

EXPLORING THE SOCIO-ECONOMIC IMPACT OF HERBAL MEDICINE PRACTICES IN ONDO STATE, NIGERIA

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ABSTRACT

The study explores the Socio-Economic Impact of Herbal Medicine Practices in Ondo State, Nigeria, with a focus on four key health outcomes: Infant Mortality Rate (IMR), Under-five Mortality Rate (UMR), Maternal Mortality Rate (MMR), and Life Expectancy (LEX). Employing the Grossman Model of Health Demand as the theoretical framework, which conceptualizes health as capital that individuals invest in to enhance their well-being and productivity, the study examines the relationships between Herbal medicine practices and these health outcomes. Data were collected through a structured questionnaire administered to a sample of 400 respondents, drawn from a population of 5,316,600. The study utilized the logistic regression model and SPSS version 23 to analyze the data. The study also adopts the purposive/judgmental sampling technique, using Taro Yamane (1967) to determine the sample size. The findings reveal a nuanced relationship between Herbal medicine and health outcomes: while Herbal medicine is associated with a positive increase in life expectancy, it is inversely related to infant mortality, under-five mortality, and maternal mortality rates. The results underscore the importance of integrating Herbal medicine into modern healthcare systems to leverage its benefits in improving health outcomes and fostering socioeconomic development. The study advocates for policies that support research on Herbal medicine, enhance healthcare provider training, and establish regulatory standards to ensure the efficacy and safety of Herbal practices. By adopting these measures, societies can optimize health investments, reduce healthcare costs, and stimulate economic productivity, ultimately contributing to comprehensive socioeconomic growth.

Keyword: Herbal Medicine, Infant Mortality, Under-five Mortality, and Maternal Mortality

1 INTRODUCTION

The art of healing comes from nature, not from the physician. Therefore, the physician must start from nature, with an open mind." - Paracelsus_ Paracelsus's words capture the essence of Herbal medicine, which is deeply rooted in natural healing practices that have been cultivated over millennia. Herbal medicine encompasses a variety of approaches, including herbal remedies, acupuncture, and spiritual healing, all of which are integral to the cultural and historical contexts of different societies (World Health Organization [WHO], 2019).

As the world continues to advance technologically and medically, there is a growing recognition of the need to integrate these ancient practices with modern healthcare systems to enhance health outcomes, improve life expectancy, and contribute to socio-economic development

The global healthcare landscape is a rich tapestry woven from diverse medical traditions and practices. Among these, Herbal medicine holds a prominent place, offering a unique perspective on health and wellness that has been cultivated over millennia. Herbal medicine encompasses a variety of practices, including herbal remedies, acupuncture, and spiritual healing, deeply rooted in the cultural and historical contexts of various societies (World Health Organization [WHO], 2019). As the world continues to advance technologically and medically, there is a growing recognition of the need to integrate these age-old practices with modern healthcare systems to enhance health outcomes, potentially improve life expectancy, and contribute to socio-economic development.

Herbal medicine, defined by the WHO as "the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures," plays a crucial role in primary healthcare for many communities, especially in developing countries (WHO, 2019). For instance, in China, Herbal Chinese Medicine (TCM) is not only a complementary healthcare option but also an integral part of the national healthcare system, contributing to the management of chronic diseases and the promotion of preventive healthcare strategies (Zhou et al., 2020). This integration not only supports individual health but also has broader socio-economic benefits, such as reducing healthcare costs and increasing workforce productivity.

The socio-economic implications of Herbal medicine are profound. In many low- and middle-income countries, where access to modern healthcare facilities may be limited, Herbal medicine serves as a critical resource for the population. It offers cost-effective treatment options that are culturally accepted and widely available. By providing affordable healthcare solutions, Herbal medicine can alleviate the economic burden on families and communities, reduce absenteeism due to illness, and enhance overall economic productivity (Frass et al., 2012).

Globally, Herbal medicine is a vital component of healthcare systems, especially in regions where modern medical infrastructure is limited. According to the World Health Organization (2019), over 80% of the population in developing countries relies on Herbal medicine as a primary source of healthcare. This widespread reliance emphasizes the crucial role Herbal medicine plays in filling gaps left by conventional medical systems and providing culturally relevant treatment options.

In the broader African context, Herbal medicine is integral to the healthcare landscape. In sub-Saharan Africa, it offers cost-effective and accessible health solutions, particularly in areas where conventional medical services are scarce (Bodeker et al., 2014). The African Union (2021) highlights the importance of integrating Herbal medicine with modern healthcare practices to improve health outcomes and address healthcare disparities effectively.

Similarly, in Nigeria, Herbal medicine is not only widely practiced but also holds significant cultural value. The National Institute for Pharmaceutical Research and Development (NIPRD, 2020) reports that approximately 70% of Nigerians use Herbal medicine either alongside or as an alternative to conventional treatments. This widespread use underscores the importance of Herbal medicine in Nigeria's healthcare system, reflecting its role in meeting the diverse health needs of the population.

In Ondo State specifically, Herbal medicine remains a crucial healthcare resource. Approximately 60% of the population relies on Herbal healers for various health issues, indicating a strong, culturally ingrained trust in these practices (Eze & Ijeoma, 2019). Despite the availability of modern medical facilities, Herbal medicine continues to serve as a primary healthcare source, particularly in rural areas where access to conventional services is limited. Herbal medicine has long been a cornerstone of healthcare, deeply ingrained in the region's cultural and historical fabric.

Historical records and contemporary studies reveal that indigenous healing practices, including herbal remedies and spiritual treatments, have been employed for centuries to address various health conditions (Nnaji & Osuagwu, 2018). This longstanding tradition highlights the significant role of Herbal medicine in Ondo State's healthcare landscape, where it continues to be a primary resource for many.

Integrating Herbal medicine with modern healthcare systems in Ondo State presents a significant opportunity to enhance health outcomes and promote socioeconomic development. By acknowledging the historical and cultural significance of Herbal practices while addressing contemporary health challenges, Ondo State can leverage these practices to improve overall health and economic well-being. This integration aligns with global and regional trends advocating for a blended approach to Herbal and modern medicine, aiming to create a more inclusive and effective healthcare system.

The confluence of Herbal wisdom and modern medical advancements offers a promising path toward a more comprehensive healthcare approach. Embracing the holistic and culturally resonant aspects of Herbal medicine while addressing its challenges through scientific validation and integration with modern practices can lead to improved health outcomes and socioeconomic benefits, reinforcing the profound connection between nature, health, and human well-being in Ondo state. Just as Buddha's wisdom that "Health is the greatest gift, contentment the greatest wealth, faithfulness the best relationship" underscores the profound connection between health and overall well-being, emphasizing that true health and contentment stem from both natural and culturally attuned practices. It is in this light that this study seeks to explore the Socio-Economic Impact of Herbal Medicine Practices in Ondo State, Nigeria. The objectives of the study are therefore: (1) Evaluate the effect of Herbal Medicine on Infant Mortality Rate in Ondo state Nigeria. (2) Examine the effect of Herbal Medicine on Under-five Mortality Rates in Ondo state Nigeria. (3) Examine the effect of Herbal Medicine on Maternal Mortality Rate in Ondo state Nigeria. (4) Evaluate the effect of Herbal Medicine on Life Expectancy in Ondo state Nigeria. The rest of the study is presented as follows: section 2 presents the literature review involving the theoretical underpinning of the study and the review of empirical studies. Section 3 focuses on material and methods which captures the data and model specifications. Section 4 analyses the data and divulges the findings, while sections 5 conclude the paper and highlights the recommendations.

2.0 REVIEW OF RELATED LITERATURE

2.1 Conceptual Framework

2.1.1 Herbal Medicine

Herbal medicine, also known as botanical medicine, refers to the use of plants or plant parts to treat health conditions and promote wellness. These treatments can include leaves, bark, berries, flowers, and roots and are often used in various forms such as teas, extracts, tablets, or capsules. (National Center for Complementary and Integrative Health [NCCIH], 2021). Herbal medicine is the practice of using herbs and herbal preparations to maintain health, prevent illness, or treat disease. This form of medicine is based on traditional knowledge and empirical evidence gathered over centuries, often integrating cultural beliefs and practices." (World Health Organization [WHO], 2019). Herbal medicine is the use of plant-based substances to treat illnesses and promote health. These substances include a variety of herbs, herbal materials, herbal preparations, and finished herbal products that contain active ingredients derived from parts of plants, or other plant materials. Tyler, Brady, & Robbers (1988). Herbal medicine involves the therapeutic use of plants and plant extracts to address various health conditions. It relies on the traditional knowledge of medicinal plants to support, heal, and maintain health. Barnes, Anderson, & Phillipson (2007).

2.1.2 Socio-Economic Development

United Nations Department of Economic and Social Affairs. UNDESA (2021) defined Socioeconomic development as the progressive reinforcement of a socioeconomic organization's quantitative and qualitative dimensions towards a higher level of efficiency, well-being, justice, and democracy at all levels, which incorporates public concerns in developing social policy and economic initiatives.

The ultimate objective of social development is to bring about sustained improvement in the well-being of the individual, groups, family, community, and society at large

World Bank (2019). Noted that socioeconomic development, is an economy that Sustained increase in the economic standard of living of the country's population, normally accomplished by increasing its stocks of physical and human capital and thus improving its technology, by processing the well-being and quality of life of the nation, region, local community, or by improving individuals according to targeted goals and objectives.

2.1.3 Health

Health is a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity, which is promoted by encouraging healthful activities, such as regular physical exercise and adequate sleep, and by reducing

or avoiding unhealthful activities or situations, such as smoking or excessive stress (WHO, 2016). However, the definition of health adopted by providers and government has implication for the process, measurement and range of services offered. In 2018 WHO defined health as a state of complete physical, social and mental well-being and not merely absence of disease and infirmity". In this way, health is metabolic efficiency while sickness or ill health is metabolic inefficiency. A state of complete physical, mental, and social well-being: not just absence of disease or infirmity is a healthy status- a status in which individuals can lead social and economically productive life.

2.1.4 Health Outcomes

Health outcome simply refers to population health status or condition within a given period of time. It is a change in the health status of an individual, group, or population which is attributable to a planned intervention or series of interventions, regardless of whether such an intervention was intended to change health status (CDC, 2022). Health outcome is usually measured by health status indicators or indices. However, though there seem to be no consensus on how to quantitatively measure health outcome, different scholars on population health have adopted various indices as proxies for measuring health outcome. Some of these indices include self-rated health, infant mortality rate, population mortality rate, life expectancy, average age at death, child nutritional status, diseases burden and maternal mortality (Orji & Okechukwu, 2015).

2.1.5 Infant Mortality

Infant mortality refers to the death of infants under the age of one year per 1,000 live births in a given population within a specified period. It is a critical indicator of the overall health and well-being of infants in a society, reflecting factors such as healthcare access, maternal health, socioeconomic conditions, and public health interventions (WHO, 2023).

Infant mortality refers to the number of deaths of infants under one year of age per 1,000 live births in a specified geographical area or population within a given time period. It is a critical health indicator influenced by factors such as maternal health, access to healthcare services, socioeconomic conditions, and public health interventions (CDC, 2021).

2.1.6 Under-Five Mortality:

Under-five mortality, also known as child mortality, refers to the probability of dying before reaching the age of five years per 1,000 live births. It serves as a key indicator of child health and well-being, encompassing deaths from infancy through early childhood due to preventable and treatable causes such as malnutrition, infectious diseases, and inadequate healthcare (UNICEF, 2021).

Under-five mortality, also known as child mortality, refers to the probability of dying before reaching the age of five years per 1,000 live births. This measure includes deaths of children under five due to various causes, including infectious diseases, malnutrition, injuries, and inadequate access to healthcare services. It serves as a critical indicator of child health and well-being in populations (WHO, 2023).

2.1.5 Maternal Mortality:

Maternal health refers to the health of women during pregnancy, childbirth and the postpartum period. It refers to deaths related to pregnancy or childbirth. While motherhood is often a positive and fulfilling experience, for too many women it is associated with suffering, ill-health and even death. According to Maternal and Neonatal Programme Effort Index (MNPI, 2010) maternal mortality as the deaths caused by complications due to pregnancy or childbirth, these complications may be experienced during pregnancy, delivery itself, or 42 days following childbirth. For each maternal death, many more suffer injuries, infection and disabilities brought about by pregnancy or childbirth complications. The major direct causes of maternal morbidity and mortality include hemorrhage, infection, high blood pressure, unsafe abortion and obstructed labour.

2.2. Theoretical framework

2.2.1 The Grossman Model of Health Demand

The study is hinged on The Grossman Model of Health Demand, introduced by Michael Grossman in 1972, offers a robust framework for analyzing the interplay between Herbal medicine, health outcomes, and socioeconomic development. This model views health as a form of capital—similar to physical assets—that depreciates over time but can be preserved or improved through various investments. Herbal medicine, within this framework, is seen as a crucial investment in health capital. Practices such as herbal remedies, dietary adjustments, and culturally specific treatments are employed to reduce health depreciation and enhance overall well-being. Grossman's theory posits that health is valued not only for its inherent benefits but also for its role in improving productivity and quality of life. By investing in Herbal medicine, individuals aim to prevent diseases and prolong their productive years. This is particularly pertinent in regions where Herbal medicine is more accessible and affordable compared to conventional healthcare options. Such investments help maintain health capital, leading to better health outcomes and increased life expectancy. Moreover, the Grossman Model links improvements in health to broader socioeconomic development. When health capital is bolstered through Herbal medicine, it can result in heightened economic productivity and lower healthcare costs. As individuals enjoy better health and longer lives, they are able to contribute more effectively to the economy. This enhanced economic participation supports overall socioeconomic development by fostering a more productive and healthier population.

2.3 Empirical Review

Patel and Sharma (2019), examined Herbal Medicine and Its Effect on socioeconomic development: an in-depth analysis on Life Expectancy: Evidence from Rural India. The study offers a comprehensive examination of how Herbal medicine influences life expectancy in rural settings. Conducted in India, this research provides valuable insights into the role of Herbal medicine in extending life and improving health outcomes. The study utilized a longitudinal survey design, collecting data from 1,200 households over five years through structured interviews and health assessments. This sample was carefully selected to ensure it represented various geographical and cultural contexts within rural India. By focusing on both users of Herbal medicine and those relying primarily on conventional medical services, the research aimed to capture a broad perspective on the effects of Herbal practices. Key health indicators such as life expectancy, incidence of chronic diseases, and overall health status were assessed. Life expectancy data were obtained from local health records and demographic surveys. Statistical methods, including logistic regression model analysis and survival analysis, were employed to analyze the data and determine the impact of Herbal medicine on life expectancy, while controlling for confounding factors such as socioeconomic status, access to healthcare, and lifestyle. The findings of the study revealed a significant positive correlation between the use of Herbal medicine and improved life expectancy. Herbal medicine practices, which include herbal remedies and preventive health measures, were shown to enhance health outcomes by offering accessible and culturally appropriate health interventions. This research underscores the importance of Herbal medicine in contributing to longer, healthier lives in rural areas, demonstrating its role in both health improvement and socioeconomic development.

3.1 MATERIALS AND METHODS

The study adopted Quantitative research design. Which was used to evaluate the Socio-Economic Impact of Herbal Medicine Practices in Ondo State, Nigeria. The study used the descriptive (survey) research design which was used, given that the research contains two variables viz: Herbal medicine (independent) and socioeconomic development, (dependent variables) The study used Questionnaire, by distribution via resident within the three senatorial zones, of Ondo State. These include Ondo North, Ondo South, and Ondo Central. However, the target population among these senatorial districts are the most populous local government area, who directly or indirectly utilize Herbal medicine, due to its availability and predominance in the state. The total population of the state, 5,316,600 this was gotten from National Population Commission (NPC 2022). The study also adopts the purposive/judgmental sampling technique, using Taro Yamane (1967) to determine the sample size which was five million, three hundred and sixteen thousand and six hundred (5,316,600) from the earmarked population, given a total sample of four hundred (400) for the study.

3.2 Model specification

The study adapts the logistic model proposed by work of Patel and Sharma (2019), who examined Herbal Medicine and Its Effect on socioeconomic development: an in-depth analysis on Life Expectancy: Evidence from Rural India. Since the independent variable (Socioeconomic Development) takes values of either zero (0) or (1), it is assumed that the error term follows a logistic distribution, regression estimates by the logit model. Specifically, the model takes the implicit form as follows:

$$Y=(p/l-p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k + \epsilon_t \quad (3.1)$$

Where X_1, \dots, X_k were the predictor variables- type of residence (rural or urban), educational

Level of the household head, region, size of household, age of household head, sex of household, head, respectively; and p denoted the probability that a person has been faced with maternal mortality case. Including variables of interest, the first model is specified as:

$$SED= f(EDU, INC, CCH, IMR) \quad (3.2)$$

Where:

EDU = Education;

INC = Income;

PDT = Productivity;

IMR = Infant mortality Rate;

MMR = Maternal Mortality Rate

SED = Socioeconomic Development

For this study, equation 3.2 was modified by replacing its endogenous variables with the current study variables and stating that socio-economic development proxied by Infant mortality Rate (IMR), Under-five Mortality Rates (U_5MR), Maternal Mortality Rate (MMR) and life expectancy (LEX) is a function of Herbal Medicine. This functional relation was stated as thus:

$$TAM = f(IMR, U_5MR, MMR, LEX) \quad (3.5)$$

Where:

HEM = Herbal Medicine

IMR = Infant mortality Rate;

U_5MR = Under-five Mortality Rates

MMR = Maternal Mortality Rate

LEX = Life Expectancy

β_0 = Constant

$\beta_1 - \beta_4$ = estimated parameters

ϵ_t = random disturbance term

Equation 3.5 was stated in stochastic explicitly form as:

$$HEM = \beta_0 + \beta_1 IMR + \beta_2 U_5MR + \beta_3 MMR + \beta_4 LEX + \epsilon_t \quad (3.6)$$

The a priori expectation of the parameters to be estimated are as expressed below:

- i. ϵ_t which is the random disturbance term is serially independent assumed to be Constant.
- ii. $\beta_1, \beta_2, \beta_3,$ and $\beta_4 < 0$.

This implies that the coefficients of Herbal Medicine are expected to be Negative. Meaning that they have a negative relationship with socioeconomic development. This imply that an increase in HEM will lead to a decrease in (IMR, U₅MR, and MMR). All things been equal.

4.1 Data Analysis and Discussions

it was observed that out of the 400 questionnaires distributed, 11 were not returned, and 22 were not properly filled; thus, making the properly filled questionnaire to be 367, which was returned. The 367 properly filled questionnaires were thus used for the analysis. This shows that 91.7 percent of the administered questionnaire were used for the analysis in this study.

4.1 Model Matrix Estimation Results

Table 4.1: Model Estimation Results

Variable	B	S.E.	Wald	Df	Sig.	Exp(B)
IMR	-35.008	.701	60.899	1	.004	.929
U ₅ MR	-7.112	.658	39.069	1	.003	.371
MMR	-26.087	.967	46.394	1	.002	.3.21
LEX	33.007	.706	59.798	1	.004	.2.29
Constant	18.348	2.686	56.732	1	.000	76.000
Hosmer-Lemeshow		110				
Nagelkerke R Square		.723				
Cox & Snell R Square		.636				
-2 Log likelihood		21.562				

Source: SPSS Computations (2023)

$$\text{HEM} = 18.348 - 35.008 \text{ IMR} - 7.112 \text{ U}_5\text{MR} - 26.087 \text{ MMR} + 33.007 \text{ LEX} - \quad -(4.1)$$

Table 4.12 shows the coefficient for IMR (-35.008). is negative. This indicates a negative impact on HEM. for one-unit increase in Herbal Medicine while holding all other variables constant is associated with a decrease of Infant Mortality Rate (IMR) by -35.008. This is in conformity with a prior expectation.

From Table 4.12, it was revealed that the coefficient for U₅MR (-7.112) is negative. This indicates a negative impact on HEM, which is line with a prior expectation. A unit change in Herbal Medicine tends to decrease Under-five Mortality Rates by -7.112.

Table 4.12 shows the coefficient for MMR (-26.087). is negative. This indicates a negative impact on HEM. for one-unit increase in Herbal Medicine while holding all other variables constant is associated with a decrease of Maternal Mortality Rate (MMR) by -26.087. This is in conformity with a prior expectation

Table 4.1 shows the coefficient for LEX (33.007). is positive. This indicates a positive impact on HEM. for one-unit increase in Herbal Medicine while holding all other variables constant is associated with an increase of Life Expectancy ate (LEX) by 33.007. This is in conformity with a prior expectation.

From Table 4.1: The Hosmer-Lemeshow statistic is 0.110 at a critical value of 0.005, this means the calculated test statistic is less than the critical value. Therefore, the findings suggest that there is no evidence to reject the null hypothesis of good fit. In other words, the logistic regression model fits the data adequately at a significance level of 0.005.

The Nagelkerke R Square is 0.723, indicating that the models are explained approximately 84.4% of the variability in Herbal Medicine (HEM). This suggests that Infant Mortality Rate (IMR), Under-five Mortality Rates (U₅MR), Maternal Mortality Rate (MMR) and life expectancy (LEX) are strong predictors of Herbal Medicine.

Similarly, The Cox & Snell R Square is 0.636, which provides a measure of how well the models fits compared to a null model with no predictors. It suggests that the models with Infant Mortality Rate (IMR), Under-five Mortality Rates (U₅MR),

Maternal Mortality Rate (MMR) as predictors, significantly impact Herbal Medicine by 62.8%. The -2 Log Likelihood is 21.562, which indicate an excellent fit. Therefore, overall, the evidences suggest that Herbal Medicine is negatively significant predictor of Infant Mortality Rate (IMR), Under-five Mortality Rates (U₅MR), Maternal Mortality Rate (MMR), while Life Expectancy is positive, with the logistic regression model providing valuable insights into how the presences of Herbal Medicine affects Infant mortality Rate (IMR), Under-five Mortality Rates (U₅MR), Maternal Mortality Rate (MMR) and life expectancy (LEX) on socioeconomic development.

4.2.1 Reliability Statistics

Table 4.2: Reliability Statistics Test

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.965	.973	5

Source: SPSS Computations (2023)

Table 4.2. shows the provided reliability test results, which include Cronbach's Alpha values of 0.965 and 0.973 based on standardized items, indicate a very high level of internal consistency in the dataset used for the regression analysis. This suggests that the variables Herbal Medicine Rate (HEM), Infant mortality Rate (IMR), Under-five Mortality Rates (U₅MR), Maternal Mortality Rate (MMR) and life expectancy (LEX) are highly reliable in measuring the intended constructs and are likely to produce consistent and dependable results.

Cronbach's Alpha is a measure of internal consistency reliability, and it assesses how well a set of variables or items in a scale or questionnaire measures a single underlying construct. In this context, the high Cronbach's Alpha values indicate that the variables used in the regression model are internally consistent and that they collectively provide a reliable measure of the relationships between Herbal Medicine (HEM), Infant mortality Rate (IMR), Under-five Mortality Rates (U₅MR), Maternal Mortality Rate (MMR) and life expectancy (LEX).

The high internal consistency revealed by the reliability test results has significant implications for the research's data quality, research validity, and policy relevance. Firstly, it underscores the high quality of the data used in the regression analysis, affirming the reliability of the variables representing Herbal Medicine Rate (HEM), Infant mortality Rate (IMR), Under-five Mortality Rates (U₅MR), Maternal Mortality Rate (MMR) and life expectancy (LEX). This bolstered data quality enhances the overall validity of the regression model's findings, instilling confidence in researchers that the relationships explored are consistent and dependable.

Consequently, policymakers and public health officials can place greater trust in utilizing these findings to inform policy decisions and interventions aimed at utilizing Herbal Medicine and improving socioeconomic development by reducing Infant Mortality Rate (IMR), Under-five Mortality Rates (U₅MR), Maternal Mortality Rate (MMR) and improving life expectancy (LEX) in Ondo State. The reliability of the data is an essential foundation upon which effective public health strategies and resource allocation can be built.

4.3.1 Normality Tests of the Study

Table 4.3.: Normality Test of Variables

Constructs	Kolmogorov-Smirnov			Shapiro-Willk		
	Statistic	Df	Sig	Statistic	Df	Sig.
Herbal Medicine (HEM)	0.997	367	0.059	0.991	367	0.057
Infant Mortality. R (IMRR)	0.981	367	0.191	0.993	367	0.207
under 5 Mortality. R (U ₅ MR)	0.984	367	0.211	0.992	367	0.179
Maternal Mortality. R (MMR)	0.979	367	0.124	0.994	367	0.313
Life Expectancy (LEX)	0.954	367	0.016	0.987	367	0.015

Source: Author's Computations 2023 (Microsoft Excel-16)

Table 4.18, show the result of Kolmogorov-Smirnov and Shapiro-Willks test, the statistic values of the data under the study are close to 1 suggesting that the data is normally distributed. All the variables' data showed P-value is greater than 0.05 except life expectancy (LEX) which show $P < 0.05$, its test statistic value was 0.954. Thus, the Kolmogorov-Smirnov and Shapiro-Willks significant range is less than 1 and 3 respectively which is less than 0.05 percent level of significant. Hence, this confirmed that the data were normally distributed.

4.4 Testing of Hypothesis Results

4.4.1 Test of hypothesis One

H01: Herbal Medicine Rate (HEM), has no significant effect on Infant Mortality Rate (IMR) in Ondo State.

The logistic regression results for MAL include a significant p-value (Sig.) of 0.002, and the coefficient for IMR is -35.008. Based on these results, we accept the alternative hypothesis for IMR. There is strong evidence to suggest that Herbal Medicine has a significant negative effect on Infant Mortality Rate (IMR) in Ondo State. Additionally, the Hosmer-Lemeshow statistic (1.000) suggests that the model fits the data well. Therefore, we accept the alternative hypothesis for IMR.

4.4.2 Test of hypothesis Two

H02: Herbal Medicine Rate (HEM), has no significant effect on Under-five Mortality Rates (U₅MR) in Ondo State

The logistic regression results for MAL include a significant p-value (Sig.) of 0.004, and the coefficient for MAL is -7.112. Based on these results, we accept the alternative hypothesis for U₅MR. There is strong evidence to suggest that Herbal Medicine has a significant negative effect on Under-five Mortality Rates (U₅MR) in Ondo State. Additionally, the Hosmer-Lemeshow statistic (1.000) suggests that the model fits the data well. Therefore, we accept the alternative hypothesis for U₅MR.

4.4.1 Test of hypothesis Three

H03: Herbal Medicine Rate (HEM), has no significant effect on Maternal Mortality Rate (MMR) in Ondo State.

The logistic regression results for MAL include a significant p-value (Sig.) of 0.002, and the coefficient for MMR is -26.087. Based on these results, we accept the alternative hypothesis for MMR. There is strong evidence to suggest that Herbal Medicine has a significant negative effect on Maternal Mortality Rate (MMR) in Ondo State. Additionally, the Hosmer-Lemeshow statistic (1.000) suggests that the model fits the data well. Therefore, we accept the alternative hypothesis for MMR.

4.4.2 Test of hypothesis Four

H04: Herbal Medicine Rate (HEM), has no significant effect on life expectancy (LEX) in Ondo State

The logistic regression results for LEX include a significant p-value (Sig.) of 0.004, and the coefficient for LEX is 33.007. Based on these results, we accept the alternative hypothesis for LEX. There is strong evidence to suggest that Herbal Medicine has a significant positive effect on life expectancy (LEX) in Ondo State. Additionally, the Hosmer-Lemeshow statistic (1.000) suggests that the model fits the data well. Therefore, we accept the alternative hypothesis for LEX.

4.3 Discussion of findings

The logistic regression analysis highlights that Herbal Medicine Rate (HEM) significantly and negatively affecting Infant Mortality Rate (IMR) in Ondo State, with increasing Herbal Medicine Rates correlating with a decrease in Infant Mortality Rate (IMR).

The analysis highlights the significant negative impact of Herbal Medicine (HEM) on Under-five Mortality Rates (U₅MR) in Ondo State, signifying that rising (HEM) is linked to decrease in Under-five Mortality Rates (U₅MR).

The logistic regression analysis reveals that Herbal Medicine (HEM) significantly and negatively impacts Maternal Mortality Rate (MMR) in Ondo State, with higher AMR associated with decreased life expectancy.

The logistic regression analysis reveals that Herbal Medicine (HEM) has a significant positive impacts life expectancy (LEX) in Ondo State, with higher AMR associated with decreased life expectancy.

Overall, the findings from the logistic regression analysis emphasize the substantial impact of Herbal Medicine on economic, health, and societal dimensions in Ondo State, revealing a nuanced interplay between Herbal medicine and health outcomes, viewed through the Grossman Model of Health Demand. This model conceptualizes health as a form of capital that individuals invest in to enhance their well-being and extend their productive lives. The study shows that Herbal medicine positively influences several health indicators, with varying effects on different outcomes. Specifically, Herbal medicine has been associated with reductions in negative health indicators such as infant mortality rate, under-five mortality rate, and maternal mortality rate. These reductions suggest that Herbal medicine, with its culturally relevant and accessible treatments, plays a critical role in improving early-life health and maternal outcomes. This aligns with the Grossman Model's view that investments in health, including Herbal medicine, help reduce adverse health conditions and enhance health capital. As Herbal medicine contributes to lowering these mortality rates, it indicates a positive impact on health, which in turn supports better socio-economic conditions by reducing the healthcare burden on families and communities. On the other hand, the study also reveals a positive relationship between Herbal medicine and life expectancy. The Grossman Model predicts that improving health through effective interventions, such as Herbal medicine, leads to longer, healthier lives. This is supported by the observed increase in life expectancy linked to the use of Herbal medicine in Ondo State.

By extending life expectancy, Herbal medicine not only improves individual well-being but also enhances productivity and economic participation, thereby contributing to broader socio-economic development. The integration of Herbal medicine with modern healthcare approaches has broader socio-economic implications. Improved health outcomes from Herbal medicine reduce healthcare costs and alleviate financial pressures on families, leading to enhanced economic stability and growth. Additionally, Herbal medicine stimulates local economies through activities such as the cultivation of medicinal plants and the establishment of health-related enterprises. This economic stimulation reinforces the positive relationship between health investments and socio-economic development, as individuals with better health outcomes are more likely to contribute productively to their communities. Empirical studies have corroborated these findings, demonstrating that Herbal medicine can effectively improve health indicators and stimulate economic benefits. For instance, similar research has shown reductions in mortality rates and increases in life expectancy in areas where Herbal medicine is prevalent, reflecting its role in enhancing economic stability and growth.

In summary, the positive impact of Herbal medicine on health outcomes such as reduced mortality rates and increased life expectancy underscores its importance in promoting socio-economic development. By improving

key health indicators and supporting economic growth, Herbal medicine offers valuable contributions to both individual well-being and community prosperity. Integrating Herbal medicine into broader healthcare systems can thus maximize its benefits and foster a more inclusive and effective approach to health and development.

4.4 Policy Implications

The positive relationship between Herbal medicine and socioeconomic development highlights several critical policy implications that can enhance both health outcomes and economic growth. To fully leverage the benefits of Herbal medicine, it is essential to integrate it with modern healthcare systems. Policies should be designed to facilitate this integration by establishing frameworks that recognize and regulate Herbal practices, ensuring that they meet established safety and efficacy standards. Such measures will provide accessible and culturally relevant healthcare options, thereby improving overall health outcomes and reducing healthcare costs. Investing in research on Herbal medicine is another crucial aspect. Increased funding and rigorous research are needed to validate the benefits of Herbal practices, providing a solid evidence base for their inclusion in healthcare systems. By understanding the scientific underpinnings of these practices, policymakers and healthcare providers can develop more effective health interventions and policies. Training programs for healthcare providers should include components on Herbal medicine. Educating practitioners about how Herbal treatments can complement modern care promotes a holistic approach to health, which can enhance patient outcomes and improve the overall quality of healthcare. It is also important to enhance access to Herbal medicine, particularly in underserved areas. Supporting local practitioners and ensuring the availability of Herbal remedies can help address healthcare disparities, leading to improved health outcomes and supporting socioeconomic development. Economic incentives for Herbal medicine can stimulate growth in this sector. Providing subsidies for research, offering tax breaks for health enterprises, and supporting local cultivation of medicinal plants can create jobs and contribute to local economies, further reinforcing the positive economic impact of Herbal medicine. Public awareness campaigns are necessary to educate communities about the benefits of Herbal medicine and its integration with modern practices. Increased awareness helps individuals make informed health choices and adopt preventative measures, ultimately enhancing health and economic benefits. Finally, establishing robust regulatory frameworks to ensure the quality and safety of Herbal medicine practices and products is essential. Such regulations will protect consumers, ensure efficacy, and build public trust, facilitating the effective integration of Herbal medicine into mainstream healthcare systems.

5.1 Conclusion

The study underscores the complex relationship between Herbal medicine and socioeconomic development, highlighting both its potential benefits and limitations. While Herbal medicine positively influences life expectancy by providing accessible and culturally relevant healthcare solutions, its impact on other critical health outcomes, such as infant mortality, under-five mortality, and maternal mortality, can be less favorable compared to modern medical interventions.

Integrating Herbal medicine with modern healthcare systems offers a promising approach to enhancing overall health outcomes. This integration can capitalize on the strengths of Herbal practices, such as affordability and cultural relevance, while addressing their limitations through complementary modern treatments. The Grossman Model of Health Demand provides a useful framework for understanding how investments in health, including Herbal medicine, can improve well-being and economic productivity.

To fully harness the benefits of Herbal medicine, it is crucial to support ongoing research to validate its effectiveness, address its limitations, and guide informed policy decisions. Training healthcare providers in both Herbal and modern practices can enhance the quality of care and ensure a more holistic approach to health. Increasing access to Herbal medicine in underserved areas, providing economic incentives for the sector, and launching public awareness campaigns can further contribute to its effective integration and impact.

Establishing regulatory frameworks that ensure the safety, efficacy, and quality of Herbal medicine practices is essential for protecting consumers and facilitating their incorporation into mainstream healthcare. By acknowledging and addressing both the positive and negative aspects of Herbal medicine, the study advocates for a balanced approach that improves health

outcomes, reduces healthcare costs, and fosters socioeconomic development, ultimately leading to a more inclusive and effective healthcare system.

5.2 Recommendations

The following recommendations were based upon the findings:

1. **Integrate Herbal Medicine into Primary Healthcare Systems:** Develop a framework to formally integrate Herbal medicine with modern healthcare services. This approach ensures that Herbal practices complement conventional treatments, enhances accessibility to culturally relevant care, and addresses critical health issues such as infant mortality, under-five mortality, and maternal mortality.
2. **Support Comprehensive Research Initiatives:** Invest in extensive research to evaluate the efficacy and safety of Herbal medicine practices. Focus on studies that assess their impact on health outcomes like life expectancy and mortality rates. This evidence will help refine practices, validate their benefits, and guide policy-making.
3. **Promote Training and Collaboration for Healthcare Providers:** Establish training programs for healthcare professionals that encompass both Herbal and modern medical practices. This will foster collaboration between Herbal healers and modern practitioners, leading to more holistic and effective patient care and improved health outcomes.
4. **Develop Regulatory Standards for Herbal Medicine:** Implement robust regulatory standards to ensure the quality, safety, and efficacy of Herbal medicine practices. Clear regulations will protect consumers, enhance the credibility of Herbal practices, and facilitate their integration into the broader healthcare system, contributing to overall socioeconomic development.

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