

Ethnostudy and Usage of Edible and Medicinal Mushrooms in Some Parts of Anambra State, Nigeria

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Received 8 January 2015; accepted 26 January 2015; published 29 January 2015

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Abstract

Indigenous knowledge and use of edible and medicinal mushrooms in some parts of Anambra state were investigated. Eleven local government areas of the state (Anambra) were randomly surveyed in which six hundred and fifty-six households were interviewed. A well-structured questionnaire was designed to obtain crucial information from the respondents. Residents of Anambra State had indigenous knowledge of mushrooms and their use. Findings revealed that residents of Anambra State consumed edible mushrooms as food and medicine equivalent to USD 7.70. The study showed that more than 85% of respondents interviewed had eaten edible mushrooms as food. Only 2% of them used some of the mushrooms as medicine for treatment of diseases. It was clearly observed that respondents who consumed edible mushrooms because their medicinal importance was significantly ($P < 0.05$) higher than those who did not consume them for the same purpose. There was no significant ($P > 0.05$) difference among the respondents who used edible mushrooms as an alternative to meat and fish when compared with those who did not use them in a similar manner. Investigation indicated that mushrooms served as an alternative source of income to rural people of Anambra State. Information gathered from respondents on the use of edible and medicinal mushrooms would form a baseline for further studies on ethnomedicinal practices among people of Nigeria and other nations of Africa.

Keywords

Edible and Medicinal Mushrooms, Ethnostudy, Anambra State, Nigeria

1. Introduction

In this present age, the study of mushrooms and their use is fast gaining the interest of many mycologists and

farmers worldwide. Ethnostudy of mushrooms is the study of how people of a particular location and culture utilize indigenous mushrooms. It also involves studying the description, biology, cultivation, nutritional values, medicinal properties, storage and benefits of consumption of mushrooms to human beings. As a fungus, mushrooms lack chlorophyll and can be found thriving on dead organic matter such as wood, rice straw, plantain leaves and orange leaves [1]. There are numerous studies carried out on cultivation, uses and nutritional importance of some edible and medicinal mushrooms in different parts of Nigeria [2]-[4]. In most cases, people, irrespective of their traditional beliefs and cultural values, recognize edible and medicinal mushrooms around their vicinities, which they use in preparation of soup and medicinal purposes. Moreover, cultivation of indigenous species of edible and medicinal mushrooms has become very urgent in order to prevent them from extinction caused by indiscriminate bush burning, urbanization and deforestation. Studies have been carried out on the application of mushrooms as sources of minerals (iron, calcium and phosphorus), vitamins (B, C and D) and treatment of certain diseases of mankind such as cancer, asthma, coughs and diabetes in some parts of Nigeria [5]-[7]. It is equally paramount to study the indigenous knowledge of mushrooms for future reference.

However, people collect some of these edible mushrooms from the forest and consume them as food. According to [2], some species of mushrooms such as those belonging to order agaricales are edible, while others like amanita species are not safe for consumption. Different edible and medicinal mushrooms are found in some parts of Anambra State which include *Lentinus squarrosulus* (Mont), *Volvariella volvacea* (Bull.) Singer, *Daldinia concentrica* (Bolton) Ces et De and so on. Mushroom biodiversity in Anambra State is poorly explored. For instance, *V. volvacea* and *L. squarrosulus* are widely distributed across the areas selected for this study and can provide additional source of income for rural dwellers. Mushrooms are collected from the wild using oil palm baskets and sold in the markets. Investigation revealed that a basket containing about 1 kg of fresh mushrooms, depending on the bargaining, could be sold for N1200, which was equivalent to USD 7.70. Information about indigenous knowledge on edible and medicinal mushrooms in different parts of Nigeria is yet to be fully studied. Additionally, in other parts of the world, reports on cultivation and use of edible and medicinal mushrooms exist. These include [8] in Tanzania, [9] in Japan, [10] in Thailand and [11] in USA.

This work, therefore, aims at investigating the indigenous knowledge and application of edible and medicinal mushrooms using some parts of Anambra State as a case study.

Objectives of the Study

- 1) To identify how rural people prepare medicinal mushrooms for treatment of ailments;
- 2) To identify reasons for consumption of mushrooms by indigenes of Anambra State;
- 3) To document the indigenous knowledge and uses of mushrooms by people of Anambra State.

2. Materials and Methods

The method of [12] was used in the study area which involved the use of a well-structured questionnaire to obtain vital information from the respondents.

2.1. Study Area

Eleven local government areas of Anambra state made up of Aguata, Awka-North, Anambra East, Dunukofia, Idemili North, Idemili South, Njikoka, Nnewi North, Nnewi South, Ogabru and Onitsha South were randomly selected for this study. Anambra state is found in the southeastern part of Nigeria. Its geographical coordinates is located between 6°20'N and 7°00'E [13]. According to [14], 98% of the indigenous ethnic group in Anambra State is the Igbo while 2% of the population is the Igala people who lived in the northwestern part of the State. The population of people living in it (Anambra State) is about 4,055,048 [15] and ranked 10 of 36 states of Nigeria. The natural vegetation in many parts of Anambra State is mainly grassland and woodland as well as tropical rainforest [16]. Also, the annual rainfall is between 1400 mm in the north to 2500 mm in the south with soil pH in some parts ranges from 3.5 to 6.4 [17].

2.2. Sampling Frame

The respondents to questionnaires were the Igbo ethnic group of Anambra State, Nigeria. Six hundred and fifty-six (656) households were interviewed. The choice of selecting the area was because they were predominantly

found in the Igbo land. In addition, they had similar cultural and traditional beliefs. In the local government areas visited, all the people spoke the same language, with slight variations in their pronunciations and intonations.

2.3. Sampling Procedure

Administration of Questionnaire

A well-structured questionnaire was designed to assist in obtaining crucial information from the people in the study areas. One hundred (100) questionnaires were randomly distributed to each eleven local government areas making a ground total of one thousand and one hundred (1100) questionnaires used in this survey. In most cases, the older men, women and some aged persons of the family helped in completing a questionnaire when given to them. The age of the respondents ranged from 29 to 81 years old. The questionnaire was constructed to get vital information as follows:

- 1) Age of respondent;
- 2) Local names and types of mushrooms collected from wild, whether they are used as food or medicine;
- 3) Reasons for eating mushrooms;
- 4) Whether mushrooms people consume are still in existence or no longer found in the environment;
- 5) How many types of mushrooms the people in the study area consume;
- 6) How to preserve fresh mushrooms for future use;
- 7) Whether the people are aware that some edible mushrooms are cultivable;
- 8) If they are interested in learning how to cultivate some of the edible mushrooms they consume;
- 9) The people involved in hunting and gathering of mushrooms within their locality;
- 10) Whether mushrooms are eaten by both the rich and the poor people.

3. Results

The residents of Anambra State have indigenous knowledge of mushrooms and their uses. They live in the southeastern part of Nigeria with latitude 6°20'N and longitude 7°00'E. The highest number of questionnaires eighty (80) was retrieved from Idemili North and the least, 44 was obtained from Ogbaru local government area (**Table 1**). The highest age bracket of respondents who have indigenous knowledge of mushrooms was obtained in Idemili North, 71 - 80 years old with 45% respondents while the least occurred in Njikoka, 71 - 80 and ≥81 years having 1.56% respectively (**Table 1**). It was clearly observed that in Aguata local government area, age categories of respondents between 71 - 80 and ≥81 years old did not provide information about the edible and medicinal mushrooms, which they consume (**Table 1**). Similarly, the same scenario was found in Anambra East (71 - 80 and ≥81 years old), Dunukofia (≥81 years old), Idemili South (71 - 80 and ≥81 years old), Nnewi South (≥81 years old), Nnewi North (71 - 80 years old, Ogbaru (71 - 80 and ≥81 years old) and Onitsha South (≥81 years old) with each age group having no respondent (**Table 1**).

Respondents gave numerous reasons for consumption of edible mushrooms found in their communities, which include substitute for meat, palatable taste, soup thickening, medicinal purposes and nutritional values (**Table 2**). In Onitsha South, 31.98% of respondents consume edible mushrooms as substitute for meat whereas 7.49% of them in Ogbaru eat mushrooms for the same motive (**Table 2**). The highest percentage of people who eat edible mushrooms due to their palatable taste was recorded in Aguata, having 37.02% respondents while the least was observed in Idemili South with 7.79% individuals (**Table 2**). It was observed that respondents who eat edible mushrooms because of their medicinal importance were significantly ($P < 0.05$) higher than those who do not consume them due to the same reason. Those who use mushrooms as soup thickening were highest in Anambra East (26.23%) but the least occurred in Ogbaru with 6.23% respondents (**Table 2**). In Njikoka, 52.71% of respondents consume edible mushrooms because of their medicinal importance while 17.20% of them in Anambra East eat mushrooms for the same purpose (**Table 2**). The highest percentage of people who eat edible mushrooms on the basis of their nutritional value was in Dunukofia with the value of 19.06% respondents whereas the least was obtained in Aguata, 8.43% respondents (**Table 2**).

Six different species of mushrooms were identified in this study as the most well known among the people of Anambra State (**Table 3**). These were *Auricularia auricula-judae* (Fr.) Quel., *Daldinia concentrica* (Bolton) Ces et De, *Lentinus squarrosulus* (Mont), *Volvariella volvacea* (Bull.) Singer, *Termitomyces robustus* (Beeli) R. Heim and *Termitomyces* sp. They collect and consume the mushrooms as food or medicine. The respondents in-

Table 1. Age range of respondents (%) from 11 selected local government areas in Anambra State knowledgeable in mushrooms.

Local government area	Number of questionnaires retrieved	Age range of the respondents						
		≤30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	≥81
		(%)	(%)	(%)	(%)	(%)	(%)	(%)
Aguata	71	23.94	32.39	35.21	5.63	2.83	0	0
Awka-North	70	5.71	44.29	17.14	20	4.29	5.71	2.86
Anambra East	40	22.5	32.5	32.5	10	2.5	0	0
Dunukofia	57	31.57	40.35	7.02	10.53	7.02	3.53	0
Idemili North	80	11.25	12.5	2.5	8.75	6.25	45	3.75
Idemili South	55	12.75	43.63	29.09	5.45	9.09	0	0
Njikoka	64	17.19	21.88	35.94	18.75	3.13	1.56	1.56
Nnewi South	60	23.33	43.33	6.67	13.33	11.67	1.67	0
Nnewi North	58	17.24	43.11	20.69	8.62	8.62	0	1.72
Ogbaru	44	20.45	29.55	45.45	4.55	0	0	0
Onitsha South	57	15.79	2.28	21.06	40.35	5.26	5.26	0

Table 2. Reasons for mushroom consumption by respondents (%).

Local government area	Substitute for meat	Palatable taste	Soup thickening	Medicinal purpose	Nutritional importance
	(%)	(%)	(%)	(%)	(%)
Aguata	7.78	37.02	8.48	38.29	8.43
Awka-North	22.12	19.05	11.47	36.35	11.01
Anambra East	24.69	16.03	26.23	17.2	15.85
Dunukofia	20.48	15.05	19.98	25.43	19.06
Idemili North	20.48	15.08	14.21	35.47	14.76
Idemili South	27.78	7.79	7.98	41.05	15.4
Njikoka	10.48	9.05	9.98	52.71	17.78
Nnewi South	10.18	21.99	19.22	29.94	18.67
Nnewi North	27.78	16.78	8.67	29.51	17.26
Ogbaru	7.49	28.79	6.23	48.29	9.2
Onitsha South	31.98	10.3	9.98	31.6	16.14

Table 3. Indigenous of mushrooms use by the people of Anambra State.

Mushroom	Local name	Mode of preparation	Mode of administration	Ailment treated
<i>Auricularia auricular-judae</i>	Ero ntioke	Cook with soup	Eat and drink the soup	Infertility in both men and women, anaemia and weakness of the body
<i>Daldinia concentrica</i>	Ero okpurukpu	Crush into powder	Mix with warm water and drink the filtrate	Stomach upset and weakness of body in both men and women
<i>Lentinus squarrosulus</i>	Ata achicha-puanya	Make into pepper soup	Chew and drink the soup	Anaemia, infertility in both men and women
<i>Volvariella volvacea</i>	Ero mkpu	Prepare as pepper soup	Eat and drink the soup	Anaemia
<i>Termitomyces robustus</i>	Ero mkpu	Cook with soup	Eat and drink the soup	Anaemia and high blood pressure
<i>Termitomyces</i> sp.	Ero mbe	Cook with soup	Eat with the soup	Anaemia, weakness of veins and high blood pressure in the aged people

interviewed provided vital information on the indigenous uses of edible and medicinal mushrooms identified such as the use of *D. concentrica* in treatment of stomach upset. They also gave useful information on local names, mode of preparation, method of administration and particular type of ailments each mushroom identified can treat (Table 3). The highest number of edible and medicinal mushrooms known and used by respondents was found in Onitsha South ($P < 0.05$) where 5 mushrooms were utilized while the least occurred in Dunukofia and Nnewi North, 2 mushrooms each (Table 4). Also, some of the prevalent mushrooms identified in each local government areas were recorded (Table 5). A percentage of people of Anambra State who lack knowledge of edible mushrooms was found in Ogbaru (81.36%) but the least occurrence was recorded in Idemili North with the value of 12.50% (Table 6). Also, those who have the highest knowledge of edible mushrooms were found in Idemili North ($P < 0.05$), having 87.50% respondents whereas the least value of 18.64% of them was observed in Ogbaru local government area (Table 6). Similarly, respondents who had knowledge of edible mushrooms were statistically ($P < 0.05$) higher in comparing with those that lack the knowledge of it.

The people's opinion on the use of mushrooms as an alternative source of meat and fish was observed highest in Njikoka, 83.66% of residents whereas the least occurred in Dunukofia having 41.24% respondents. Those who believed that mushrooms cannot be used as an alternative to meat and fish occurred most in Dunukofia, having 58.76% of respondents and the least, 16.34% of respondents was observed in Njikoka (Table 6). There was no significant ($P > 0.05$) difference between the respondents who use edible mushrooms as alternative to meat and fish to that of those who did not use them in similar manner. However, opinions of the residents of Anambra State on consumption of edible mushrooms by the rich and the poor were surveyed. Those whose opinions were that the rich people consume edible mushrooms occurred highest in Idemili South with 77.67% while the least was obtained in Onitsha south, 36.67% of respondents (Table 6). However, people who believed rich persons consume edible mushrooms were significantly ($P < 0.05$) higher than those who had different opinions. Some residents believed that the affluent (the rich people) persons have no use of edible mushrooms. In Onitsha South local government area, 63.33% of residents believed that the rich people did not consume edible mushrooms while 22.33% of them in Idemili South were of the opinion that the affluent individuals eat edible mushrooms (Table 6).

Knowledge of the possibility of cultivating edible mushrooms which the residents in the study area collect from forest and consume revealed that the highest percentage of people who believed that edible mushrooms can be cultivated was 69.55% in Aguata whereas Anambra East, Dunukofia, Idemili South, Idemili North, Nnewi South, Nnewi North and Onitsha South local government areas had 0.00% respondents respectively (Table 7). Those who believed that edible mushrooms can be cultivated were observed highest in Anambra East, Dunukofia, Idemili South, Idemili North Nnewi North, Nnewi South and Onitsha South with 100% respondents respec-

Table 4. Number and names of edible and medicinal mushrooms known and used by respondents.

Local government area	Number	Names of mushrooms known by respondents
Aguata	4	<i>Auricularia auricular-judae</i> , <i>Lentinus squarrosulus</i> , <i>Daldinia concentrica</i> and <i>Volvariella volvacea</i>
Awka-North	3	<i>Lentinus squarrosulus</i> , <i>Volvariella volvacea</i> and <i>Termitomyces robusta</i>
Anambra East	3	<i>Lentinus squarrosulus</i> , <i>Volvariella volvacea</i> and <i>Auricularia auricular-judae</i>
Dunukofia	2	<i>Daldinia concentrica</i> and <i>Lentinus squarrosulus</i>
Idemili South	4	<i>Auricularia auricular-judae</i> , <i>Lentinus squarrosulus</i> , <i>Daldinia concentrica</i> and <i>Volvariella volvacea</i>
Idemili North	3	<i>Auricularia auricular-judae</i> , <i>Daldinia concentrica</i> and <i>Volvariella volvacea</i>
Njikoka	4	<i>Auricularia auricular-judae</i> , <i>Lentinus squarrosulus</i> , <i>Daldinia concentrica</i> and <i>Volvariella volvacea</i>
Nnewi South	3	<i>Termitomyces</i> sp., <i>Daldinia concentrica</i> and <i>Lentinus squarrosulus</i>
Nnewi North	2	<i>Daldinia concentrica</i> and <i>Lentinus squarrosulus</i>
Ogbaru	3	<i>Auricularia auricular-judae</i> , <i>Lentinus squarrosulus</i> and <i>Daldinia concentrica</i>
Onitsha South	5	<i>Auricularia auricular-judae</i> , <i>Lentinus squarrosulus</i> , <i>Daldinia concentrica</i> , <i>Volvariella volvacea</i> , <i>Termitomyces robusta</i> and <i>Termitomyces</i> sp.

Table 5. Names of mushrooms and local government areas where they were found in Anambra State.

Names of mushrooms	Local government areas where they can be found
<i>Auricularia auricular-judae</i>	Aguata, Anambra East, Idemili South, Idemili North, Njikoka, Ogbaru and Onitsha South
<i>Lentinus squarrosulus</i>	Aguata, Awka-North, Anambra East, Dunukofia, Idemili South, Njikoka, Nnewi South, Nnewi North, Ogbaru and Onitsha South
<i>Daldinia concentrica</i>	Aguata, Dunukofia, Idemili South, Idemili North, Njikoka, Nnewi South, Nnewi North, Ogbaru and Onitsha South
<i>Volvariella volvacea</i>	Aguata, Awka-North, Anambra East, Idemili South, Idemili North, Njikoka and Onitsha South
<i>Termitomyces robustus</i>	Awka-North and Onitsha South
<i>Termitomyces</i> sp.	Nnewi South and Onitsha South

Table 6. Respondents opinion (%) on the use, consumption and lack of knowledge of edible mushrooms in Anambra State.

Local government area	Lack knowledge of edible mushrooms	Have knowledge of edible mushrooms	Consumption of mushroom by affluent persons		Use of mushroom as alternative to meat and fish	
			Yes	No	Yes	No
Aguata	25.49	74.51	47.35	52.65	49.94	50.06
Awka-North	22.36	77.64	55.97	44.03	45.59	54.41
Anambra East	37.5	62.5	44.79	55.21	73.11	26.89
Dunukofia	41.05	58.95	59.90	40.10	41.24	58.76
Idemili South	36.36	63.64	77.67	22.33	78.70	21.30
Idemili North	12.5	87.5	75.65	24.35	63.04	36.96
Njikoka	45.62	54.38	60.54	39.46	83.66	16.34
Nnewi South	71.67	28.33	40.80	59.20	47.45	52.55
Nnewi North	37.93	62.07	46.71	53.29	67.45	32.55
Ogbaru	81.36	18.64	45.75	54.25	46.21	53.79
Onitsha South	27.54	72.46	36.67	63.33	59.94	40.06

Table 7. Knowledge of the possibility of the cultivating mushrooms and interest in growing grow them among residents in Anambra State.

Local government area	Knowledge of the possibility of cultivating mushrooms		Interest in growing mushrooms	
	Yes (%)	No (%)	Interested (%)	Not interested (%)
Aguata	69.55	30.45	39.98	60.02
Awka-North	66.67	33.33	44.45	55.55
Anambra East	0.00	100	39.06	60.94
Dunukofia	0.00	100	100	0.00
Idemili South	0.00	100	39.06	60.94
Idemili North	0.00	100	67.45	32.55
Njikoka	28.83	71.17	81.23	18.77
Nnewi South	0.00	100	81.23	18.77
Nnewi North	0.00	100	25.39	74.61
Ogbaru	64.01	35.99	58.03	41.97
Onitsha South	0.00	100	65.83	34.17

tively whereas the least occurrence was observed in Aguata, having 30.45% individuals (**Table 7**). Respondents who believed that edible mushrooms could hardly be cultivated were significantly ($P < 0.05$) higher when compared with those who agreed that they could be cultivable. The interest of Anambra State people in learning how to cultivate edible mushrooms they consume was surveyed. The highest percentage of residents in Dunukofia with value of 100% showed their interest learning it while the least was observed in Nnewi North, 25.39% of respondents indicated their interest in mushroom cultivation (**Table 7**). About 74.61% of respondents in Nnewi North indicated no interest whereas the least was observed in Dunukofia (0.00%) where no individual showed interest in learning how to cultivate edible mushrooms (**Table 7**). Also, respondents who showed interest in learning how to cultivate edible mushrooms were significantly ($P < 0.05$) higher in comparing with those of them that had no interest in learning it.

Opinions of the residents on those particularly involved in the mushroom hunting were investigated. The highest percentage of respondents in Aguata (29.15%) believed that young men were mostly involved in hunting of edible mushrooms while the least of them in Awka-North, with the value of 3.77% were of the opinion that young men were responsible for hunting mushrooms in their locality (**Table 8**). In Awka-North, 75.47% of the respondents suggested that young women were more responsible for mushroom hunting within their community but in Onitsha South, 13.64% of them agreed with the former (residents in Awka-North) that young women were involved in gathering of edible mushrooms (**Table 8**). Also 55.56% people of Ogbaru stated that children were responsible for gathering mushrooms from wild (forest) but in Awka-North, 3.77% minority of the respondents were of the opinion that mushroom hunting was the responsibility of children within their vicinity (**Table 8**). The highest percentage of respondents (9.68%) in Anambra East local government area showed that old men were mainly involved in edible mushroom hunting but in Awka-North, 3.77% of the respondents was observed as the least on the same individuals being responsible for collection of edible mushrooms (**Table 8**). There was statistical significant difference ($P < 0.05$) between the residents who believed that young men were involved in edible mushroom gathering when compared with the respondents who were of the opinion that it was responsibility of old men. In Onitsha South, 29.55% of residents reported that old women were involved in mushroom hunting whereas in Idemili North, 10% of them agreed that old women were responsible for collecting edible mushrooms from the forest (**Table 8**).

The indigenous knowledge of people in the study area on how to preserve mushrooms was studied. The highest percentage of respondents (90.91%) in Onitsha South use method sun drying in preserving mushrooms but the least, 44.05% respondents was obtained in Aguata using the same mode of preservation (**Table 9**). In Aguata, 43.45% of individuals adopt the method of oven drying while the least, with the value of 3.33% was observed in Anambra East (**Table 9**). Dry over fire which is one of the means of preserving edible mushrooms was used by Awka-North residents while the rest of respondents in other local government areas use alternative methods such as sun drying, refrigeration and oven drying for preserving mushrooms (**Table 9**). Also, it was only in Awka-

Table 8. Respondents' opinions on category of persons involved in mushroom hunting (%).

Local government area	Young men	Young women	Children	Old men	Old women
	30 - 49 yrs (%)	30 - 49 yrs (%)	≤29 yrs (%)	50 - 80 yrs (%)	50 - 82 yrs (%)
Aguata	29.15	21.81	22.77	9.38	16.89
Awka-North	3.77	75.47	3.77	3.77	13.22
Anambra East	6.45	61.29	9.68	9.68	12.9
Dunukofia	9.52	57.14	9.52	7.14	16.68
Idemili South	9.38	31.25	37.5	6.25	15.68
Idemili North	15	63.33	5	6.67	10
Njikoka	13.33	44.44	15.56	8.89	17.78
Nnewi South	10	52.5	15	7.5	15
Nnewi North	14.29	57.14	8.64	5.71	14.22
Ogbaru	5.56	22.22	55.56	5.56	11.1
Onitsha South	18.18	13.64	34.08	4.55	29.55

North that people use salt solution as a means of mushroom preservation (**Table 9**). Refrigeration as one of the methods of preserving mushrooms recorded highest percentage of respondents, 23.26% in Dunukofia while the least, 9.09% respondents were observed in Onitsha South employing the same means of mushroom storage (**Table 9**). The analysis of various methods adopted by respondents for preservation of mushrooms for future consumption showed that the use of sun drying was significantly ($P < 0.05$) higher when compared with other means of preserving them (mushrooms) by the residents. There was no statistical difference ($P > 0.05$) between those who use dry over fire and salt solution as means of preserving edible mushrooms for future utilization.

Studies were carried out to ascertain knowledge of the use of mushrooms in traditional medicine among various age categories of people in Anambra State. The highest age categories of respondents who had knowledge of uses of mushrooms in tradomedicine (traditional medicine), ≥ 81 years old with the value, 41.92% was observed in Awka-North whereas the least, 1.64% (51 - 60 years old) was recorded in Idemili North (**Table 10**).

Table 9. Methods adopted by indigenes for mushroom preservation (%).

Local government area	Sun drying	Oven drying	Drying over fire	Salt solution	Refrigeration
Aguata	44.05	43.45	0	0	12.5
Awka-North	74.53	3.64	3.64	3.64	14.55
Anambra East	76.67	3.33	0	0	20
Dunukofia	76.74	0	0	0	23.26
Idemili South	78.79	0	0	0	21.21
Idemili North	90	0	0	0	10
Njikoka	79.59	0	0	0	20.41
Nnewi South	89.19	0	0	0	10.81
Nnewi North	76.32	5.26	0	0	18.42
Ogbaru	77.78	0	0	0	22.22
Onitsha South	90.91	0	0	0	9.09

Table 10. Respondents knowledge of the use of mushrooms in tradomedicine among different age categories in Anambra State.

Local government area	Age range													
	≤ 30		31 - 40		41 - 50		51 - 60		61 - 70		71 - 80		≥ 81	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Aguata	0.00	16.27	0.00	41.86	0.00	34.88	0.00	2.33	2.33	2.33	0.00	0.00	0.00	0.00
Awka-North	1.92	5.39	0.00	15.00	0.00	11.15	1.92	11.15	0.00	3.85	0.00	3.85	41.92	3.85
Anambra East	0.00	20.00	0.00	30.00	0.00	36.67	0.00	13.33	0.00	0.00	0.00	0.00	0.00	0.00
Dunukofia	0.00	26.19	0.00	42.86	0.00	7.14	0.00	16.67	0.00	7.14	0.00	0.00	0.00	0.00
Idemili South	0.00	9.09	0.00	45.45	0.00	21.22	0.00	9.09	0.00	15.15	0.00	0.00	0.00	0.00
Idemili North	0.00	14.75	0.00	18.03	0.00	29.51	1.64	22.95	0.00	4.92	0.00	1.64	1.64	4.92
Njikoka	0.00	12.00	0.00	24.00	0.00	36.00	0.00	20.00	0.00	4.00	0.00	2.00	0.00	2.00
Nnewi South	2.78	13.89	5.56	38.87	0.00	0.00	2.78	16.67	0.00	13.89	0.00	2.78	0.00	2.78
Nnewi North	0.00	14.29	0.00	34.29	0.00	34.29	0.00	11.42	0.00	5.71	0.00	0.00	0.00	0.00
Ogbaru	0.00	16.67	0.00	30.56	0.00	47.21	0.00	5.56	0.00	0.00	0.00	0.00	0.00	0.00
Onitsha South	2.27	11.36	0.00	11.36	0.00	25.00	2.27	31.83	0.00	6.82	0.00	6.82	2.27	0.00

Yes = Use mushroom in tradomedicine (Traditional medicine); No = Do not use mushroom in tradomedicine.

4. Discussion

Edible mushrooms have been found to be essential source of food for people of Anambra State especially during the rainy season. The study showed that more than 85% of the respondents interviewed consume edible mushrooms as food. Only 2% of them use some of the mushrooms as medicine for treatment of ailments like stomach upset, diabetes, heart problems, obesity and asthma. This observation agreed with the work of [7], who reported that about 90% Bini-speaking people of Nigeria eat mushrooms as food whereas 21.06% utilize them for medicinal reasons. According to [18], mushrooms have been collected and consumed by a good number of people which they attributed to their nutritional values while [19], believed that individuals purchase edible mushrooms from market for consumption because they contain high amount of proteins, minerals, vitamins and amino acids. Additionally, women sold a basket containing about 1 kg of fresh mushrooms for N1200 equivalent to USD 7.70 both in the market and along main road.

Similarly, consumption of edible mushrooms regularly can treat breast cancer, prostate, diabetes and high cholesterol levels [19] [20]. [21] observed that mushrooms contained selenium and produced vitamin D when exposed to sunlight. According to [21], edible mushrooms are good sources of iron. Mushrooms have been a high priced commodity in many parts of the world and may be gathered from the forest. [20], reported that edible mushrooms aid in control of cancer. The reason is due to inhibition of aromatase, which is an enzyme that brings about hyperestrogenemia (excessive estrogens). [22] revealed that people of America used edible mushrooms as soup ingredients because of their nutritional contents which included proteins, vitamins and minerals. This observation was confirmed by [20], that edible mushrooms are rich in niacin and help in improving body immunity as well as prevention of diseases. They have ability to fight cancer, reduce blood pressure and cholesterol. It was observed clearly that, most residents of Anambra State consume edible mushrooms because of their medicinal values. [6], revealed that mushrooms are used for treatment of some diseases threatening life of human beings. This was confirmed in this study people of Anambra State use some mushrooms to treat stomach upset in their locality. However, [19] observed that mushrooms contained selenium which when consumed help in losing weight of the body.

In Idemili North local government area, respondents with age bracket of 71 - 80 years old gave more information on the use of edible and medicinal mushrooms. This may be attributed to availability of forest in their area, which serves as habitat of different species of mushrooms within their region. This enables them to have access and close contact with edible mushrooms. In contrast, it was observed that in Ogbaru local government area, age range of respondents 61 - 70, 71 - 80, ≥ 81 and Aguata 71 - 80 and ≥ 81 did not provide information about the use of edible and medicinal mushrooms. The reason can be attributed to urbanization and deforestation, which led to extinction of mushrooms in their locality.

This observation was further confirmed by [7] that anthropogenic activities (human activities) could lead to disappearance of mushrooms in the environment. The people living in Onitsha South provided most of the information about the utilization of both edible and medicinal mushrooms. This may be due to commercial activities and Onitsha having the largest market (Main Market), which attracts people from different geographical zones to come and buy and sale, their produce.

The residents of Anambra State in this study mentioned about 11 different species of mushrooms. This was in line with the findings of [4], who observed 10 different species of mushrooms used among the Igala people of Nigeria. *Auricularia auricula-judea* occurred in all the local government areas surveyed in this work. The reason for this behaviour can be linked to its adaptation to both rainy and dry seasons of the year. This was equally confirmed by [23], who observed similar scenario in their study. However, most of the respondents interviewed revealed that some of edible mushrooms they collect and consume are no longer found in their communities due to increasing urbanization and deforestation. They indicated that urgent efforts should be made in order to preserve existing mushrooms from extinction. This observation was in consonant with the work of [24], who reported that loss of forest caused by deforestation and urbanization can lead to disappearance of mushrooms from our environment. All respondents interviewed consume edible mushrooms for many reasons such as substitute for meat, soup thickening and nutritional purposes. In the same vein, it was observed that both the rich and the poor consume edible mushrooms among people of Anambra State. The reason may be due to nutritional and medicinal properties of edible mushrooms. In addition, [4], demonstrated that Igala people use mushrooms because of their nutritional purposes and soup thickening. Some of the residents interviewed revealed that consuming edible mushrooms helped them to become stronger and heal any sickness in their body. It was

found in this work that hunting of mushrooms cut across all age groups. Children, men and women were involved in mushroom gathering. Similarly, [24] observed that rural women and children of Cameroon, Central Africa are responsible for collecting mushrooms from wild during rainy season. According to some of the women interviewed, mushrooms gathered from the forest are sold to assist in their family income. On the other hand, children revealed that they collect and sale mushrooms so as to earn a living instead of depending on their parents to provide all the necessary things they want in life. This observation was in line with the findings of [12] and [4], who suggested that children use the money they made from sale of edible mushrooms to pay their school fees.

A good number of the respondents use method of sun drying for preserving freshly harvested mushrooms. This may be attributed to availability of sunshine. This makes it (sun drying) the cheapest method of mushroom preservation. Some of the residents expressed their interest in learning how to cultivate edible mushrooms. This is because it will serve as another source of protein and vitamins. In contrast, some of them showed no interest in learning mushroom cultivation. According to them (respondents) they could not combine with their former means of earning a living, which include trading, teaching and working for governments. This study revealed that majority of residents of Anambra State believed that mushrooms grow in the wild and can hardly be cultivated by human beings because they have not seen where mushrooms are being farmed. However, [18], showed that edible mushrooms are cultivable and can also be collected from the wild. It was gathered from this work that young people of Anambra State lack knowledge of mushrooms in traditional medicine. The reason for this attitude can be attributed to their flair towards white-collar jobs (office work). Moreso, old men and women have more knowledge of mushrooms in tradomedicine (traditional medicine). This may be because they are predominantly farmers in their locality.

5. Conclusion

This work has shown that people of Anambra State in southeastern part of Nigeria consume edible mushrooms as food and medicine. The information obtained from the respondents on edible and medicinal mushrooms was necessary, as it would form a baseline for future research. Also, it will serve as a platform for further studies on ethnomedicinal practices among various people in Nigeria and other nations of Africa.

Recommendation

The indigenous knowledge of people on the application of mushrooms both edible and medicinal should be preserved, so that there will be transfer of this knowledge from one generation to another. Further research should be geared towards cultivation of mushrooms in order to increase food production, thereby reducing hunger and malnutrition in developing countries. Since edible mushrooms contain high amount of proteins, minerals and vitamins, it is therefore, recommended to consume them as an alternative source of fish and meat.

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