



Mitigating the Risks of Herb-Drug Interaction among Artisans in Ibadan Metropolis Through Public Health Education Survey

Omonike O. Ogbole ^{a*}, Aduke E. Ipingbemi ^b,
Olabimpe O. Olayinka ^a, Esther O. Akinbobola ^a,
Zainab A. Molik ^a, Temitayo O. Ajayi ^a, Tolulope O. Ajala ^c,
Kemisola Akinsiku ^a and Hamidu Oluyedun ^d

^a Department of Pharmacognosy, Faculty of Pharmacy, University of Ibadan, Nigeria.

^b Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan, Nigeria.

^c Department of Pharmaceutics and Industrial Pharmacy, Faculty of Pharmacy, University of Ibadan, Nigeria.

^d Pharmacy Department, Oyo State Hospital Management Board, Ibadan, Nigeria.

Authors' contributions

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

Article Information

DOI: 10.9734/JOCAMR/2023/v24i4507

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/110029>

Original Research Article

Received: 10/10/2023

Accepted: 16/12/2023

Published: 28/12/2023

ABSTRACT

Background: Globally, there has been an increase in the use of herbal medicines with the general misconception that herbal medicines are absolutely effective and safe. Many people often use herbs concomitantly with orthodox medicines and this may lead to fatal complications of herb-drug

*Corresponding author: E-mail: nikeoa@yahoo.com;

interactions. This cross-sectional survey assesses the knowledge and attitude of teachers and artisans on the use of herbal medicine and the possible occurrence of herb-herb and herb-drug interactions.

Method: A semi-structured questionnaire was used which covered demographics, cultural categorization of herbal medicine used, socio-economic factors (SEF), reason(s) for herbal medicine use, knowledge of herb-herb (HHI) and herb-drug interactions (HDI) and, and attitude to herbal medications (AHM) of the respondents. Data were entered into SPSS version 20 and analyzed using descriptive and inferential statistics.

Results: There were 277 respondents, comprising 93 teachers, 77 drivers, and 107 mechanics. The response rate was 95.1%. Seventy-two (77.4%) teachers, 56 (72.7%) drivers and 101 (94.4%) mechanics use herbal medicine for infectious diseases while 57 (61.3%) teachers, 20 (26.0%) drivers and 83 (77.6%) use herbal medicine for non-infectious diseases. Assessment of SEF shows that a significant number ($p=0.04$) of participants were encouraged by friends to use herbal medicines while 63 (67.7%) teachers, 57 (74.0%) drivers, and 84 (78.5%) mechanics preferred herbal medicine to hospital management because it is affordable. Assessment of HHI shows 81 (75.7%) mechanics are aware of HHI, whereas 56 (72.7%) drivers and 69 (74.2%) teachers are not. Similarly, majority of the teachers (81, 87.1%) and drivers (47, 61.0%) were not aware of the possible occurrence of HDI while a significant ($p=0.03$) number (76, 71.0%) of the mechanics were aware.

Conclusion: The respondents' awareness of herb-herb and herb-drug interactions was poor. Public awareness program on the potential implications and health impact of herb-herb and herb-drug interactions is highly essential.

Keywords: Herbal medicines; herb-drug interactions; herb-herb interaction perception; knowledge; Nigeria.

1. INTRODUCTION

Due to the widespread acceptance of the complementary and alternative medicine system, there has been an increase in the use of herbal drugs and phytomedicines for the treatment of diseases in recent times [1]. Across Africa, herbal medicines are a choice treatment option particularly because of their affordability, accessibility, and cultural beliefs that drugs from nature are effective and safe. Herbal medicines have been in use since ancient times as nutraceuticals and for the treatment of diseases such as malaria, diabetes, cancer, and infectious diseases [2]. Adverse reactions to herbal medicines have been widely reported [3, 4]. The risk of adverse reactions linked to herbal medicines increases significantly in the presence of multiple herbal medications. Many polyherbal medications have been shown to contain toxic chemicals that can cause cellular toxicity [4, 5]. Nowadays, patients often use herbal medications alongside synthetic or orthodox medicines to get a faster response and usually without the knowledge of a healthcare professional, for fear of being castigated. Formulations that contain herbs, herbal extracts, or phytoconstituents when taken with synthetic drugs may lead to undesirable interactions. Hence, the general public should be made aware of herb-herb and

herb-drug interactions and their negative effects on health especially for drugs with a narrow therapeutic index such as warfarin or digoxin [6]. Clinicians should ask patients about their use of herbs in a non-judgmental and relaxed way in order to encourage patients to disclose concomitant use of herbal medicine and prescribed medication. The patient should be treated as a partner in observing adverse reactions or interactions, and should be informed about the lack of information on interactions and the need for open communication regarding the use of herbal remedies. Formulation, brand, dose, and reason for use of herbs should be documented on the patient's charts and updated regularly [7, 8].

A drug interaction is a situation in which a substance affects the activity of a drug when both are administered together. It occurs when a patient's response to a drug is modified by food, nutritional supplements, formulation excipients, environmental factors, other drugs, or diseases. Interactions may be beneficial or harmful. Harmful interactions (especially drug-drug) are important as they cause 10–20% of the adverse drug reactions requiring hospitalization [9]. Elderly patients are especially vulnerable – with a strong relationship between ageing [9], the number of drugs prescribed and the frequency of

potential drug-drug interactions. Increasing multi-morbidity with age often makes it necessary to prescribe several drugs for one patient at a time [10]. More often than not, the interactions are of no clinical significance, because the response of most systems within the body is graded, with the intensity of response varying continuously with the concentration of the compound producing it [11]. The factors responsible for drug-drug interaction include; individual genetic differences, dietary factors, insufficient knowledge, and the presence of a pathological condition [12]. *In vitro* [13], *in silico* and *in vivo* studies have shown the occurrence of herb-cytochrome P450 (CYP) inhibition, herb-drug interactions and elevated CYP genes upon exposure to herbal drugs and its active constituents [14, 15]. The mechanism of herb-drug interaction could be pharmacokinetic or pharmacodynamic. The pharmacokinetic mechanism of drug interaction may affect the drug bioavailability, clearance, distribution, metabolism, and excretion. While the pharmacodynamics effect of drug interaction may be seen as agonism, antagonism, displacement from protein binding, enzyme inhibition, or enzyme induction [16].

On the other hand, there can also exist therapeutically advantageous interactions. For instance; Ginseng is considered to be a potent adjuvant for the delivery of vaccines which have been proven to induce higher or similar antibody titers than vaccines adjuvant with aluminum hydroxide [17]. *In vitro* studies also revealed that silibinin enhances the antitumor activity of cisplatin. All these data suggest that a synergistic potential between herbal medicines and drugs can be beneficial at times, clearly stressing the need for extensive work to be done in this area [18]. Nevertheless, using phytomedicine for self-medication comes with certain challenges. Due to differences in plant strength and individual responses, it might be difficult to find the ideal dosage and potency of plant-based medicines. Furthermore, certain plants may interact adversely with other drugs, underlying medical disorders, or allergies, or cause unwanted effects. Herbal supplement quality and purity must be guaranteed; tainted or incorrectly labeled goods may be dangerous. Different regions have different laws governing herbal treatments, which causes variations in safety requirements and quality assurance. It may be difficult to determine the efficacy of certain herbal medicines for particular ailments due to a lack of clinical studies or scientific proof.

The aim of this study was to assess and improve the knowledge, perception, and attitude of teachers, drivers and mechanics in Ibadan metropolis about the incidence of herb-drug or herb-herb interactions (HHI and HDI), their significance, and the danger it poses to their health.

2. METHODOLOGY

2.1 Study Design

The survey was carried out in Ibadan North Local Government Area (LGA), Oyo State. The survey was conducted among public-school teachers, drivers, and mechanics who are registered members of their professional association and attends their monthly meetings.

2.2 Data Collection Instruments and Procedure

A semi-structured questionnaire (quantitative data) and key informant survey (qualitative) were used as data collection tools. The questionnaire contained both open-ended and closed-ended questions designed to assess the demographics, cultural categorization of herbal medicine used, socioeconomic factor, reason(s) for herbal medicine use, knowledge of herbal medication, and attitude to herbal medication of the respondents. Data were collected during the weekly or monthly association meetings of each group of respondents. A total of 277 respondents were included in the study. Furthermore, an educational intervention on herbal use and possible herb-herb and herb-drug interactions (HHI and HDI) was provided for each study group at the end of the collection of the data. The intervention was verbal, and participants were allowed to ask questions to clarify any misinformation on herbal use, HHI and HDI.

Thereafter, key informant interview was conducted to assess the impact of the educational intervention on each study group. An informant interview session was conducted a month after the intervention to assess the impact of the educational intervention on the participants. Five (5) opinion leaders (informants) drawn from each group were involved in the interview. This is to explore the informant's attitudes, feelings, beliefs, experiences, and reactions which could not be obtained using the questionnaire only.

2.3 Consent

Purpose of the study was clearly defined and explained and each respondent was adequately informed about the aims, methods, and expected benefits of the study. Questionnaires were given only after obtaining informed consent of participants.

2.4 Data Analysis

Data were sorted and entered into Statistical Package for Social Science (SPSS) version 20.0 (IBM Corporation, Armonk, NY, USA) and analyzed using descriptive and inferential statistics. A Chi-square test was used to compare the association between participants' occupation and cultural herbal usage with $p < 0.05$ considered statistically significant.

3. RESULTS

3.1 Demographics Characteristics

A total of 277 respondents comprising; 93 teachers, 77 drivers, and 107 mechanics were included in the study. All the mechanics and drivers were male (100%) while the teachers were a mixture of male (41.9%) and female (58.1%). The teachers 69 (74.2%) and mechanics 73 (70.2%) were mainly 40 – 60 years while the drivers 41(53.2%) were mainly 21- 40 years. Most of the drivers 62 (80.5%) and mechanics 78 (75.0%) had at least attended secondary school. More than half 61.2% (n=57) of the teachers had the first degree while 21 % had post-graduate qualifications (Table 1).

3.2 Assessment of Cultural Usage of Herbal Medicine

The cultural usage of herbal medicines among the participants are as shown in Table 2.

3.3 Assessment of Socio-Economic Factors (SEF)

Assessment of SEF indicated that majority participants were encouraged by friends to use herbal medicines. Sixty-three (67.7%) teachers, 57 (74.0%) drivers and 84 (78.5%) of mechanics prefer to use herbal medicine instead of going to the hospital because of its affordability, while 66 (71.0%) teachers, 65 (84.4%) drivers and 91 (85.0%) mechanics claimed the use of herbal medicine saves the cost of healthcare (Table 3).

3.4 Assessment of Knowledge of Herb-Drug and Herb-Herb Interactions

Generally, a significant number ($p=0.04$) of mechanics claimed their knowledge of herbal medicine improved through their contact with traditional medicine practitioners. A significant number of the participants believe herbal medicine is safe for their health but also indicated that too much use can be dangerous to health. Assessment of HDI and HHI shows 81 (75.7%), mechanics believe there is herb-herb interaction (HHI), 56 (72.7%) drivers and 69 (74.2%) teachers are not aware of HHI. Majority of the teachers 81 (87.1%) and drivers 47 (61.0%) do not know about herb-drug interaction (HDI) while a significant ($p=0.04$) number of mechanics 76 (71.0%) claimed to know about HDI (Table 4)

Table 1. Demographics characteristics of the Participants

| Parameter | Specification | Teachers (n=93) No (%) | Drivers (n=77) No (%) | Mechanics (n=107) No (%) |
|--------------------------|---------------------|---------------------------|--------------------------|-----------------------------|
| Sex | Female | 54 (58.1) | 0 (0) | 0 (0) |
| | Male | 39 (41.9) | 77 (100) | 104 (100) |
| Age | < 21 | 0 (0) | 3 (3.9) | 0 (0) |
| | 21- 40 | 15 (16.1) | 41 (53.2) | 7 (6.7) |
| | 40 -60 | 69 (74.2) | 33 (42.9) | 73 (70.2) |
| | >60 | 9 (9.7) | 0 (0) | 24 (23.1) |
| Educational level | No formal education | 0 (0) | 7 (9.1) | 26 (25.0) |
| | Primary | 0 (0) | 8 (10.3) | 0 (0) |
| | Secondary | 0 (0) | 62 (80.5) | 78 (75.0) |
| | NCE | 15 (16.1) | 0 (0) | 0 (0) |
| | Graduate | 57 (61.2) | 0 (0) | 0 (0) |
| | Postgraduate | 21 (22.6) | 0 (0) | 0 (0) |

Table 2. Participant’s Cultural usage of herbal medicine

| Variables | Teachers (n=93) N (%) | Drivers (n= 77) N (%) | Mechanics (n=107) N (%) |
|---|--------------------------|--------------------------|-------------------------------|
| Herbal Medicine for Infectious Diseases (Malaria, Typhoid, etc.) | | | |
| Yes | 72 (77.4) | 56 (72.7) | 101 (94.4) * |
| No | 12 (12.9) | 21 (27.3) | 6 (5.6) |
| Non-response | 9 (9.7) | 0(0) | 0(0) |
| Herbal Medicine for Non-Infectious Diseases (Hypertension, Diabetes, etc.) | | | |
| Yes | 57 (61.2) | 20 (26.0) | 83 (77.6) * |
| No | 27 (29.0) | 57 (74.0) | 9 (8.4) |
| Non-response | 9 (9.7) | 0(0) | 15 (14.0) |
| Herbal Medicine for other disease conditions (hemorrhoids, waist pain, constipation) | | | |
| Yes | 24 (25.8) | 29 (37.7) | 88 (82.2) * |
| No | 60 (64.5) | 48 (62.3) | 8 (7.5) |
| Non-response | 9 (9.7) | 0(0) | 11 (10.3) |

*Significant at $p<0.05$

Table 3. Socio-Economic Factors Affecting Herbal Usage

| Statements | Teachers (n=93) N (%) | Drivers (n= 77) N (%) | Mechanics (n=107) N (%) |
|---|--------------------------|--------------------------|-------------------------------|
| 1. PEER INFLUENCE | | | |
| Friends consider me knowledgeable in the act of using herbal medicine | | | |
| Yes | 84 (90.3) | 53 (68.8) | 95 (88.8) * |
| No | 9 (9.7) | 24 (31.2) | 6 (5.6) |
| Non-response | 0 (0) | 0 (0) | 6 (5.6) |
| Encourage my friends to use herbal medicine | | | |
| Yes | 87 (93.5) | 70 (90.9) | 101 (94.4) |
| No | 6 (6.5) | 7 (9.1) | 6 (5.6) |
| Motivated to use herbal medicine by my friends | | | |
| Yes | 90 (96.8) | 62 (80.5) | 100 (93.5) * |
| No | 3 (3.2) | 15 (19.5) | 7 (6.5) |
| I use the medicine if my friends are also involved | | | |
| Yes | 75 (80.6) | 63 (81.8) | 83 (77.6) |
| No | 18 (19.4) | 14 (18.2) | 24 (22.4) |
| Use the herb that I know the constituents if my friends use them | | | |
| Yes | 54 (58.1) | 63 (81.8) | 77 (72.0) * |
| No | 39 (41.9) | 14 (18.2) | 30 (28.0) |
| Take risk of using herbal medicines just for friends to consider me a hero | | | |
| Yes | 6 (6.5) | 20 (26.0) | 26 (24.3)* |
| No | 87 (93.5) | 57 (74.0) | 81 (75.7) |
| 2. ECONOMIC FACTORS | | | |
| Prefer herbal medicine use to hospital management because it is affordable | | | |
| Yes | 63 (67.7) | 57 (74.0) | 84 (78.5) * |
| No | 27 (29.0) | 20 (26.0) | 20 (18.7) |
| Non-response | 3 (3.2) | 0(0) | 3 (2.8) |
| Herbal medicine is time-saving | | | |
| Yes | 57 (61.3) | 69 (89.6) | 101 (94.4) * |
| No | 33 (35.5) | 8 (10.4) | 6 (5.6) |
| Non-response | 3 (3.2) | 0 (0) | 0 (0) |
| The use of herbal medicines saves money | | | |
| Yes | 66 (71.0) | 65 (84.4) | 91 (85.0) * |
| No | 24 (25.8) | 12 (15.6) | 16 (15.0) |
| Non-response | 3 (3.2) | 0 (0) | 0 (0) |

*Significant at $p<0.05$

Table 4. General knowledge on the herb-drug and herb-herb interaction

| Statements | Teachers (n=93) N (%) | Drivers (n= 77) N (%) | Mechanics (n=107) N (%) |
|---|--------------------------|--------------------------|-------------------------------|
| Influenced to know more about herbal medicine through traditional medicine practitioners | | | |
| Yes | 33 (35.5) | 39 (50.6) | 93 (86.9) * |
| No | 48 (51.6) | 38 (49.4) | 14 (13.1) |
| Non-response | 12 (12.9) | 0 (0) | |
| The moderate use of herbal medicines cannot have an adverse effect | | | |
| Yes | 63 (67.7) | 50 (64.9) | 71 (66.4) * |
| No | 15 (16.1) | 27 (35.1) | 36 (33.6) |
| Non-response | 15 (16.1) | 0 (0) | 0 (0) |
| The use of herbal medicines cannot affect my health | | | |
| Yes | 30 (32.3) | 35 (46) | 94 (88) * |
| No | 48 (51.6) | 42 (55) | 13 (12) |
| Non-response | 15 (16.1) | 0(0) | 0(0) |
| Use of herbal medicines should be on a prescription basis | | | |
| Yes | 72 (77.4) | 46 (59.7) | 87 (81.3) * |
| No | 9 (9.7) | 31 (40.3) | 20 (18.7) |
| Non-response | 12 (12.9) | 0 (0) | 0 (0) |
| Excessive use of herbal medicines is dangerous to the body | | | |
| Yes | 63 (67.7) | 41 (53.2) | 71 (66.4) * |
| No | 18 (19.4) | 36 (46.8) | 36 (33.6) |
| Non-response | 12 (12.9) | 0 (0) | 0 (0) |
| The use of different herbal medications together can be dangerous to the body | | | |
| Yes | 24 (25.8) | 21(27.3) | 81 (75.7) |
| No | 69 (74.2) | 56 (72.7) | 26 (24.3) |
| Non-response | 0 (0) | 0(0) | 0(0) |
| Inappropriate use of herbal and orthodox drugs can be dangerous to the body | | | |
| Yes | 12 (12.9) | 30 (39.0) | 76 (71.0) * |
| No | 81 (87.1) | 47 (61.0) | 31 (29.0) |
| Non-response | 0(0) | 0(0) | 0(0) |

*Significant at p<0.05

3.5 Attitudes to Herbal Medication (AHM)

The majority of the respondents claim they feel improvement in their body when they use herbal medicine. A significant number of the mechanics (p=0.03) believe that orthodox medicine is not superior to herbal medicine and that herbal medicines usually come in handy when needed (Table 5).

the drug especially if it relates to my sickness, but now I know better”.

{Teacher 1}

“My job as a long-distance driver exposes me to a lot of advises on herbs from different people of different backgrounds and different ways of treatment. Hence, I tend to take all sorts of herbal concoctions. I will stop doing this and limit myself to drugs that I know their constituents or understand how they work”.

{Driver 1}

3.6 Reponses from Key Informant Interview to Assess the Improvement in Knowledge among Study Groups

On peer influence: Majority of key informants acknowledge that peer influence has been one of the major reasons why they used an herbal drug without proper consultation.

“I use herbal medicine because it is cheaper and saves time, even if I do not have the money, I can always go into the bush to fetch herbs, but I will be more careful of my choices from now on”.

{Driver 2}

“Whenever our colleagues come in with a new herbal product and testify of its great actions, I am usually very excited to check out

On general knowledge and attitude to herbal medicine: The key informants agreed that they have a better understanding of why it is better to obtain the correct information to improve

Table 5. General knowledge on the usage of herbal medications

| Variables | Teachers (n=93) N (%) | Drivers (n= 77) N (%) | Mechanics (n=107) N (%) |
|--|----------------------------------|----------------------------------|------------------------------------|
| Having a taste of herbal medications to satisfy my curiosity | | | |
| Strongly agree | 15 (16.1) | 4 (5.2) | 31 (29.0) * |
| Agree | 36 (38.7) | 13 (16.9) | 38 (35.5) |
| Disagree | 15 (16.1) | 20 (26.0) | 38 (35.5) |
| Strongly disagree | 15 (16.1) | 40 (51.9) | 0 (0) |
| Non-response | 12 (12.9) | 0 (0) | 0 (0) |
| Feel improvement in my body anytime I consume herbal medication | | | |
| Strongly agree | 12 (12.9) | 22 (28.6) | 35 (32.7) * |
| Agree | 45 (48.4) | 14 (18.2) | 58 (54.2) |
| Disagree | 15 (16.1) | 9 (11.7) | 14 (13.1) |
| Strongly disagree | 9 (9.7) | 32 (41.6) | 0 (0) |
| Non-response | 12 (12.9) | 0 (0) | 0 (0) |
| Consider herbal medication use as therapy that helps in elongating the lifespan | | | |
| Strongly agree | 15 (16.1) | 27 (35.1) | 47 (43.9) * |
| Agree | 21 (22.6) | 16 (20.8) | 60 (56.1) |
| Disagree | 30 (32.3) | 6 (7.8) | 0 (0) |
| Strongly disagree | 12 (12.9) | 28 (36.4) | 0 (0) |
| Non-response | 15 (16.1) | 0 (0) | 0 (0) |
| Consider herbal medication to be better than orthodox medicine | | | |
| Strongly agree | 12 (12.9) | 12 (15.6) | 68 (63.6) * |
| Agree | 27 (29.0) | 16 (20.8) | 36 (33.6) |
| Disagree | 24 (25.8) | 9 (11.7) | 3 (2.8) |
| Strongly disagree | 18 (19.4) | 40 (51.90) | 0 (0) |
| Non-response | 12 (12.9) | 0 (0) | 0 (0) |
| Herbal medicines come in handy when in need of them | | | |
| Strongly agree | 18 (19.4) | 36 (46.8) | 61 (57.0) * |
| Agree | 21 (22.6) | 7 (9.1) | 46 (43.0) |
| Disagree | 33 (35.5) | 6 (7.8) | 0 (0) |
| Strongly disagree | 9 (9.7) | 28 (36.4) | 0 (0) |
| Non-response | 12 (12.9) | 0 (0) | 0 (0) |
| Herbal medications are not good enough | | | |
| Strongly agree | 15 (16.1) | 0 (0.0) | 23 (21.5) * |
| Agree | 18 (19.4) | 0 (0.0) | 4 (3.7) |
| Disagree | 30 (32.3) | 0 (0.0) | 80 (74.8) |
| Strongly disagree | 18 (19.4) | 77 (100.0) | 0 (0.0) |
| Non-response | 12 (12.9) | 0 (0.0) | 0 (0.0) |
| Consider the use of herbal medication as inferior to orthodox drug | | | |
| Strongly agree | 15 (16.1) | 0 (0.0) | 24 (22.4) * |
| Agree | 21 (22.6) | 0 (0.0) | 3 (2.8) |
| Disagree | 36 (38.7) | 0 (0.0) | 80 (74.8) |
| Strongly disagree | 9 (9.7) | 77 (100.0) | 0 (0.0) |
| Non-response | 12 (12.9) | 0 (0.0) | 0 (0.0) |

*Significant at $p < 0.05$

knowledge from the right sources especially pharmacists since they are knowledgeable in both herbal and orthodox medicine.

“We do a lot of hard work, so we always look for what to take to increase our strength. We have a lot of herb sellers around, with promises of gaining strength from using diverse kinds of herbs, so on daily basis we drink different

concoctions, it is good to know that the practice is wrong, we have a better understanding, we have gained a lot from this lecture”.

{Mechanic 1}

On herb-drug and herb-herb interaction: The informants said they were surprised to learn about the extent and type of interactions that could occur when herbs and orthodox medicine

are used together. After further clarification, they agreed that some serious health crises might arise due to herb-herb and herb-drug interactions.

"I came from a home where I was raised with traditional medicine. I have a perfect understanding of how herbal medicine works, I don't believe there is herb-herb interaction or contraindication, I have never experienced such".
{Driver 3}

"We must have been losing some of our members to the incidence of herb-drug interaction and adverse drug reactions, considering the dramatic circumstances surrounding some deaths, but sometimes we blame spiritual circumstances on that death".
{Teacher 2}

"We know better now and we won't mind if you can extend the health talk to our colleagues in other local governments"
{Teacher 3}

"One of our members got an herbal recipe from a colleague comprising of "Ewuro" (bitter leaf) and personal urine. He decided to use it and he collapsed almost immediately after taking the drug, we thought it was a spiritual attack but with this new information, I am thinking that it might be a strong reaction to the concoction and herb-drug interaction. As for me oh! I will be more careful of what I take together henceforth".
{Driver 4}

4. DISCUSSION

This study shows that the prevalence of herbal drug use among the study groups was consistent with the WHO statement that 80% of the world population is dependent on traditional medicines (mainly herbal medicines) for their primary health care needs [19]. The global increase in the usage of herbal medicines is globally mostly due to the perception "natural" implies "safe" [20]. Herbal medicines may be beneficial but they are not entirely safe.

Based on educational qualifications, most of the drivers 62 (80.5%) and mechanics 78 (75.0%) had at least attended secondary school. More than half (61.2%) of the teachers had first degree while 21 (22.6%) had post-graduate qualifications. Educational level did not affect the perception of the respondents on the cultural usage of herbal medicine as there was no significant difference in the usage and cultural

understanding of herbs among the three professions (mechanics, drivers, and teachers). This finding resonates with previous studies that have shown that increased years of education had no significant impact on the usage of herbal medications [21, 22].

Overall, the mechanics used herbal preparations more among all the participants for the treatment of infectious and non-infectious diseases (NIDs) including other disease conditions like constipation and pile. Although, majority of the participants; 72 (77.4%) teachers, 56 (72.7%) drivers and 101 (94.4%) mechanics used herbal medicine for the treatment of infectious diseases. The use of herbal preparations by 83 (77.6) mechanics for treatment of non-infectious diseases (hypertension, diabetes, arthritis etc.) is consistent with surveys indicating a similar correlation between the use of herbal medicines and management of upper respiratory infections and arthritis [23]. Previous studies have also shown that herbal medicines were the most commonly used complementary and alternative medicines (CAM) used in the management of NIDs such as diabetes, arthritis, hypertension, and respiratory disorders [24].

Socio-economic factors remains a major reason why people prefer to use herbal medicines. In this study, majority of the participants are influenced by their friends and colleagues to use herbal medications. Similar results were observed in previous studies where the recommendation of herbal medications are mainly by friends and family [25, 26]. This finding is also in agreement with results of a previous study conducted in Lagos where friends, family and colleagues were a major influence in herbal medicine usage [27]. Herbal medicines were considered affordable and time saving by more than half of the participants. This finding is consistent with another study [22, 28], which found that most people believe herbal medicines are effective and readily available. This observation is also in agreement with the general public's opinion that herbal medications are effective, inexpensive, and safe [29]. Following discussion with key informants, 80% of them insisted that economic factors or cost of treatment informed their usage of herbal medicine while they also agreed to imbibe the attitude of disclosing their use of herbal medicine when consulting orthodox doctors. This finding is similar to the report from a previous study [30].

Regarding knowledge about herb-drug interactions and herb-herb interactions, more

than 60% of all the participants admitted that moderate use of herbal medicines may not have an adverse effect on their health. More than half of respondents unanimously agreed that excessive use of herbal medicines was dangerous to their health [31]. Assessment of HDI and HHI shows that 81 (75.7%) mechanics believe there is HHI, 56 (72.7%) drivers and 69 (74.2%) teachers had no previous knowledge of HHI. The majority of the teachers 81 (87.1%) and drivers 47 (61.0%) do not know about herb-drug interaction (HDI) while a significant ($p=0.04$) number of mechanics 76 (71.0%) claimed to know about HDI. Even though the global increase in the popularity of alternative medicine has raised renewed concerns regarding herb-drug interactions among health practitioners [32], a lot of people remain ignorant of the existence of herb-drug interactions as noted among some participants in this study. Therefore, educational intervention studies like this will go a long way in educating people on the safety of herbal medicine use and they probably be more cautious in its use with other herbs and drugs.

Generally, a significant number ($p=0.04$) of mechanics claimed their knowledge of herbal medicine improved through their contact with traditional medicine practitioners. A significant number of the participants believe herbal medicine is safe for their health but also indicated that too much use can be dangerous to health. Therefore, the participants are unlikely to excessively use herbal medicine in the treatment or management of any form of disease state. In addition, they are unlikely to use herbal medicine without good health reasons(s) as an insignificant number use it due to their curiosity as noted among the mechanics and teachers.

After the educational intervention, the teachers' group was comparatively the most improved possibly as a result of increased educational level and better exposure. The health talk generated much enthusiasm among the teachers such that they wanted a similar awareness talk to be presented to a larger audience. One of them said "*it will be very difficult for me to take the herbal drug and orthodox medicine together after this time*". Some referred to incidences in the past including tragic ones which could have resulted from suspected herb-drug interactions. The artisans were similarly impressed to learn about the possible occurrence of herb-herb and herbal-drug interactions but were not willing to adopt the new information to their lifestyle. One of them reported that he had been using herbal

medications all his life, that he grew up in the village and he doubted the existence of adverse reactions from herbs.

5. CONCLUSIONS

The use of herbal medicine for self-treatment is on the increase, especially among regions of the world facing economic challenges. However, its safety among the users needs to be evaluated for proper education of the consumers. This study indicates that the usage of herbal drug cut across socio-economic groups and the lack of awareness of herbal drug interaction is prevalent among all study groups. Although, many of the participants believed there is no herb-drug or herb-herb interactions, a few of them reported suspected past mild to moderate unpleasant experiences. The enthusiastic responses after each interventional talks underscore the fact that the general public is willing to learn and increase their awareness about herbal medications. Through the educational intervention, we were able to educate and improve knowledge among the study groups. However, survey responses might be influenced by recall bias or subjectivity, missing out on the complexity of herb-herb, herb-drug, and herb-food interactions. The findings might not represent the entire population, and self-reported information may not be verifiable. To address these limitations, combining survey data with clinical studies or utilizing more objective measures in future studies could provide a more holistic understanding of interactions.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Parvez MK, Rishi V. Herb-drug interactions and hepatotoxicity, *Curr. Drug Metab.* 2019 ;20(4):275-282.
2. Dong Y, Chen H, Gao J, Liu Y, Li J, Wang J, Bioactive ingredients in chinese herbal medicines that target non-coding rnas: Promising new choices for disease treatment, *Front. Pharmacol.* 2019;10:515.
3. Ernst E. Toxic heavy metals and undeclared drugs in Asian herbal medicines, *Trends Pharmacol. Sci.* 2002; 23(3):136-9.
4. Ekor M, Osonuga O, Odewabi A, Bakre A, Oritogun K. Toxicity evaluation of Yoyo cleanser bitters and fields Swedish bitters herbal preparations following sub-chronic

- administration in rats, *Am. J. Pharmacol. Toxicol.* 2010;5:159-66.
5. Mohd Fuat A, Aidoo K, Calvert T, Candlish A, Mycoflora, cytotoxicity, and DNA interaction of polyherbal products from Malaysia, *Pharm. Biol.* 2006;44(1):23-31.
 6. Yulin Z, Lingti K, Shan G, Yong Z. A possible interaction between linezolid and digoxin: A case report of therapeutic drug monitoring, *Saudi Pharmaceutical Journal.* 2020;28(11):1408-1410.
 7. Orief YI, Farghaly NF, Ibrahim MIA. Use of herbal medicines among pregnant women attending family health centers in Alexandria, *Middle East Fertility Society Journal.* 2014;19(1):42-50.
 8. Mamindla S, Prasad K, Koganti B. Herb-drug interactions: An overview of mechanisms and clinical aspects, *International Journal of Pharmaceutical Sciences Research and Clinical Studies in Headache.* 2016;7(9):3576.
 9. Ribeiro MR, Motta AA, Marcondes-Fonseca LA, Kalil-Filho J, Giavina-Bianchi PJC. Increase of 10% in the rate of adverse drug reactions for each drug administered in hospitalized patients. 2018 ;73.
 10. Shetty V, Chowta MN, Chowta KN, Shenoy A, Kamath A, Kamath P. Evaluation of potential drug-drug interactions with medications prescribed to geriatric patients in a tertiary care hospital, *J. Aging Res;* 2018.
 11. Fasinu PS, Rapp GK, Herbal interaction with chemotherapeutic drugs—a focus on clinically significant findings, *Front. Oncol.* 2019;1356.
 12. Rescigno T, Micolucci L, Tecce MF, Capasso A. Bioactive nutrients and nutrigenomics in age-related diseases, *Molecules.* 2017;22(1):105.
 13. Lim SYM, Binti Azidin AR, Ung YT, Al-Shagga M, Alshawsh MA, Mohamed Z, Ong CE, Pan Y, Effect of 95% ethanol khat extract and cathinone on in vitro human recombinant cytochrome P450 (CYP) 2C9, CYP2D6, and CYP3A4 activity, *Eur. J. Drug Metab. Pharmacokinet.* 2019;44:423-431.
 14. Lim SYM, Alshagga MA, Alshawsh MA, Ong CE, Pan Y. In vitro effects of 95% khat ethanol extract (KEE) on human recombinant cytochrome P450 (CYP) 1A2, CYP2A6, CYP2B6, CYP2C8, CYP2C19, CYP2E1, CYP2J2 and CYP3A5, *Drug Metabolism and Personalized Therapy.* 2021;37(1):55-67.
 15. Lim SYM, Loo JSE, Alshagga M, Alshawsh MA, Ong CE, Pan Y. *In vitro* and in silico studies of interactions of cathinone with human recombinant cytochrome P450 CYP (1A2), CYP2A6, CYP2B6, CYP2C8, CYP2C19, CYP2E1, CYP2J2, and CYP3A5, *Toxicology Reports* 9. 2022;759-768.
 16. Peng Y, Cheng Z, Xie F. Evaluation of pharmacokinetic drug–drug interactions: A review of the mechanisms, *In Vitro and In silico approaches,* *Metabolites.* 2021; 11(2):75.
 17. Ramos-Espinoza FC, Cueva-Quiroz VA, Yunis-Aguinaga J, Alvarez-Rubio NC, de Mello NP, de Moraes JRE. Efficacy of two adjuvants administered with a novel hydrogen peroxide-inactivated vaccine against *Streptococcus agalactiae* in Nile tilapia fingerlings, *Fish Shellfish Immunology.* 2020;105:350-358.
 18. Mamindla S, Prasad K, Koganti B. Herb-Drug interactions: An overview of mechanisms and clinical aspects *International Journal of Pharmaceutical Sciences and Research.* 2016;7(9):3576-86.
 19. Ahmadi S, Rafiey H, Sajjadi H, Nosrati Nejad F, Ahmadi N, Yoosefi M, Irandoost SF, Farzadfar F. Trend and pattern of using herbal medicines among people who are aware of their diabetes mellitus: results from National STEPs Surveys in 2005 to 2011 in Iran, *Journal of Diabetes Metabolic Disorders.* 2021;20(2):1319-1325.
 20. Brantley S, Gufford B, Dua R, Fediuk D, Graf TN, Scarlett Y, Frederick K, Fisher M, Oberlies N, Paine M. Physiologically based pharmacokinetic modeling framework for quantitative prediction of an herb–drug interaction, *CPT: pharmacometrics & systems pharmacology.* 2014;3(3):1-9.
 21. Li S, Odedina S, Agwai I, Ojengbede O, Huo D, Olopade O. Traditional medicine usage among adult women in Ibadan, Nigeria: a cross-sectional study, *BMC complementary medicine therapies.* 2020;20(1):1-7.
 22. Elechi-Amadi KN, Briggs ON, Konne FE, Giami LK, C Ajufo B. Perception and acceptance of herbal medicines among residents of Port Harcourt, Nigeria. *Journal of Complementary and Alternative Medical Research.* 2021;12(3):24-34.

23. Rashrash M, Schommer JC, Brown LM. Prevalence and predictors of herbal medicine use among adults in the United States, J Patient Exp. 2017;4(3): 108-113.
24. Jafari A, Movahedzadeh D, Barsalani FR, Tehrani H. Investigation of attitude, awareness, belief, and practice of complementary and alternative medicine among type 2 diabetic patients: a cross sectional study, Journal of Diabetes Metabolic Disorders. 2021;20(1):477-484.
25. Abdelmola AO, Bahri A, Abuallut I, Refaei BA, Hakami WK, Abutaleb AK, Mahzari SM, Mashragi MA, Es'haq SA, Aldarbi KF. Prevalence, knowledge, and perception about the use of herbal medicines jazan - Saudi Arabia, J Family Med Prim Care. 2021;10(6):2386-2393.
26. Al-Ghamdi S, Aldossari K, Al-Zahrani J, Al-Shaalan F, Al-Sharif S, Al-Khurayji H, Al-Swayeh A. Prevalence, knowledge and attitudes toward herbal medication use by Saudi women in the central region during pregnancy, during labor and after delivery, BMC Complement. Altern. Med. 2017;17(1):196.
27. Oreagba IA, Oshikoya KA, Amachree M. Herbal medicine use among urban residents in Lagos, Nigeria, BMC Complement. Altern. Med. 2011;11(1):117.
28. Usifoh S, Udezi A. Social and economic factors influencing the patronage and use of complementary and alternative medicine in Enugu, Journal of Pharmacy & Bioresources. 2013;10(1):17-24.
29. Nwauzoma A, Dappa MS. Ethnobotanical studies of port Harcourt metropolis, Nigeria. International Scholarly Research Notices; 2013.
30. Uzochukwu BSC, Ossai EN, Okeke CC, Ndu AC, Onwujekwe OE. Malaria knowledge and treatment practices in Enugu state, Nigeria: A qualitative study, International Journal of Health Policy Management. 2018;7(9):859.
31. Ameade EPK, Ibrahim M, Ibrahim H-S, Habib RH, Gbedema SY. Concurrent use of herbal and orthodox medicines among residents of Tamale, Northern Ghana, who patronize hospitals and herbal clinics, Evidence-Based Complementary Alternative Medicine Review; 2018.
32. Jahromi B, Pirvulescu I, Candido KD, Knezevic NN. Herbal medicine for pain management: Efficacy and drug interactions, Pharmaceutics. 2021;13(2): 251.

© 2023 Ogbole et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/110029>*