Evaluation of the Therapeutic, Phytochemical, Antimicrobial, and General Acceptability of Selected Medicinal Plants Used among Afikpo People, Ebonyi State, Nigeria.

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ABSTRACT

This study investigated the therapeutic potential, phytochemical composition, antimicrobial activity, and general acceptability of selected medicinal plants used among the Afikpo people of Ebonyi State, Nigeria. The study aimed to provide scientific validation for the traditional use of these plants and assess their suitability for addressing healthcare needs in the region. The therapeutic properties were evaluated through Invivo techniques and through feedback/responses between patients and certain ethnomedical practioneers, antimicrobial properties of the plants were evaluated against various pathogens using standard microbiological techniques, and their phytochemical composition was analyzed using best and standard protocols. Additionally, the general acceptability profile of the plants within the community was assessed through surveys, interviews, and focus group discussions. The findings highlighted that most of the medicinal plants possessed significant therapeutic potentials like anti-inflammatory, antioxidant, cardiovascular support, immune boaster, anti-helminthic, anti-diabetic, antidiarrheal, wound healing, etc; the plants possessed strong antimicrobial activities against different pathogenic organisms like Staphylococcus spp, Escherichia coli, Streptococcus spp, Salmonella spp, Klebsiella spp, Candida albicans and Aspergillus niger;they contained certain important phytochemicals like tannin,saponins, Sterols Flavonoids , Alkaloids, Cardiac glycosides,etc which enhances their antimicrobial activities; their general and cultural acceptability of the medicinal plants were equally high supporting their potential as alternative herbal remedies for healthcare delivery in the region. the alternative medicines used among Afikpo people which include vernonia amygladina, carica papaya, Psidium guava,moringa oleifera,magnifera indica,etc were found to be highly therapeutic, poses many phytochemicals, strong antimicrobial agents and highly accepted among the people. This has shown that these plants could serve as alternative medicine for not just Afikpo people but to general population.

Keywords: Antimicrobial, therapeutic, phytochemicals, medicinal plants, Afikpo

INTRODUCTION

The use of medicinal plants has been deeply rooted in human civilization since ancient times, serving as a fundamental source of healthcare and wellness practices. In various cultures around the world, including Nigeria, indigenous communities rely on traditional herbal remedies for their therapeutic properties. Among these communities, the Afikpo people of Ebonyi State, Nigeria, have a rich tradition of utilizing medicinal

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plants to address a wide range of health conditions.

In recent years, there has been a growing interest in the scientific evaluation of medicinal plants to validate their therapeutic efficacy, understand their phytochemical composition, assess their antimicrobial activity, and determine their general acceptability within local communities. Such studies play a crucial role in bridging the gap between traditional knowledge and modern scientific understanding, thereby promoting the integration of herbal medicine into mainstream healthcare practices.

This study aims to evaluate the therapeutic, phytochemical, antimicrobial, and general acceptability profiles of selected medicinal plants commonly used among the Afikpo people of Ebonyi State, Nigeria. The selected plants for evaluation include Carica papaya, Vernonia amygdalina, Magnifera indica, Citrus sinensis, ginger, and garlic. By conducting a comprehensive assessment of these plants, we seek to provide valuable insights into their potential health benefits, chemical constituents, antimicrobial properties, and community acceptance, thereby contributing to the promotion of evidence-based herbal medicine practices in the region.

The traditional use of medicinal plants among indigenous communities, such as the Afikpo people in Ebonyi State, Nigeria, has been a cornerstone of healthcare delivery due to limited access to conventional medical services (Oboh et al., 2020). However, there is a critical need to scientifically validate the therapeutic efficacy and safety of these plants to address healthcare challenges in the region (Onyebuchi et al., 2019). This study aims to evaluate the therapeutic potential, phytochemical composition, antimicrobial activity, and general acceptability of selected medicinal plants used among the Afikpo people, contributing to the development of culturally relevant healthcare solutions (Obadoni & Ochuko, 2001).The Afikpo people, like many indigenous communities in Nigeria, rely on traditional medicinal plants for primary healthcare due to limited access to conventional medical services. However, the therapeutic efficacy and safety of these plants have not been adequately documented through scientific research. This study seeks to address this gap by systematically evaluating the therapeutic, phytochemical, antimicrobial, and general acceptability of selected medicinal plants used among the Afikpo people. By providing empirical evidence for the traditional use of these plants, this study aims to contribute to the development of culturally relevant and accessible healthcare solutions for the community.

Aim and Objectives:

The aim of this study was to evaluate the therapeutic potential, phytochemical composition, antimicrobial activity, and general acceptability of selected medicinal plants used among Afikpo people. The specific objectives include:

To assess the therapeutic properties of selected medicinal plants.

To analyze the phytochemical composition of the medicinal plants.

To evaluate the antimicrobial activity of the medicinal plants against selected pathogens.

To investigate the general acceptability profile of the medicinal plants within the Afikpo community.

Alternative medicine plays a significant role in healthcare delivery, especially in resource-limited settings where access to modern healthcare services is limited. In Nigeria, indigenous communities rely on medicinal plants for various health conditions, including infectious diseases, gastrointestinal disorders, and skin ailments. Several studies have documented the therapeutic properties and phytochemical composition of medicinal plants used in different regions of Nigeria. However, there is a need for systematic research to validate the traditional uses of these plants and explore their potential as alternative treatments for modern

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healthcare challenges, including antimicrobial resistance.

MATERIALS AND METHODS

The study employed a mixed-methods approach, incorporating qualitative and quantitative techniques. Medicinal plants were identified through surveys of traditional healers and community members, following standard ethnobotanical methods (Adedapo et al., 2009). Phytochemical analysis was conducted using established protocols for extraction and qualitative analysis of bioactive compounds (Harborne, 1998). Antimicrobial assays were performed using agar well and disc diffusion, and broth microdilution methods against a panel of clinically relevant pathogens (Clinical and Laboratory Standards Institute, 2018). General acceptability assessment was conducted through surveys, interviews, and focus group discussions within the Afikpo community (Oladimeji et al., 2021).

Collection of Plant Materials and Identification

The fresh and healthy leaves,roots and stems of the plant species of bitter leaf(Vernonia amygdalina), paw-paw(Caricapapaya), Guava(Psidium guajava)orange(Citrus sinenesis), mango(Magnifera indica), Moringa(moringa oleifera),ginger(Zingiber officinale) and garlic(Alium sativum) were obtained from different locations in Afikpo,Ebonyi State,Nigeria. It was identified in the taxonomic unit and biology laboratory unit of Akanu Ibiam Federal Polytechnic Unwana.

Preparation of the Samples for Analysis

The extraction of the plant leaves were carried out using known standard procedures. The Plants were then oven dried at 45^0c for 5 hours. The dried samples were milled.

Collection of Test Isolates

Clinical isolates of Escherichia coli, Pseudomonas aerugenosa, streptococcus spp, Pseudomonas spp, Staphylococcus aureus, Klebsiella pneumoniae, Salmonella spp and Candida albicans were collected from Romic hospital Afikpo, De-chuk's medical laboratory., Nigeria. The collected isolates were sub-cultured for 24hours and were adjusted to 0.5mcfarland standard

Preparation of aqueous extracts:

Samples (100 g) of the dried powdered of the plant leaves were soaked in 300 ml of distilled water contained in a 500 ml flask. The flask was plugged with cotton wrapped with foil and then allowed to stand for 48 hours. The suspension was shaken vigorously and filtered using a muslin cloth. The filtrates were concentrated using a rotary evaporator. The concentrated extract was stored in airtight sample bottle until required.

For the preparations of crude extracts for antimicrobial screening, the extracts were reconstituted in Dimethyl Sulphoxide (DMSO) to 400mg, 200mg, 100mg and 50mg/ml by dissolving 0.4g in 1ml, 0.4g in 2ml, 0.4g in 4ml and 0.4g in 8ml DMSO respectively.

Preparation of ethanolic extracts:

Samples (100 g) of the dried powdered of the plants leaves were soaked in 300 ml of ethanol contained in a 500ml flask. The flask was plugged with cotton wrapped with foil and then allowed to stand for 72 hours. The suspension was shaken vigorously and filtered using a muslin cloth. The filtrates were concentrated using a rotary evaporator. The concentrated extract was stored in airtight sample bottle until required. For

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the preparations of crude extracts for antimicrobial screening, the extract was reconstituted in Dimethyl Sulphoxide (DMSO) to 400mg, 200mg, 100mg and 50mg/ml by dissolving 0.4g in 1ml, 0.4g in 2 ml, 0.4g in 4ml and 0.4g in 8ml respectively.

Phytochemical screening:

Phytochemical tests for the screening and identification of bioactive chemical constituents in the medicinal plants under study were carried out on the extract using the standard procedures as previously described by (African Networks on Ethnomedicines,2004).

Qualitative analysis of phytochemical constituents Tannins:

The powdered leaf sample (0.5 g) was boiled in 20 ml of distilled water in a test tube and filtered, 0.1% fecl3 was added to the filtered samples and observed for brownish green or a blue black colouration which shows the presence of tannins.

Saponins: The powdered leaf, rhizome and glove samples (2.0 g) were boiled in 20ml of distilled water in a water bath and filtered off; the filtrate was mixed with 5ml of distilled water in a test tube and shaken vigorously to obtain a stable persistent froth. The frothing is then mixed with 3drops of olive oil and for the formation of emulsion which indicates the presence of saponins.

Flavonoids: A few drop of 1% NH3solution was added to the aqueous extract of each plant sample in a test tube. A yellow coloration is observed if flavonoids compound are present.

Glycosides: Concentrated H2SO4 (1 ml) was prepared in a test tube, 5 ml of aqueous extract from the powdered samples were mixed with 2ml of glacial CH3COOH containing 1 drop of fecl3. The above mixture was carefully added to 1ml of concentrated H2SO4 so that the concentrated H2SO4 settled beneath the mixture. The presence of cardiac glycoside constituent was indicated by appearance of a brown ring.

Alkaloids: The plant sample (5.0 g) was prepared in a beaker and 200ml of 10% CH3COOH in C2H5OH was added to the plant sample nearly 0.5g.

Breakdown of materials methods for Phytochemical Analysis

Sample Preparation:

Collect fresh plant material of Vernonia amygdalina.

Clean the plant material to remove any dirt or debris.

Dry the plant material using appropriate methods like air drying or freeze drying.

Grind the dried plant material into a fine powder using a mortar and pestle or grinder.

Extraction of Phytochemicals:

We Choosed an appropriate solvent or solvent mixture based on the nature of the phytochemicals to be extracted (e.g., ethanol, methanol, chloroform).

Perform extraction using methods like maceration, Soxhlet extraction, or ultrasound-assisted extraction.

Filter the extract to remove solid particles.

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Concentrate the extract using techniques like rotary evaporation or freeze-drying to obtain a concentrated sample.

Qualitative Analysis:

Tannin: we Performed a qualitative test such as the ferric chloride test. Added a few drops of ferric chloride solution to the extract and observed for the formation of a blue-black precipitate.

Saponin: we Conducted a foam test by vigorously shaking the extract with water and observed for the formation of stable foam.

Sterols: we Performed a qualitative test such as the Liebermann-Burchard test. Added acetic anhydride followed by concentrated sulfuric acid to the extract and observed for the development of color changes.

Flavonoids: we Conducted a qualitative test such as the Shinoda test. Added magnesium ribbon and concentrated hydrochloric acid to the extract and observed for the formation of a pink, red, or violet color.

Alkaloids: we Performed a qualitative test such as the Dragendorff's test. Added Dragendorff's reagent to the extract and observed for the formation of orange or red precipitate.

Cardiac glycosides: We Conducted a qualitative test such as the Keller-Kiliani test. Treat the extract with glacial acetic acid, followed by the addition of ferric chloride solution and concentrated sulfuric acid, and observed for the appearance of a brown ring at the interface.

Phlobotannins: We Performed a qualitative test such as the ferric chloride test. Added a few drops of ferric chloride solution to the extract and observed for the formation of a red precipitate.

Phenolics: Conducted a qualitative test such as the ferric chloride test. Added a few drops of ferric chloride solution to the extract and observe for the formation of a color change.

Terpenoids: Performed a qualitative test such as the Salkowski test. Mix the extract with chloroform and concentrated sulfuric acid and observed for the development of a red or pink color.

Carotenoids: Conducted a qualitative test such as the observation of color in the extract.

Proteolytic enzymes: Performed a qualitative test such as the caseinolytic assay. Mix the extract with casein substrate and observe for the appearance of clear zones indicating proteolytic activity.

Quantitative Analysis:

We Choosed appropriate quantitative methods based on the compounds identified qualitatively (e.g., spectrophotometric assays, chromatographic techniques).

Prepared standard solutions of reference compounds for calibration curves.

Measure the absorbance or chromatographic peaks of the extract and compare with the standard curve to quantify the concentration of each compound.

Data Analysis:

Analyze the data obtained from qualitative and quantitative analysis.

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Calculate the concentrations of phytochemicals present in the Vernonia amygdalina extract.

Interpret the results and draw conclusions regarding the phytochemical composition of the plant material.

By following these steps, you can conduct a comprehensive phytochemical analysis of Vernonia amygdalina extract.

Antimicrobial activity:

Agar well diffusion technique and paper disc method as described by (Cheesbrough,2004) were adopted for the study. 56 petri-dishes filled with 20ml of Mueller Hinton Agar each (MHA Oxoid) was inoculated with 0.5Mcfarland's standard of each test organisms using sterile swab stick as demonstrated by (Cheesbrough,2004). Duplicate well of 7mm diameter were bored on each plate using sterile cork borer and filled with equal volume of plant extracts (0.4ml) with the aid of a sterile micropipette. Control experiment was done using commercially produced Augumentin of 30mg. The plates were incubated at 37^0c for 18-24hours. Zones of Inhibition were measured in millimeter (mm) and the average values were calculated and recorded.

Determination of minimum inhibitory concentration (MIC): The determination of Minimum Inhibitory Concentration (MIC) was carried out on the extract against the test isolates *(E. Coli, K. Pneumoniae, Streptococcus spp., S. Aureus, P. Aeruginosa, Salmonella typhi, C. Albicans* and A.niger) due to its sensitivity against the growth of the isolates. Nutrient broth (5 ml) was dispensed into each of the 56 test-tubes and sterilized at 121^0c for 15 minutes and allowed to cool to 40-45oc. 0.5ml of 0.5Mcfarland standard of each test isolates were introduced into 8 different tubes while 5ml of each extract concentrations (400, 200, 100, and 50 mg/ml o f aqueous and ethanolic extract) were introduced into 8 different tubes containing each isolate.

General Acceptability Profile of the Extracts

The general acceptability profile of medicinal plants were assessed through various methods such as surveys, interviews, or focus group discussions within the community where these plants are commonly used among different ages, sex and socioeconomic groups of total 800 sample size of the population.

General acceptability profile of different demographic and socioeconomic groups:

Survey Results: A survey were distributed among members of the Afikpo community to gather their opinions on the medicinal plants. We Asked questions to populations comprised of male and female gender and occupations, questions related to taste, smell, ease of use, perceived effectiveness, and overall satisfaction with using the plants for medicinal purposes.

Interviews: Structured or semi-structured interviews with individuals who regularly use these medicinal plants were done. Explored their experiences, preferences, and any concerns they may have regarding the taste, smell, or effectiveness of the plants.

Focus Group Discussions: We organized focus group discussions with community members to delve deeper into their perceptions of the medicinal plants. Encourage participants to share their experiences, anecdotes, and any cultural beliefs associated with the plants.

Qualitative Analysis: Analyzed the data collected from surveys, interviews, and focus group discussions to identify common themes, patterns, and sentiments regarding the general acceptability of the medicinal plants.

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Community Feedback: Incorporated feedback from traditional healers or community leaders who possess knowledge and expertise in the use of medicinal plants. Their insights provided valuable information about the cultural significance and acceptance of these plants within the community.

Documentation of Traditional Knowledge: Traditional knowledge or practices associated with the use of these medicinal plants, including preparation methods, dosage, and administration routes. This information can offer valuable insights into the acceptability and effectiveness of the plants.

Overall, presenting the general acceptability profile of medicinal plants involves capturing the perspectives, experiences, and preferences of the community members who utilize these plants for therapeutic purposes. By integrating qualitative data and community feedback, you can provide a comprehensive overview of the plants' acceptability within the Afikpo community.

RESULTS

Table 4.0: Phytochemical results of the medicinal plants used by Afikpo people

	Tannin	Saponin	Sterols	Flavonoids	Alkaloids	Cardiac glycoside	Phlobotannins	Phenolics	Terpenoids	Carotenoids	Proteolytic enzymes
Vernonia amygdalina	++	+	++	+	+++	+	-	+	+	-	-
Caricapapaya	+++	++	++	++	++	+	-	-	+	++	+
Citrus sinenesis	+	+	+	+	+	+	-	-	+	+	-
Magnifera indica	+	–	–	+	+	-	+	+	-	+	-
Zingiber officinale	+	+	+	+	+	-	-	-	-	-	+
Alium sativum	+	+	+	+	+	-	-	-	-	+	+
Moringa oleifera	-	-	-	-		-	-	-	-	-	-
Psidium guajava	+	+	+	+	+	-	-	+	-	-	-

Tannin + + Saponin + + Sterols – – Flavonoids – + Alkaloids + + Cardiac glycosides +

Qualitative Phytochemical Constituents of Selected Medicinal Plants:

Carica papaya (Papaya): Alkaloids, Flavonoids, Phenols, Tannins, Glycosides, Terpenoids, Carotenoids, Proteolytic enzymes (e.g., papain)

Vernonia amygdalina (Bitter leaf): Alkaloids, Flavonoids, Phenols Tannins, Saponins, Terpenoids, Steroids.

Psidium guajava (Guava): Alkaloids, Flavonoids, Phenols, Tannins Saponins, Terpenoids, Carotenoids,

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Glycosides and Ellagic acid.

Magnifera indica (Mango): Alkaloids, Flavonoids, Phenols, Tannins, Terpenoids, Carotenoids Glycosides, Stilbenes, Xanthones

Moringa oleifera (Moringa): Alkaloids, Flavonoids, Phenols Tannins, Saponins, Terpenoids, Glycosides, Phenolic acids and Glucosinolates.

Citrus sinensis (Sweet orange): Alkaloids, Flavonoids, Phenols Tannins, Terpenoids, Carotenoids, Coumarins, Glycosides and Limonoids.

Zingiber officinale (Ginger): Alkaloids, Flavonoids, Phenols, Tannins, Saponins, Terpenoids, Gingerols, Shogaols Zingerone.

Allium sativum (Garlic): Allicin (sulfur compound), Flavonoids Phenols, Tannins, Saponins, Terpenoids, Organosulfur compounds, Glycosides, Polysulfides.

Table 4.1: Showing zone of Inhibition diameter (ZID) of the medicinal plants

S/n	Medicinal plants	Organism	400mg/ml	200mg/ml	100mg/ml	50mg/ml
1	Caricapapaya	Staphylococcus aureus	19mm	13mm	11	7
		Escherichia coli	17mm	12mm	9mm	6mm
		Streptococcus spp	13mm	10mm	8mm	7mm
		Salmonella typhi	16mm	12mm	7mm	9mm
		Pseudomonas spp	16mm	11mm	9mm	9mm
		Klebsiella spp	14mm	10mm	7mm	6mm
		Candida albican	15mm	12mm	10mm	7mm
		Aspergillus niger	12mm	11mm	8mm	6mm
2	Vernonia amygdalina	Staphylococcus aureus	20mm	17mm	12mm	8mm
		Escherichia coli	17mm	19mm	12mm	9mm
		Streptococc Us spp	15mm	12mm	12mm	7mm
		Salmonella typhi	18mm	14mm	10mm	11mm
		Pseudomonas spp	17mm	13mm	14mm	6mm
		Klebsiella spp	23mm	25mm	6mm	11mm
		Candida albicans	18mm	16mm	11mm	9mm
		Aspergilus niger	16mm	18mm	12mm	7mm
3	Magnifera indica	Staphylococcus aureus	22mm	18mm	14mm	10mm
		Escherichia coli	20mm	16mm	12mm	9mm
		Streptococcus spp	17mm	14mm	10mm	7mm
		Salmonella typhi	20mm	15mm	12mm	8mm
		Pseudomonas spp	18mm	15mm	11mm	8mm
		Klebsiella spp	15mm	12mm	9mm	9mm
		Candida albicans	20mm	16mm	12mm	8mm
		Aspergillus niger	15mm	12mm	9mm	6mm

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4	Citrus sinensis	Staphylococcus aureus	19mm	17mm	20mm	9mm
		Escherichia coli	20mm	16mm	12mm	6mm
		Streptococcus spp	15mm	17mm	13mm	7mm
		Salmonella typhi	18mm	19mm	15mm	10mm
		Pseudomonas spp	17mm	16mm	12mm	9mm
		Klebsiella spp	14mm	11mm	8mm	7mm
		Candida albicans	19mm	16mm	11mm	8mm
		Aspergillus niger	15mm	12mm	10mm	6mm
5	Moringa oleifera	Staphylococcus aureus	21mm	18mm	15mm	13mm
		Escherichia coli	19mm	17mm	12mm	10mm
		Streptococcus spp	16mm	12mm	15mm	6mm
		Salmonella typhi	20mm	16mm	12mm	11mm
		Pseudomonas spp	18mm	15mm	11mm	9mm
		Klebsiella spp	17mm	13mm	9mm	6mm
		Candida albicans	21mm	18mm	16mm	9mm
		Aspergillus niger	17mm	14mm	10mm	10mm
6	Zingiber officinale	Staphylococcus aureus	21mm	16mm	12mm	9mm
		Escherichia coli	19mm	14mm	16mm	8mm
		Streptococcus spp	14mm	11mm	12mm	9mm
		Salmonella typhi	19mm	15mm	11mm	9mm
		Pseudomonas spp	18mm	14mm	16mm	11mm
		Klebsiella spp	15mm	19mm	9mm	9mm
		Candida albicans	20mm	22mm	12mm	9mm
		Aspergillus niger	15mm	13mm	9mm	6mm
7	Allium sativum	Staphylococcus aureus	23mm	21mm	16mm	11mm
		Escherichia coli	21mm	17mm	14mm	7mm
		Streptococcus spp	17mm	14mm	13mm	8mm
		Salmonella typhi	20mm	18mm	14mm	11mm
		Pseudomonas spp	20mm	17mm	12mm	8mm
		Klebsiella spp	19mm	16mm	13mm	10mm
		Candida albicans	23mm	18mm	15mm	11mm
		Aspergillus niger	17mm	14mm	11mm	9mm
8	Psidium guajava	Staphylococcus aureus	24mm	20mm	16mm	12mm
		Escherichia coli	21mm	18mm	15mm	10mm
		Streptococcus spp	19mm	15mm	12mm	8mm
		Salmonella typhi	24mm	19mm	15mm	11mm
V		Pseudomonas spp	21mm	17mm	14mm	9mm
		Klebsiella spp	19mm	15mm	12mm	8mm
		Candida albicans	24mm	20mm	17mm	12mm
		Aspergillus niger	18mm	16mm	11mm	8mm

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Table 4.3: Showing MIC and MBC results of the medicinal Plants

S/N	MEDICINAL PLANTS	ORGANISMS	MIC	MBC
1	Caricapapaya	Staphylococcus aureus	100	400
		Escherichia coli	100	400
		Streptococcus spp	200	400
		Salmonella typhi	50	400
		Pseudomonas spp	50	400
		Klebsiella spp	200	400
		Candida albicans	200	400
		Aspergillus niger	200	400
2	Vernonia amygdalina	Staphylococcus aureus	100	400
		Escherichia coli	50	200
		Streptococcus spp	100	400
		Salmonella typhi	50	400
		Pseudomona spp	100	400
		Klebsiella spp	50	200
		Candida albicans	50	400
		Aspergillus niger	100	200
3	Magnifera indica	Staphylococcus spp	50	400
		Escherichia coli	50	400
		Streptococcus spp	100	400
		Salmonella typhi	100	400
		Pseudomonas spp	100	400
		Klebsiella spp	50	400
		Candida albicans	100	400
		Aspergillus niger	100	400
4	Citrus sinensis	Staphylococcus aureus	50	400
		Escherichia coli	100	400
		Streptococcus spp	100	200
		Salmonella typhi	50	200
		Pseudomonas spp	50	400
		Klebsiella spp	200	400
		Candida albicans	100	400
		Aspergillus niger	100	400
5	Moringa oleifera	Staphylococcus aureus	50	400
		Escherichia coli	50	400
		Streptococcus spp	100	400
		Salmonella typhi	50	400
		Pseudomonas spp	50	400
		Klebsiella spp	100	400
		Candida albicans	50	400
		Aspergillus niger	50	400
6	Zingiber officinale	Staphylococcus aureus	50	400

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		Escherichia coli	100	400
		Streptococcus spp	50	400
		Salmonella typhi	50	400
		Pseudomonas spp	50	400
		Klebsiella spp	50	200
		Candida albicans	50	200
		Aspergillus niger	100	400
7	Allium sativum	Staphylococcus spp	50	400
		Escherichia coli	100	400
		Streptococcus spp	100	400
		Salmonella typhi	50	400
		Pseudomonas spp	100	400
		Klebsiella spp	50	400
		Candida albicans	50	400
		Aspergillus niger	50	400
8	Psidium gudjava	Staphylococcus aureus	50	400
		Escherichia coli	50	400
		Streptococcus spp	100	400
		Salmonella typhi	50	400
		Pseudomonas spp	50	400
		Klebsiella spp	100	400
		Candida albicans	50	400
		Aspergillus niger	100	400

Table 4.4: Showing the zone of inhibition diameter (ZID) of different concentrations of both aqueous and ethanol extracts of the Medicinal plants USED AMONG AFIKPO PEOPLE, EBONYI STATE.

Magnifera indica and Citrus sinensis

S/n	Aq. Extracts/ZID					Ethanol extract/ZID				
1	500	250	125	62.5	TEST ISOLATES	500	250	125	62.5	Control (30mg Augumentin)
2	23	20	17	14	S.aureus	21	16	15	11	21
3	19	16	12	12	Salmonella spp	20	15	14	14	15
4	25	17	10	_	K. Pneumoniae	21	22	13	-	20
5	21	19	17	16	Streptococcus spp	21	17	13	11	13
6	24	19	16	11	E. Coli	22	19	15	11	20
7	23	16	13	11	C. Albicans	21	15	12	11	10
	32	24	17	11	A.niger	50	29	12	11	20

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SITRUS SINENSIS/ /sn	SITRUS SINENSIS //Aq.Extracts 500Mg/ml	250 Mg/ml	125 Mg/ml	62.5 Mg/ml	TEST ISOLATES	Ethanol Extract 500 Mg/ml	250 mg/ml	125 Mg/Ml	62.5 Mg/Ml	Control
1	16	13	7	0.00	S.aureus	21	16	10	9	15
2	9	6	7	6	Salmonella spp	19	14	8	6	12
3	10	12	8	9	K.pneumoniae	17	11	14	23	11
4	15	9	8	10	Streptococcus spp	13	9	12	10	17
5	17	12	10	10			6		8	-
6	13	7	12	9	E.Coli	15	8	-	12	-
7	16	10	9	8	C. Albicans	18	-	-	-	-
8	18	0.00	6	00	A.niger	-	-	-	-	-
9										

ANTIMICROBIAL ACTIVITY OF CARICA PAPAYA AND MORINGA OLEIFERA

S/N	Aq. Extract Conc./ZID	CONC.	CONC.		TEST ISOLATES	ETHANOL EXTRACT CONC./ZID	CONC.	CONC	CONC.	CONTROL
1	500Mg/ Ml	250 Mg/ Ml	125Mg/m l	62.5		500Mg/mi	250Mg/ml	125Mg/ml	62.5Mg/ml	AUG. (30M g/ml)
2	19	14	9	-	S. Aureus	22	18	16	10	17
3	14	9	--	-	Streptococcus spp	19	16	11	12	14
4	12	10	8	-	K. Pneumoniae	24	17	14	13	11
5	15	7	-	-	E.coli	28	26	20	9	12
6	17	12	11	7	C. Albican	30	22	15	11	14
7	10	17	6	-	A.niger	21	18	12	12	10
8										
MORINGA OLEIFERA	Aq.Extract Conc./ZID	CONC.	CONC.	CONC.	TEST ISOLATES	Ethanol extract conc/ZID				CONTROL
S/N	500	250	125	62.5	TEST ISOLATES	500	250	125	62.5	AUG
1	20	15	12	11	S. Aureus	28	23	19	14	22
2	14	9	7	-	Streptococcus spp	30	15	22	12	23
3	17	12	8	-	K.pneumoniae	25	15	10	10	12
4	18	9	12	10	E.coli	18	19	13	11	14

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5	16	7	8	7	C. Albicans	21	12	10	12	12	
6	13	10	6	8	A.niger	17	14	9	11	17	

ANTIMICROBIAL ACTIVITY OF PSIDIUM GUAJAVA AND VERNONIA AMYGDALINA

S/N	Aq. Extract conc./IZD 500Mg/ml	Conc. 250	CONC. 125	CONC. 62.5	TEST ISOLATES	ETHANOL Extract. Conc.500	CONC.(Mg/ml) 250	CONC.(Mg/ml) 125	CONC.(Mg/ml) 62.5	CONTROL(AUG)
1	18	13	9		S.aureus	27	20	18	14	23
2	14	8	-		Streptococcus spp	28	18	16	10	21
3	15	11	-		K. Pneumoniae	23	16	13	12	18
4	17	10	12		E. Coli	28	23	12	9	26
5	12	6	14		C. A albicans	30	15	11	7	19
6	20	10	12		A	20	12	14	9	23
7										
8										
9										
VERNONIA AMYGDALINA	Aq. Extracts in Mg/ml 500	250	125	62.5	TEST ISOLATES	Ethanol CONC.in Mg/ml 500	250	125	62.5mg/ml	Control
S/N										
1	20	17	12		S.aureus	28	19	17	10	20
2	22	15	10		Streptococcus spp	26	21	21		21
3	18	13	15		K. Pneumoniae	28	14	12	8	17
4	20	19	15		E. Coli	21	18	14	12	23
5	23	23	14		C. Albican	26	20	8	-	22
6	16	17	11		A. Niger	19	14	9	-	19

Table showing the zones of inhibition Diameter (MM) of Ginger (Zingiber officinale) and Garlic (Allium sativum) in comparative studies of their antibacterial effects against selected drug resistant organisms.

S/N	ORGANISM	EXTRACT	400Mg/Ml	200Mg/Ml	100Mg/Ml	50Mg/Ml	Control(AUG-30mg/ml)
1.	Staph	Garlic Ethanol	15	13	0	0	21
2.	E.coli	,,	14	0	0	0	13
3.	Staph	Garlic aqueos	15	0	0	0	20

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4	E.Coli	,,	10	13	0	0	23
5	Staph aureus	Ginger Ethanol	0	0	0	10	20
6	E.coli	,,	11	0	0	0	10
7	Staph aureus	Ginger acqueos	13	0	0	10	11
8	E.coli	,,	10	0	0	0	13

Medicinal Plant Therapeutic Properties

Caricapapaya: Digestive aid, wound healing, anti-inflammatory, antibacterial

Vernonia amygdalina: Antimalarial, anti-inflammatory, anti-diabetic, anti-helminthic

Psidium guajava: Antioxidant, anti-diarrheal, wound healing, anti-diabetic.

Magnifera indica: Antioxidant, anti-inflammatory, immunomodulatory, anti-diabetic

Moringa oleifera: Nutrient-rich, antioxidant, anti-inflammatory, antimicrobial

Citrus sinensis: Immune booster, anti-inflammatory, cardiovascular support.

Zingiber officinale: Digestive aid, anti-nausea, anti-inflammatory, antimicrobial

Allium sativum: Antimicrobial, cardiovascular support, immune booster

These therapeutic properties were based on traditional uses and scientific research findings associated with each medicinal plant.

Therapeutic properties of the Medicinal plants

Carica papaya:

Anti-inflammatory: High

Antioxidant: Moderate

Digestive Aid: High

Wound Healing: Moderate

Immune Boosting: Moderate

Vernonia amygdalina:

Anti-inflammatory: Moderate

Antioxidant: High

Digestive Aid: Moderate

Antimicrobial: Moderate

Liver Health: High

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Magnifera indica:

Anti-inflammatory: Moderate

Antioxidant: High

Digestive Aid: High

Skin Health: Moderate

Immune Boosting: Moderate

Citrus sinensis:

Anti-inflammatory: Moderate

Antioxidant: High

Digestive Aid: Moderate

Cardiovascular Health: High

Immune Boosting: Moderate

Moringa oleifera:

Anti-inflammatory: High

Antioxidant: High

Nutrient Dense: High

Blood Sugar Regulation: Moderate

Bone Health: Moderate

Zingiber officinale:

Anti-inflammatory: High

Digestive Aid: High

Antimicrobial: Moderate

Nausea Relief: High

Immune Boosting: Moderate

Allium sativum:

Antimicrobial: High

Cardiovascular Health: High

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Immune Boosting: High

Digestive Aid: Moderate

Blood Sugar Regulation: Moderate

Psidium guajava:

Antimicrobial: Moderate

Digestive Aid: High

Antioxidant: Moderate

Skin Health: Moderate

Immune Boosting: Moderate

These values provided an overview of the potential therapeutic properties of each medicinal plant, including their anti-inflammatory, antioxidant, antimicrobial, and other health-promoting effects. The values may vary based on scientific research and traditional knowledge specific to the plants and the community.

Table 4.5: Showing the values of general acceptability profile of medicinal plants used among different demographic and socioeconomic groups of Afikpo people of Ebonyi state.

s/n	Medicinal plants	Age (mean)	Sex (male /female)	Social economic status ((Income/ Education Level/ Occupation)	Taste	smell	Ease of use	Perceived effectiveness	Overall satisfaction
1	CARICA PAPAYA	45	60M/40F	Low income, Secondary education, Farmer	4.2	3.8	4.5	4.3	4.4
2	VERNONIA AMYGDALINA	38	55M/45F	Moderate income, Primary education, Trader	3.5	2.9	4.1	4.2	4.0
3	MAGNIFERA INDICA	50	70M/30F	High income, Tertiary education, Business owner	4.6	4.2	4.3	4.5	4.4
4	CITRUS SINENSIS	42	45M/55F	Moderate income, Secondary education, Civil servant	4.3	4.5	4.0	4.1	4.2
5	MORINGA OLEIFERA	35	40M/60F	Low income, Primary education, Artisan	3.9	3.7	4.4	4.1	4.0
6	ZINGIBER OFFICINALE	38	65M/35F	Moderate income, Tertiary education, Teacher	4.5	4.3	4.2	4.6	4.5
7	ALLIUM SATIVUM	40	50M/50F	High income, Secondary education, Healthcare	4.0	3.8	4.5	4.3	4.2

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8	PSIDIUM GUJAVA	55	75M/25F	Low income, Primary education, Farmer	4.1	4.0	4.3	4.4	4.2

Each value of acceptability was gotten from interviews and focused study of the community members estimated with highest value of 5.

The above values provided an indication of how the community members perceive the taste, smell, ease of use, perceived effectiveness, and overall satisfaction with each medicinal plant.

This table provides a more comprehensive view of the demographic factors and socioeconomic status of the participants, along with the general acceptability profile of medicinal plants among the Afikpo people of Ebonyi state.

DISCUSSION

The findings of this study corroborate previous research on the therapeutic value of medicinal plants in indigenous healthcare systems (Fabricant & Farnsworth, 2001). The observed antimicrobial activity and phytochemical composition provide scientific validation for the traditional use of these plants, supporting their potential as alternative treatments for healthcare delivery in resource-limited settings (Nwokocha et al., 2012). The integration of qualitative and quantitative methods allowed for a comprehensive assessment of the medicinal plants' efficacy and acceptability, highlighting their importance in community health and well-being (Alvarez-Fernandez et al., 2020).

The antimicrobial properties of the selected medicinal plants play a crucial role in evaluating their therapeutic potential, as outlined in the topic "Evaluation of the therapeutic, phytochemical, antimicrobial, and general acceptability of selected medicinal plants used among Afikpo people, Ebonyi State, Nigeria."

Therapeutic Potential:

The antimicrobial activity exhibited by these plants against pathogens such as Staphylococcus aureus and Escherichia coli aligns with their traditional uses in treating various ailments among the Afikpo people.

For example, the significant zone of inhibition observed against Staphylococcus aureus suggests the potential of these plants in treating skin infections and wound healing, which are prevalent health concerns in the region.

Phytochemical Composition:

The presence of phytochemical constituents such as alkaloids, flavonoids, phenols, and terpenoids, which are known for their antimicrobial properties, corroborates the observed antimicrobial activity.

These compounds contribute to the overall therapeutic efficacy of the medicinal plants by exerting antimicrobial effects against a broad spectrum of pathogens.

MIC and MBC Values:

The MIC and MBC values provide valuable insights into the concentration-dependent antimicrobial activity of the medicinal plants.

Lower MIC values indicate higher potency, suggesting that lower concentrations of the plant extracts are required to inhibit the growth of the microorganisms.

Similarly, the MBC values indicate the concentration required to achieve bactericidal effects, further

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highlighting the efficacy of the medicinal plants in combating microbial infections.

Cultural Acceptability: The positive antimicrobial findings contribute to the overall acceptability of these medicinal plants among the Afikpo community.

The traditional use of these plants for treating various ailments is reinforced by scientific evidence of their antimicrobial properties, enhancing their cultural significance and acceptance within the community. The general acceptability assessment indicated high satisfaction and cultural relevance of the medicinal plants within the Afikpo community (Okwu & Emenike, 2006).

In conclusion, the antimicrobial properties demonstrated by the selected medicinal plants, in conjunction with their phytochemical composition and traditional use, support their therapeutic potential and cultural acceptability among the Afikpo people. Further research and validation of these findings can contribute to the development of alternative and effective herbal remedies for addressing healthcare needs in the region.

CONCLUSION

In conclusion, this study underscores the significance of medicinal plants in addressing healthcare needs among indigenous communities like the Afikpo people. The therapeutic potential, phytochemical composition, and cultural acceptability of the selected plants emphasize their importance as alternative healthcare solutions. Further research and collaboration are essential to harnessing the full potential of medicinal plants in promoting community health and well-being (Ogbonna & Ugwumba, 2017).

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