frequency distribution. The coefficient ranges from 0 to 1 and as a percentage which ranges between 0 and 100. More specifically, the upper bound of the Gini coefficient equals one only in populations of infinite size. A low Gini coefficient indicates a high level of equal distribution, with 0 corresponding to complete equality, while higher Gini coefficients indicate unequal distribution, with 1 corresponding to complete inequality. Some researchers have adopted the use of the Gini Coefficient to determine the structure and conduct of agricultural markets (Harris, 1982; Adegeye & Dittoh, 1985; Okunmadewa, 1990; Tweelen, 1997; Olukosi, Isitor & Ode, 2005, Akinsola *et al*, 2016). Iheanacho (2005) mathematically expressed the Gini coefficient as:

$GC = 1 - \sum XY$ ---------- (1)

where:

GC = Gini coefficient,

X = proportion of sellers,

Y = cumulative proportion of sellers, and

$\sum$ = summation sign

The value of GC ranges from 0 to 1. The higher the coefficient, the higher the level of concentration and consequently, high inefficiency in the market structure and vice versa.

Lorenz curve graphically showed the nature of seller concentration that was quantitatively analyzed using the Gini coefficient. The graph was plotted using the cumulative market proportion and the cumulative market share as given on the x and y-axis, respectively. A perfectly equalized degree of concentration is depicted by the straight diagonal line y=x called the line of perfect equality (45$^o$ line). The extent of deviation of the curve from the line reveals the level of seller concentration and the nature of market competition. When the Lorenz curve is closer to the line of Equality, the Gini coefficient is smaller and close to zero.

**Market Efficiency:** This was used to measure anti-measles medicinal plants' efficiency as an indicator of market performance.

$$\text{Market Efficiency (\%)} = \frac{\text{Value added by marketing}}{\text{Marketing cost}} \times 100$$

Where; Value added by marketing = selling price – total cost

## 4. RESULTS AND DISCUSSION OF FINDINGS

**Socio-economic Characteristics Distribution of Anti-measles Medicinal Plant Marketers**

The majority of the medicinal plant sellers were female with 95% and only 5% were male. The average age of the medicinal plant sellers was 48 years. Most of the medicinal sellers were married (61.67%), followed by 20.0% divorced. Most of the medicinal plant sellers had no formal education (52.5%) followed by 40.8% who had only primary education The mean market experience was 14 years. Most of the sellers had experience within 11-20 years (53.33%) followed by those that had market experience less than 10 years (31.67%). Most of the medicinal plant sellers were traditional health practitioners (50.98%) as a secondary occupation followed by 29.41% who were farmers. The result displayed in Table 1 showed the local names of the anti-measles medicinal plants sold by marketers in the study area as well as the common and scientific names, parts traded, and sources. These confirmed the documentation made by Oladunmoye and Kehinde (2011) on the medicinal plants used in treating viral infections among the Yoruba tribe of South Western Nigeria.

**Table 1: Types and Sources of Medicinal Plants for Treating Measles**

| S/N | Local Name | Common name | Scientific name | Parts Trade (Bark, Leaves or Root/Tuber) | Source (Farm, Wild or Bought) |
|---|---|---|---|---|---|
| 1 | Otili | Pigeon pea | *Cajanus cajan* | Leaves | Bought |
| 2 | Atare | Alligator pepper | *Aframomum melegueta* | Leaves | Bought |
| 3 | Eeru | Ethiopia pepper | *Xylopia ethiopica* | Leaves | Bought |
| 4 | Odundun (abamoda) | Tassel flower | *Bryophylum pinnatum* | Leaves | Bought |
| 5 | Bomubomunn | Giant milkweed | *Calotropis procera* | Leaves | Bought |
| 6 | Oruru | Sausage tree | *Spathodea campanulata* | Leaves | Bought |
| 7 | Gbersi | Nauclea | *Nauclea latifolia* | Root, stem, or bark | Farm bought |

| | | | | | |
|---|---|---|---|---|---|
| 10 | Osanwewe | Lime | *Citrus aurantifolia* | Leaves and fruits | Farm, bought |
| 11 | Afomo | Mistletoe | *Crudia klainei* | Leaves | Bought |
| 12. | Idahe | Bamboo | *Banbusa vulgaris* | Leaves | Bought |
| 13. | Ayuu | Garlic | *Allium sativa* | Bulb | Farm and Bought |
| 14. | Orunpa | Hymenocardia | *Hymnocardia acida* | Leaves | Bought |
| 15. | Ayo | Bonduc nut | *Caesalpinia bonduc* | Leaves | Bought |

Source: Field Survey.

In addition, 95.83% of the marketers were part of the medicinal plant trade association, this revealed that most of the respondents are registered and licensed by the trade association. 45.0% of the sellers source their capital from relatives and grants from friends followed by 33.33% of sellers who started their business with personal savings. The only after-sales services available in the markets in the study area is consultation (19.17%) and of most, the sellers get information on changes in price and other market information through trade associations (85.57%).

**Analysis of the market structure of Anti-measles medicinal plants**

**The Market Concentration Ratios for marketers of Anti-measles medicinal plants**

Market concentration ratio (CR) was determined for the sellers of anti-measles medicinal plant trade to assess their market power. The ratio obtained helped to provide an understanding on the concentration of the anti-measles medicinal plant's sellers in the market using Khols and Uhl's (1990) rule of thumb market concentration indicative indices. According to Kohls and Uhl (1990), the CR of over 50% is an indication of the strong monopolistic firm, while a CR of between 33% and 50% indicates a weak monopolistic firm. A CR of less than 33% shows an unconcentrated firm. The CR analytical approach has been used by several researchers such as Kotler and Armstrong (2006) who noted that the marketing of cotton in Kahama District is an oligopoly since the CR was high (77%).

The concentration for anti-measles medicinal plants sellers was calculated from the total amount of sales of the four biggest sellers divided by the total amount of the products sold by all the sellers in the market (table 2). It was found that the CR for the sellers was 26.02% (Table 13). These results indicated that the market for anti-measles medicinal plants is unconcentrated. The findings of Olurinde et. al. (2010) affirmed the result of this study who found that the concentration ratio analysis of anti-malaria medicinal plant market a low concentration structure with the largest 4 and 8 retailers having a combined market share of 7.30% and 18.24% respectively.

**Table 2: Concentration Ratio**

| **Variables** | **Wholesalers** |
|---|---|
| Cumulative sales of the four largest traders (CS) | ₦161,900 |
| Total sales of anti-measles medicinal plants (TS) | ₦622,150 |

| | | |
|---|---|---|
| Concentration ratio (CS/TS)*100 | | 26.02 |

**Gini Coefficient Computation**

Gini-coefficient lies between two extremes. The closer the value to unity, the greater is the degree of inequality and, therefore, the higher is the level of concentration. Higher concentration signifies that a market is monopolistic with few individuals controlling the market (Furman *et al*, 2019) and The Gini coefficient was calculated using the proportion of marketers and the cumulative proportion of sales. This was presented in Table 3, which showed that the estimated Gini coefficient for anti-measles medicinal plants sellers was 0.486. This implies that there is a certain level of inequality in the sale income of the respondents but not high as stated by Dillion and Hardaker (1993) that the value of Gini coefficient greater than 0.35 indicates an inequitable distribution of sales income. The value of the Gini coefficient for this study proved an almost equitable distribution of sales income among wholesalers of anti-measles medicinal plants.

**Table 3: Computation of Gini Coefficient for anti-measles medicinal plant trade**

| **Income Range (₦)** | **No of marketers** | **The proportion of marketers (X)** | **Cumulative proportion of marketers** | **Total sales (₦)** | **Proportion of sales** | **Cumulative proportion of sales (Y) (₦)** | **XY** |
|---|---|---|---|---|---|---|---|
| 6,000-15,000 | 52 | 0.433 | 0.433 | 364,000 | 0.206 | 0.206 | 0.089 |
| 16,000-25,000 | 48 | 0.400 | 0.833 | 818,400 | 0.463 | 0.669 | 0.268 |
| 26,000-35,000 | 17 | 0.142 | 0.975 | 459,000 | 0.260 | 0.929 | 0.132 |
| 36,000-45,000 | 2 | 0.017 | 0.992 | 77,900 | 0.044 | 0.973 | 0.017 |
| ≥46,000 | 1 | 0.008 | 1.000 | 47,000 | 0.027 | 1.00 | 0.008 |
| TOTAL | 120 | | | 1,766,300 | | | 0.514 |

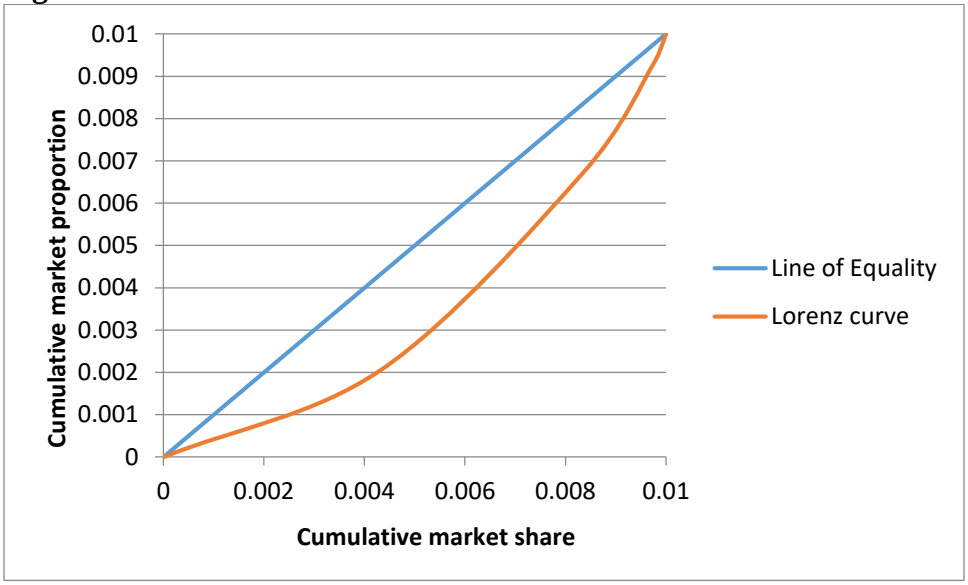
*Gini coefficient = 1 - ∑XY = 1-0.514 = 0.486*

Source: Field survey.

**Lorenz curve**

The result presented in figure 1 showed the Lorenz curve which graphically showed the nature of seller concentration that was quantitatively analyzed using the Gini coefficient. The graph was plotted using the cumulative market proportion and the cumulative market share as given on the x and y-axis respectively. A perfectly equalized degree of concentration is depicted by the straight diagonal line y=x called the line of perfect equality ($45^o$ line). The degree of inequality in the market share among the sellers was concave with the line of equality. The value of the Gini coefficient (0.486) for sellers implies a little bit low level of sellers' concentration and that competition exists among sellers but is low.

**Figure 1: Lorenz curve for income distribution of wholesalers**




**Market Margin of Anti-measles Medicinal Plant Marketing**

The market margin analysis of the anti-measles medicinal plants market was estimated in table 4. The results showed that the margin for marketers was ₦49.09 and the net market margin was ₦19.18. The market margin expressed as a percentage of selling price was given for the marketers as 53.16% which implies an efficient market though not very efficient.

**Table 4: Marketing Margin of the anti-measles medicinal plant's marketers**

| **Market Margin** | **Average cost/bundle** |
|---|---|
| Purchase Price (A) | 45.98 |
| **Marketing cost** | |
| Transportation | 15.73 |
| Rent | 8.0 |
| Salaries/wages | 6.36 |
| Miscellaneous | 10.36 |
| Total Marketing Cost (B) | 30.45 |
| **Total Cost (TC)** | 76.43 |
| Selling Price (SP) | 95.07 |
| Gross market margin (D) SP-A | 49.09 |
| Net Market Margin (D-B) | 19.18 |
| Market margin as percentage of selling price | 51.63% |

Source: field survey.

**The efficiency of anti-measles medicinal plants trade**

The market efficiency was calculated for the sellers and was expressed as a ratio of value added by marketing services to the marketing cost.

**Table 5: Market Efficiency of anti-measles medicinal plants trade**

| Estimates | Average cost/unit(₦) |
|---|---|
| Marketing Cost (A) | 30.45 |
| Value added by marketing services (selling price – total cost) (B) | 18.64 |
| Marketing efficiency (%) (B/A) | 61.22% |

Source: Field survey

The marketing cost was ₦30.45 and the value added by marketing services was ₦18.64. The efficiency of the trade estimated as 61.22% indicates that the anti-measles plants marketing is efficient in the study area.

## CONCLUSION AND POLICY RECOMMENDATIONS

The empirical evidence presented in the study indicated that anti-measles medicinal plants are readily available and homogenous in the study area and that the trade is considerably efficient and the market is relatively not too concentrated, and the minimum level of competition exists among sellers. The marketers buy majorly from the farmers and sell to individual consumers. From the study, the following recommendation can be highlighted

- The anti-measles plants marketers should adopt strategies that will make them meet up with the international market standard; these strategies include branding and packaging of products.
- Government policies should be directed towards improving indigenous markets by providing market facilities to reduce transportation, labor, rent, and other marketing costs and increase marketing efficiencies for wholesalers and retailers.

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