

Knowledge, Attitude and Practice of People Using the Crude Extract of *Andrographis paniculata* (Buem. f) Nees. (Acanthaceae) on *Salmonella typhi*, *Escherichia coli* and *Staphylococcus aureus*

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Data on Traditional Medicine Practice (TMP) in population with access to modern medicine is not clear, though, it has gained huge popularity in all regions of developing countries over decades. This research was conducted to investigate the Knowledge, Attitude and Practice (KAP) of people using *Andrographis paniculata* (Burm. f.) Nees as a medical herb and the effects of the crude extracts on some microbial isolates. Quantitative-based cross-sectional survey was carried out on 100 participants around Auta-Baleifi and Bingham University communities through the use of structured questionnaires. Data collected from the participants were analyzed using descriptive statistics. The plant species leaves were collected, washed and extracted by boiling, soaking and macerating using distilled water. The crude extracts were tested for its antimicrobial activities on *Salmonella typhi*, *Escherichia coli* and *Staphylococcus aureus* using ciprofloxacin as the control. From the result of the KAP analysis, majority (36%) of the participants were between 19-28 years old, followed by 29 – 38 years (32%) and only 5% were 59 years and above. 91% of the participants have good knowledge of traditional medicine, while only 9% were not aware of the practice, 32.0% of the participant claimed that the use of traditional medicine preparation had no adverse effects as compared to modern medicine, while larger percentage (68%), do not agree that traditional

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medicine is safer than modern medicine., 36% of the participants claimed to have used *A. paniculata*, a traditional herb, for one medicinal purpose or the other, while 54% said they have never used it, but may considered using it in future,. The population in Auta-baleifi and Bingham University communities has good knowledge with high acceptability of the use of traditional medicine. Although the result of the antimicrobial showed that the crude extracts of *A. paniculata* had no clear zone of inhibition against the test organisms, but the plant have demonstrated effective used in traditional medicine against symptoms very similar to that of malaria.

Keywords: Medicinal plants; knowledge; *Andrographis paniculata*; crude extracts; antimicrobials.

1. INTRODUCTION

Knowledge, Attitude and Practice are popular in health care research because they provide useful pieces of information that are easy to execute. They are good designs that help in collection of socio-demographics data, and responses to the questions and statements on the subject matter under study, from the respondents. The practice of traditional medicine from region to region varies greatly, as they are influenced by the factors such as culture, history, personal attitude and philosophy of local communities and their populations. In many cases, the theory and application are quite different from those of conventional medicine, even though, both practices are aimed at healing and prevention of diseases. for instance, the historical use of many traditional medicine practices, including experience passed from generation to generation, has demonstrated the safety and efficacy of traditional medicine [1]. Over the years, the significance of traditional medicine have also been established by different types of traditional medicine practitioners include herbal healers, herbal sellers, bone setters, traditional birth attendance and diviners. In addition, the investigation of folk beliefs and knowledge of traditional healers has been reported a short cut to the isolation of pharmacologically active compound [1]. In fact, the use of medicinal herbs by local populations of various cultures has served as starting point for drug discovery and has led to the development of many drugs used in treatment of diseases [2]. For instance, the use of the herbaceous plant, *Catharanthus roseus*, (L.) G.Don by indigenous people of the Southeastern Madagascar, has led to the discovery of over 75 alkaloids, two of which are used in the treatment of Hodgkins lymphoma and leukaemia in children [2]. Eighty percent of population in some Africa and Asian country relies on traditional medicine for their primary health need. Although, modern medicine may exist side-by-side with such traditional practice, yet, traditional medicine has often maintained

their popularity for historical and cultural reasons [2]. Traditional medicine essentially represents a natural form of health care which has been used through generations. It is a practice derived from the values and perception of the members of the community. The practice is believed to have gone beyond the maintenance of good health of the populace as it also protects the people from the menace of wild animals, evil spirits, motor accidents, bountiful harvests and other human activities [3]. The genus *Andrographis* from the family, *Acanthaceae* comprises about 40 species This genus has one of the most popular medicinal plants used traditionally in the treatment of many diseases including cancer, diabetes, high blood pressure, ulcer, leprosy, bronchitis, skin diseases, flatulence, colic, influenza, dyspepsia and malaria in Asia, America and Africa continents for centuries. They possess several phytochemical constituents with unique and interesting biological properties [4]. However, despite the enormous benefits provided by plants and their chemical, it is largely recognized that most synthetic drugs currently available as antimicrobial agents are usually with one side effect or the other. Bacteria or microbes are now; largely resistant to these drugs. Therefore, there is need to source for alternatives that will be cheaper, non-resistant, and effective agents. Medicinal herbs may offer such alternatives.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out at the Department of Biological Sciences, Bingham University, located in Auta-Balefi town, Karu Nasarawa State, about 26km away from Abuja, Federal Capital Territory, (FCT). The University covers approximately a land mass of 200M² and is geographically located at latitude 8° 50'N and longitude 7° 52'E [5]. Hausa language is the major language of the people, and the religion is mainly Christianity, with a small percentage of

the people that are Muslim. Two distinct seasons of tropical climate, rainy season (April - October) and dry season (November-March). The temperature mostly ranges from 25°C and 32°C, with high humidity. The vegetation of the study area is predominantly guinea savanna, and the occupations of the people include business, civil service, farming and full house wives.

2.2 Study Design and Data Analysis

The KAP of residents of Auta-Balefi and Bingham University communities on the use of, *A. paniculata* as traditional medicine among the people was investigated through interviews and use of structured questionnaires to obtain relevant medicinal information / data from different categories of participants. English language was used to prepare the questionnaires, but discussion was communicated to the participant in Hausa language for participants who did not fully understand. Four major sections were captured in the questionnaire; (A) Socio-demographic information of the participants. (B) Knowledge of *A. paniculata* (C) Attitude of the people using *A. paniculata* plant for disease treatment, and (D) Practice of people using *A. paniculata* as a medicinal herb.

In order not to violate ethical concerns, just before the administration of the questionnaires, the participants were briefed on the purpose of the study, and their permission sought to publish the findings of the research obtained orally from them. A total of one hundred (100) participants comprising of herbalist, bone setters, traditional birth attendants and others were involved in this research.

Data obtained from the field survey were examined and analyzed using descriptive statistics according to [6].

2.3 Plant Collection and Authentication/ Bacterial Isolates

Fresh leaves of *A. paniculata* were collected from the University premises, at the back of the animal house and identified by experts from both, the Department of Biology Sciences and that of the Department of Pharmacognosy, Bingham University, Nasarawa state. Voucher Plant species specimen were deposited at the herbarium, Bingham University. Bacterial isolates used in the study including, *Escherichia coli*, *Staphylococcus aureus*, and *Salmonella typhi* were obtained from National Veterinary Research Institute (NVRI), Vom.



Fig. 1. Plant specie specimen in its habitat

2.4 Preparation of Culture Media

The agar was measured according to the required quantity of water and producer's instructions [7]. The agar mixture was sterilized and autoclaved and was poured aseptically into the Petri-dishes and allowed to solidify under room temperature and the standard isolates were sub-cultured on the plates and were incubated for 24 hours at 37°C. Crude extract was made, through the process of soaking, boiling, and maceration [7].

2.5 Determination of Antimicrobial Activity

Before the agar was prepared, each of the test organisms was picked from the sub-cultured using swab stick and was transferred into three test tubes and sterile distilled water was added into the three test tubes and it was compared with the Mcfarland standard to check for turbidity. Mueller Hinton Agar (MHA) was prepared according to the producer's instruction and it was divided into four different conical flasks, 500 ml of the organisms was added to each conical flask using micropipette [7]. Each organism was poured into four plates and allowed to solidify at room temperature, after that a cork was used to make six wells in the Petri dishes containing the test organisms and the media and one drop of the Mueller Hinton Agar (MHA) was dropped in each of the wells. Serial dilution was carried out where five tubes for each samples (boiling, maceration, soaked for 24 hours and 3days), 5ml

of the sample was transferred into the first test tubes and 1ml of distilled water into the other four tubes, 1ml from the first sample was transferred into the second till the last test tube and the last tube 1ml of the mixture was discarded. Each well was poured with the plant extract according to their serial dilution and other six wells contained with the antibiotic (Ciprofloxacin) and it was incubated for 24 hours [8]. The disk method was used in the process of determining the microbial activities. The disk was soaked in the mixtures for one hour and was placed on the plates containing the organisms and media using forceps and it was incubated for 24 hours [9].

3. RESULTS

3.1 Socio-demography Data of the Participants

The Socio-demographic data of the participants are presented Table 1. Majority of the participants were between the ages of 19 to 48 years, while only five (5%) were above 59 years, and none of them were below 19 years. Forty-eight (48%) of the participants were married, while forty-four (44%) were single. Some (23%) of the participants were full time Businessmen, Government employee (23%) and Farmer and Students were 13% each. Larger percentages (39%) of the participants were neither Hausa nor Yoruba or Igbo. However, fifty-nine (59%) of the participant were married with family size of between 3-4 children. Christianity (91%) was the major religion of the participants, followed by Islam (7%), and Traditional (2%).

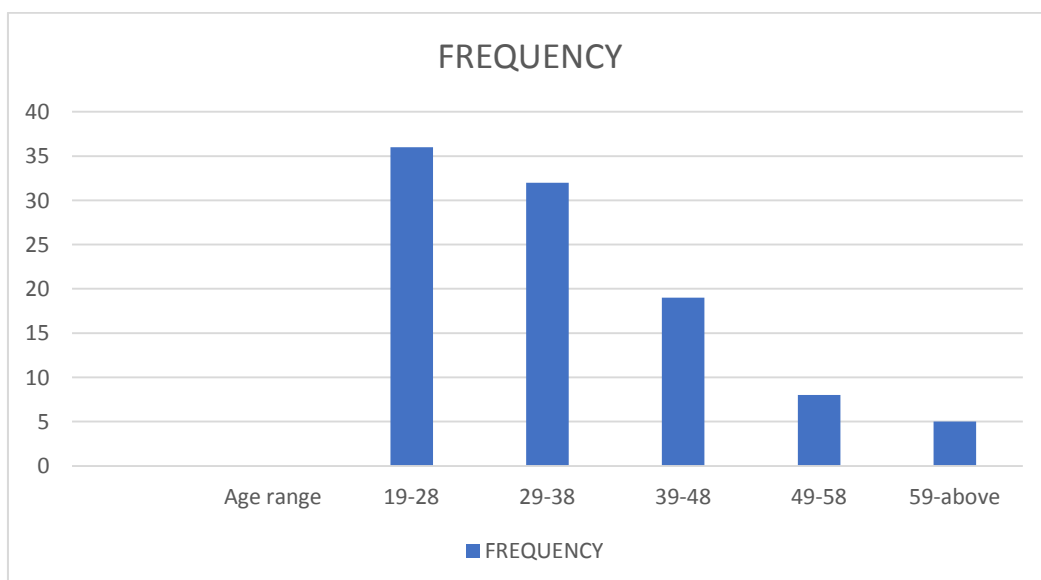


Fig. 2. Age range of respondents

Table 1. Socio-demographic Information of respondents

Variables	Responses	Frequency	Percentage (%)
Age	19-28	36	36.0
	29-38	32	32.0
	39-48	19	19.0
	49-58	8	8.0
	59-above	5	5.0
Marital status	Married	48	48.0
	Widow	8	8.0
Occupation	Single	44	44.0
	House wife	15	15.0
	Farmer	13	13.0
	Government Employee	22	22.0
	Student	13	13.0
	Unemployed	14	14.0
	Businessman/woman	23	23.0
Ethnicity	Hausa	28	28.0
	Yoruba	11	11.0
	Igbo	22	22.0
	others	39	39.0
Family	1-2	20	20.0
	3-4	59	59.0
	5-6	1	1.0
	6 above	20	20.0
Level of education	Primary	9	9.0
	Secondary	22	22.0
	Higher education	69	69.0
Religion	Traditional	2	2.0
	Christian	91	91.0
	Muslim	7	7.0

3.2 Knowledge of the Study Subjects on Traditional Medicine

A total of one hundred (100) respondents participated in the study, including herbalist, bone setter, traditional birth attendant and others. As shown in Table 2, Fifty-two percent (52%) of the respondents knew about the plant while (48%) did not know anything about the plant, Majority (91%) of the participants heard about traditional medicine, 66% knew about herbal medicine, 12% knew about traditional birth attendance, 19% knew about bone setting, while 2% of the participants were not aware of anything about herbal medicinal practice, Forty-seven (47%) of the participants claimed they knew at least someone that visited modern health care service soon after visiting traditional practitioner and 53% did not. Thirty-three (33%) do visit because of no improvement, Twenty-two (22%) did because of peer influence, eighteen (18%) do not because of side effects and others

twenty-seven (27%) did. Twenty-nine (29%) claimed use of herbal drugs for fever, thirty-one (31%) use it for malaria, eight (8%) use it for hypertension, ten (10%) use it for infection, nine (9%) use it for constipation and thirteen (13%) use it for diabetes. Greater percentage (89%) of the participants know about the risks and benefits of traditional medicine, while eleven (11%) marked no. Thirty-two (32%) indicated that traditional medicine are safer than modern health service, while sixty-eight (68%) said traditional medicines are not more effective than modern health services.

3.3 Attitude of Participants to the Towards *A. paniculata* Plant

Fifty-four (54%) of the participants have plans of using the plant in future, while forty-six (46%) claimed no plans to use plants, to which thirty-six (36%) reasons was due to access of modern medicine, while fear of side effects which was

forty (40%), and others (24%). Twenty-one (21%) strongly agree to the use of traditional medicine among the community, forty-five (45%) agree, twenty-eighty (28%) stayed neutral, four (4%) disagreed and two (2%) strongly disagree. Eighty-two (82%) encourage others to use traditional medicine and five (5%), of them did not, and their reason were due to religion, eighteen (18%) cost sixty-two (62%), availability and thirteen (13%) for others Larger percentage (63%) of the participants claimed that there are diseases that are not cured by modern medicine and thirty-nine (39%) said no.

3.4 Practice of the Subjects Using *A. paniculata* as a Medicinal Herb

Ninety-one (91%) of the participants used the plant for traditional medicine. Mostly drinkable (70%), ingestible (12%), ointment (14%) and others (4%). It also includes. The outcome was improved in seventy (72%) exacerbated in fifteen (15%) and thirteen (13%) indicated there was no change in the outcome. Twenty-eight (28%)

preferred traditional medicine, twenty-two (22%) preferred modern medicine and fifty (50%) preferred both due to its availability (69%) and affordability (31%). Sixty-three (63%) have visited a practitioners, while thirty-seven (37%) have not, thirty-three (33%) visited one year ago, Eight (8%) visited 6 months ago, fifty (50%) visited 2 weeks ago and nine (9%) visited daily. Thirty-six (36%) of the participants indicated used of the plant for medicinal purpose before by one (1%) for headache, three (3%) for cough, ten (10%) for typhoid fever, twenty-one (21%) for malaria and four (4%) for others while sixty-one (61%) specified that they have not used the plant *A. paniculata* for the treatment. of any disease in the past.

Investigating the antimicrobial activities for each of the microorganisms, there was no clear zone of inhibition for each of the cultured microorganism upon application of crude extracts, but only the control (Ciprofloxacin) showed zones of inhibition for *Staphylococcus aureus* (Table 5).

Table 2. Knowledge of people using *A. paniculata* as medicinal herb

Variables	Responses	Frequency	Percentage (%)
Have you ever heard of <i>Andrographis paniculata</i> (Burm.f.) Nees plant?	Yes	52	52.0
	No	48	48.0
Have you heard about Traditional medicine	Yes	91	91.0
	No	9	9.0
Which one do you know?	Herbalist	66	66.0
	Traditional birth attendant	12	12.0
	Bone setter	19	19.0
	others	3	3.0
Have you or anyone you know visited modern health care service soon after visiting traditional practitioner	Yes	47	47.0
	No	53	53.0
Why he/she did?	No improvement	33	33.0
	Peer influence	22	22.0
	Side effects	18	18.0
	Others	27	27.0
Why did you use herbal Medicine?	Fever	29	29.0
	Malaria	31	31.0
	Hypertension	8	8.0
	Diabetes	13	13.0
	Constipation	9	9.0
	Infection	10	10.0
Health education about Risks and benefits of Traditional medicine is Important.	Yes	89	89.0
	No	11	11.0
Traditional medicines are More effective and safer than Modern health services	Yes	32	32.0
	No	68	68.0

Table 3. Attitude of people using *A. paniculata* as medicinal herb

Variables	Responses	Frequency	Percent
Do you have plans of using <i>Andrographis Paniculata</i> in future?	Yes	54	54.0
	No	46	46.0
If No to question above Why don't you have?	Access to modern medicine	37	37.0
	Fear of side effects	40	40.0
	Others	24	24.0
Do you agree the usage of traditional medicine Among the community	Strongly agree	21	21.0
	Agree	45	45.0
	neutral	28	28.0
	Disagree	4	4.0
	Strongly disagree	2	2.0
Do you encourage others to use traditional medicine	Yes	82	82.0
	No	18	18.0
Why do you encourage others to use traditional medicine	Religion	5	5.0
	Cost	18	18.0
	Availability	63	63.0
	Others	14	14.0
Do you think that there are diseases not cured by modern medicine?	Yes	63	63.0
	No	37	37.0

Table 4. Practice of people using *A. paniculata* as a medicinal herb

Variables	Responses	Frequency	Percent
Have you ever used traditional?	Yes	91	91.0
	No	9	9.0
If yes which one did you use?	Drinkable	70	70.0
	ingestible	12	12.0
	ointment	14	14.0
	others	4	4.0
If yes what was the outcome?	improved	72	72.0
	exacerbated	15	15.0
	no change	13	13.0
Which do you prefer?	Traditional medicine	28	28.0
	Modern medicine	22	22.0
	Both	50	50.0
Why do you prefer it?	Its availability	69	69.0
	Affordability	31	31.0
Have you ever visited a Practitioner?	Yes	63	69.0
	No	37	37.0
If yes when was the last time?	One year ago	33	33.0
	6months	8	8.0
	2weeks	50	50.0
	Daily	9	9.0
Have you ever used the Plant <i>Andrographis paniculata</i> For medicinal purpose before?	Yes	39	39.0
	No	61	61.0
If you, which ailment did you Use the herbal medicine for?	Headache	1	1.0
	Cough	3	7.7
	Typhoid fever	10	25.6
	Malaria	21	43.8
	Others	4	10.3
	None	61	61.0

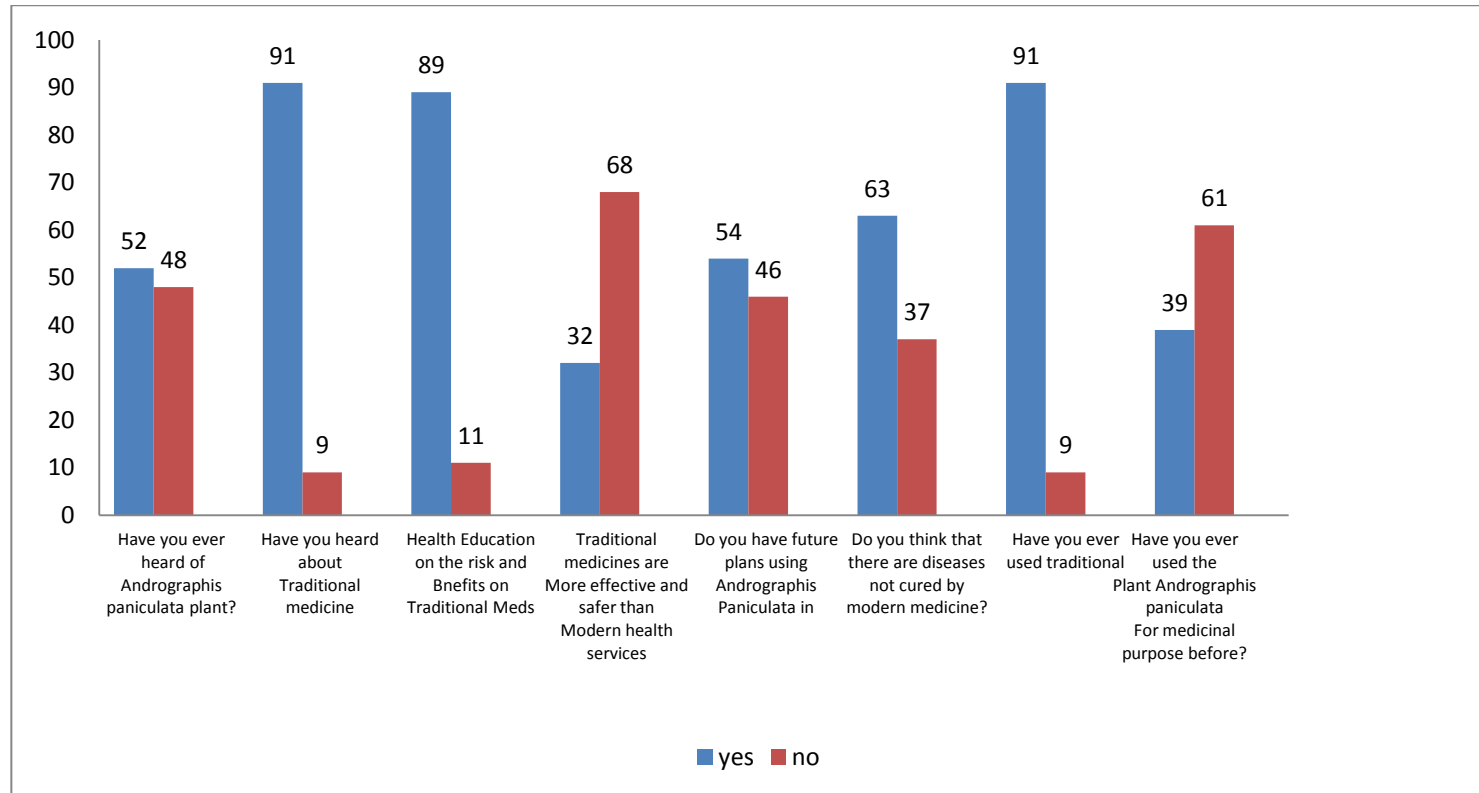


Fig. 3. Brief information of knowledge, practice and attitude of respondents using *Andrographis paniculata* (Burm.f.) Nees as a medicinal herb

Table 5. Zone of inhibition (mm) on the cultures of *Salmonella typhi*, *Staphylococcus aureus*, and *Escherichia coli* upon the application of the crude extracts

Test organisms	Boiled	Soaked for 3 days	Soaked for 24 hours	Maceration	Control ciprofloxacin
<i>Salmonella typhi</i>	0.00	0.00	0.00	0.00	36.0
<i>Escherichia coli</i>	0.00	0.00	0.00	0.00	28.6
<i>Staphylococcus aureus</i>	0.00	0.00	0.00	0.00	20.0

4. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

4.1 Discussion

Traditional medicine is an integral component of healthcare in sub-Saharan Africa where it is often the most accessible and affordable treatment option available. According to the World Health Organization, 80% of the population in developing countries, especially in the rural areas depends on herbal medicine for their healthcare needs [10]. For example, a study conducted in 2018 revealed that approximately 80% of the Malian population utilizes traditional medicine as their only source of medicine [11]. This situation is also obtainable in Nigeria, especially during our fore fathers when there were little or no healthcare facilities.

This research was conducted to investigate the people's, Knowledge, Attitude and Practice of *A. paniculata* as a medicinal herb using KAP analysis, by administered one hundred (100) questionnaires divided into four sections, socio demography, knowledge, attitude and practice of people in Bingham University and Auta-baleifi communities. It further investigates the antimicrobial activities of the crude extracts of the plant by adopting microbial culture and sensitivity test. The age group of 19-28 years formed the largest proportion (36.0%) of the respondents. This present study reported that 91% of the respondents have heard of traditional medicine and it serves as an alternative way of getting treatment of ailments apart from modern medicine. The finding is similar to the research conducted in West Ethiopia [12] Prominent among the traditional medicine practitioners known by the respondents include herbal healers (66.0%), bone setter (19.0%) and traditional birth attendant (12.0%).The prevalence use of traditional medicine observed in this study was 91.0%. This was similar to a study conducted in Ethiopia where the prevalence of traditional medicine use was 80.0% [13].

Our study showed that the adults were the age category where the use of traditional medicine is highly common; this may not be unconnected with their level of education and lack of access to modern health services. This also indicated that the knowledge and usage of traditional medicine is evergreen regardless of ancient age of traditional medicine. Herbal medicine use (66.0%) is the commonest type of traditional

medicine practice; this was in line with the study conducted in Melawi Town of Northwest Ethiopia that reported 64% for herbal medicine use [14]. In addition, this was in compares with similar studies carried out within urban residence in Lagos Nigeria that reported 66.8%.

Herbal medicine (66.0%), was the highest form of traditional medicine as observed in this study as the respondents also affirmed that they did not experience any side effects. Even though, a large number (68.0%) of the respondents do not agree that traditional medicine is more effective and safer than modern medicine; Whereas, majority 89.0% believed that health education is important and out of 91% that used traditional medicine, 72.0% of them claimed reported improvement. 69.0% of the respondents prefer traditional medicine because of its availability and 31.0% affordability. 46.0% do not have plans of using the plant in future because of access to modern medicine, and 24.0% feared using it because of likely side effects they may experience.

Majority of the respondents agreed to the usage of traditional medicine and this is related to the benefits they obtained from traditional medicine. 50.0% prefer both traditional and modern medicine; because not all sickness are cured by either traditional or modern medicine and the most use route for administering traditional medicine is oral 70.0% similar to the study done in Jara, Ethiopia [15]. Comparing the family size, majority of the respondents have large family size, and this could be another reason for high use of traditional medicine.

Unfortunately, despite documented medicinal values of this plant, and its confirmation, this study could not established its antimicrobial activity yet as there was no clear zone of inhibition of *A. paniculata* crude extracts against the specific isolates (*Salmonella typhi*, *Escherichia coli* and *Staphylococcus aureus*) used in this study.

4.2 Conclusion

In conclusion, this study revealed that a good number of the inhabitants of Bingham University community and Auta-Balifi have appropriate knowledge about the usage of *A. paniculata*. They also confirmed through their altitude and practice, that a lot still need to be done concerning *A. paniculata* in scientific world. The plant was confirmed to be medically valid to all.

However, the crude extract of *A. paniculata* may not have antimicrobial activity against *Salmonella typhi*, *Staphylococcus aureus* and *Escherichia coli* as zero clear zones of inhibitions were recorded in this study.

4.3 Recommendations

1. Further research is needed to be carried out to molecular level
2. A wider range of microbial isolates is recommended for further studies in order to establish any antimicrobial properties

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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