The aim of this study characterizes the content of cadmium, copper, iron, nickel, selenium, zinc, lead, and mercury in a random sample of traditional Nigerian products. Herbal drugs are said to be therapeutic and are widely accepted, there have been cases of chronic and acute excitement as a result of their use [19].

METHODS

Herbal formulation profile

Anti-viral samples of the 10 herbal formulations dispensed by Registered Medical Practioners were gathered from Solapur district India's area. Herbal formulations containing mainly the *Swertia chirata, Triphala, Haridra, Daruharidra, Kantakari, Brhati, Karcura, Sunthi, Marica,* and *Pippali* were selected for study in this research. The herbal formulations were denoted by code AV1 to AV10.

Chemicals and reagents

J. T. Baker supplied supra pure nitric acid, and Merck supplied hydrogen peroxide is analytical grade chemical. Merck provided stock solutions with standard of Cr, Cd, Pb, As, and Hg. Milli-Q water was used to make all of the solutions and dilutions (Millipore, Elix).

Sample preparation

Microwave aided wet digestion was used to prepare a sample of each herbal formulation. In a clean, dry Teflon digestion tube, around of herbal powder 0.5 g were mixed with 5 mL of (68%) nitric acid, 1 mL (30%) of hydrogen peroxide and microwave assisted digestion in a microwave digester. After filtration the digest was transferred into a volumetric flask with Milli-Q water after digestion. If necessary, more dilutions were prepared.

INSTRUMENTATION

Equipment calibration

The following detection limits and sensitivity of the employed atomic absorption spectrophotometer (AAS) equipment were obtained from the researched elements. As of 0.02 and 0.08 parts per million for Cd, 0.2 and 1.0 parts per million for Cd, and 2 and 10.0 parts per million for Pb.

Extraction of heavy metals from Herbal formulations

A sample of herbal formulation of 10 g was taken and heated in a silica crucible to remove the moisture. At 450°C, for 2 h in a muffle furnace it was put, in to separate the organic parts. To cool, 20 mL distilled water added, ash was digested in 5 mL dilute HCL + 1 mL HNO3. By distilling water, filtered and the filter paper was washed in 100 mL volumetric flask. Distilled water and suitable dilutions were prepared with it was made with 100 ml. This filtrate contained the metal-like, cadmium, Mercury, lead, Chromium, and arsenic. The Lead, Arsenic, cadmium and Mercury, and Chromium were evaluated by Atomic Absorption Sphectrophometer [20].

Standard solutions varying from 1 ppb to 15 ppb were diluted from 1000 ppm standard stock solutions and stored at 4°C. An (AAS, Agilent 280FS AA) fitted along an atomizer of graphite tube was used to evaluate the product samples right away (GTA 120). The apparatus was set to GTA mode, with a run rate of 3 L/min of argon gas and temperature settings that the instrument manufacturer suggested. All analyses were carried out in batches, with standards, reagent blanks, and herbal samples included in each batch. The concentrations of heavy metals were calculated [21].

RESULTS

The result of herbal formulations given arsenic was found in AV1, AV2, AV7, and AV8 with values of 15.21, 9.39, 291.43, and 632.34 ppm in this study, respectively (Table 1 and Fig. 1).

Lead was found in herbal formulations in this study in AV2, AV4, AV6, AV7, AV8, and AV9, with values of 13.32, 12.865, 13.569, 160.809, 398.664, and 12.969 ppm it above the WHO recommended limits (Table 1 and Fig. 2).

Cadmium was found in all herbal formulations with the values of <0.1 ppm in this study (Table 1 and Fig. 3).

Mercury was detected in AV1, AV2, AV3, AV4, AV6, AV7, AV8, AV9, and AV10 with the value of 14.54, 7.39, 14.87, 12.28, 8.06, 8.23, 4.13, and 8.84 ppm of the herbal formulation calculated in this investigation (Table 1 and Fig. 4).

Chromium level was found in AV1, AV2, AV3, AV4, AV6, AV7, AV8, AV9, and AV10 with the value of 224.52, 140.46, 138.7, 135.67, 141.72, 143.09, 221.87, 316.87, 222.05, and 137.96 ppm of the herbal formulation calculated in this investigation (Table 1 and Fig. 5).

DISCUSSION

Chemicals and heavy metals are constantly polluting the atmosphere and soil as a result of the rapid development of industries, as well as the widespread use of fertilizers and pesticides. As a result, contaminants and heavy metals concentrate in the herbal plants that in contaminated regions, then enter into the body of human being by food chain via herbal preparations, extracts, and any parts. The negative health effect of this heavy metals, and environmental impact, have been a major topic of worry around the world Indian herbal medicine are now thought to be a toxicity of heavy metal and their source in both humans and animals [22]. The Ayurvedic Pharmacopoeia of India, like WHO, suggested the herbals, those are the fresh obtained for herbal treatments, be tested of existing toxic heavy metals mentioned above, and sets limits for them. The maximum allowed limit of lead in raw herbs, according to the Ayurvedic Pharmacopoeia of India, is 10.0 ppm and the highest allowed value 0.3 ppm for cadmium. According to the Ayurvedic Pharmacopoeia of India, the maximum allowed value 3.0 ppm for arsenic [23]. There have been reports of traditional Chinese, Indian, Malaysian, and Thai herbal medications contaminating herbal preparations, among other reasons for their toxic effects [24-26]. The majority of Ayurvedic and herbal enterprises in India commercial suppliers supply herbal materials for use them in contents without testing. Ten herbal formulations were submitted for qualitative determination of heavy metal by AAS in the current investigation. Table 1 summarizes the results of the examination of five heavy metals in ten herbal formulations.

Arsenic is a nonessential element that is poisonous. It is contaminated by geological sources that drain into aquifers and contaminate water. It can also be contaminated by mining, pesticide application, and other industrial operations. Many traditional treatments given it is a contaminated. Arsenic toxicity in groundwater is severing public health issue that affects people in millions of in the Ganges delta, which includes India and Bangladesh [27]. Arsenic toxicity is caused by the inactivation of up to 200 enzymes, most of which are complicated in cellular energy processes, and repair, DNA synthesis. Nausea, vomiting, abdominal discomfort, and severe diarrhea are all symptoms of acute arsenic poisoning. Chronic toxicity causes multisystem disorders, such as carcinogens, which affects nearly all organs [28,29].

Arsenic was found in AV1, AV2, AV7, and AV8 with values of 15.21, 9.39, 291.43, and 632.34 ppm in this study (Table 1 and Fig. 1). The stable heavy metal lead is most commonly found in soil. This is highly toxic to microorganism, animals and plants. The use of fertilizers on a regular basis, the combustion of fossil fuels, and the disposal of sewage sludge are all contributing to the rise in lead pollution. Harmful toxicity symptoms produced such as nephritis, colic, headache, anemia, convulsions, brain damage, and central nervous system disease could result from level of lead exceeding acceptable limits [30,31].

Lead was found in AV2, AV4, AV6, AV7, AV8, and AV9 herbal formulations in this study, with values of 13.32, 12.865,13.569,160.809, 398.664, and 12.969 ppm it above the WHO recommended limits (Table 1 and Fig. 2). It has recently gained increasing attention as a result of its widespread presence in water, soil, milk, food, and herbal therapeutic item [32]. Small amounts of cadmium cause damage to the human arterial kidney, resulting in renal collapse. It builds up in the human body, replacing zinc

Table 1: Heavy metal contents in unregistered herbs (ppm)

S. No	Herbal formulations Code	Arsenic (As) Mean±SD WHO permissible Limit: 5 ppm	Lead (Pb) Mean±SD WHO permissible Limit: 10 ppm	Cadmium (Cd) Mean±SD 0.3 ppm	Mercury (Hg) Mean±SD WHO permissible Limit: 0.5 ppm	Chromium (Cr) Mean±SD WHO permissible Limit: 2 ppm
1	AV1	15.21±1.9860	4.371±0	<0.1±1.5202	14.54±3.9443	224.52±3.1776
2	AV2	9.39±0	13.320±1.9860	<0.1±1.5300	7.39±9.9301	140.46±0
3	AV3	0.62±0	0.5±0	<0.1±1.5101	14.87±0	138.70±0
4	AV4	1.62±0	12.865±0	<0.1±1.5201	12.28±0	135.67±0
5	AV5	0.67±0	4.48±0	<0.1±1.5002	0.01±0	141.72±0
6	AV6	2.98±0	13.569±0	<0.1±1.5000	8.06±0	143.09±0
7	AV7	291.43±0	160.809±0	<0.1±1.5102	8.23±0	221.87±0
8	AV8	632.34±0	398.664±0	<0.1±1.5201	4.13±0	316.87±0
9	AV9	0.85±0	12.969±0	<0.1±1.5303	8.84±0	222.05±0
10	AV10	0.32±0	0.5±0	<0.1±1.5104	0.83±0	137.96±0

Numbers of samples n=10

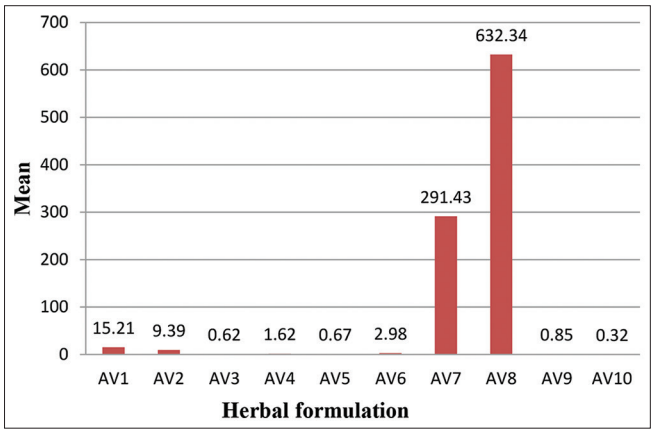

Fig. 1: Summarized arsenic level in herbal formulations. Result are given in mean

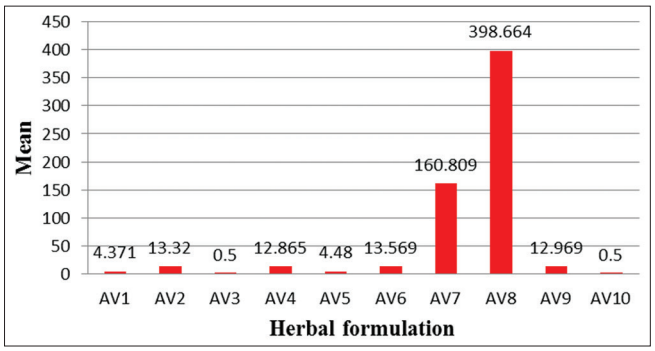

Fig. 2: Summarized lead level in herbal formulations. Result are given in mean

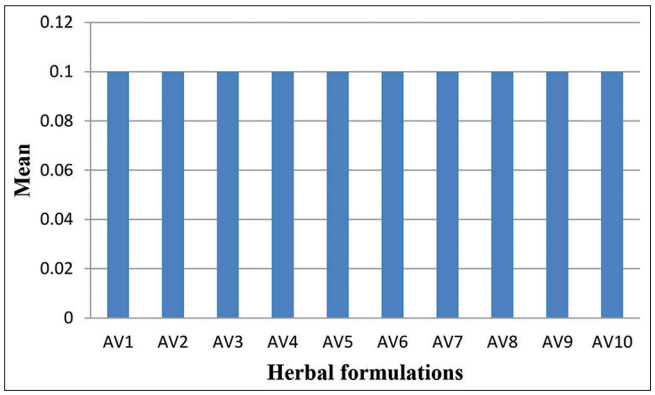

Fig. 3: Summarized cadmium level in herbal formulations. Results are given in mean

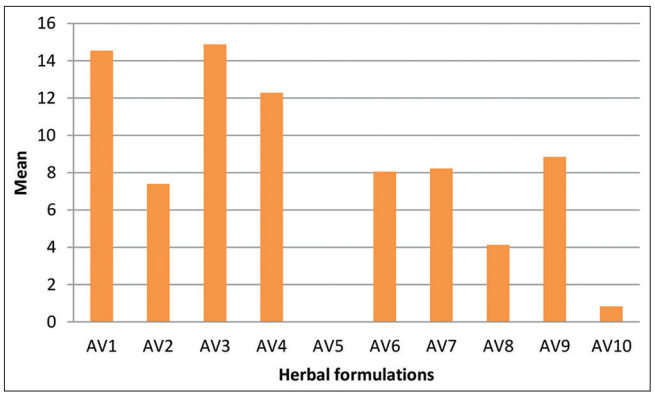

Fig. 4: Summarized mercury level in herbal formulations. Result are given in mean

biochemically, resulting in liver problems, hypertension, and kidney failure. Cadmium produces toxicity which is characterized by bone weakening, anemia, renal failure, and death [33]. Cadmium was found in all herbal formulations with the values of <0.1 ppm in this study (Table 1 and Fig. 3). The cadmium concentration of the remaining herbs was determined to be below level and the WHO standards. Mercury has negative outcomes on the kidneys and nervous system, and it can penetrate the placental barrier, posing a risk to the fetus [34]. The general public is exposed to mercury mostly through the ingestion of fish, as methyl mercury, and possibly through dental amalgam fillings [35]. Infertility, suppression of natural antioxidant enzymes, and brain damage has all been linked to mercury levels beyond the permitted limits.

Mercury was detected in AV1, AV2, AV3, AV4, AV6, AV7, AV8, AV9, and AV10 with the value of 14.54, 7.39, 14.87, 12.28, 8.06, 8.23, 4.13, and 8.84 ppm of the herbal formulation evaluated in this investigation (Table 1 and Fig. 4). Tanneries, paper, paint, and steel industries, as well as sewage sludge applications and alloys in motor vehicles, all contribute to chromium contamination. The mineral chromium is required for glucose metabolism. It also has a role in the production of proteins and lipids. It is a crucial component for maintaining adequate glucose metabolism. Chromium's function is inextricably linked to that of insulin, which plays a critical role in diabetes mellitus. The pancreas, which makes insulin, contains chromium [36,37].

Skin rashes, nasal irritations, bleeding, lung cancer, kidney and liver damage, and stomach upset and are all hazardous actions of chromium use. Chromium deficiency causes problems with glucose, lipids, and protein metabolism [38]. According to the WHO, the acceptable maximum for chromium in raw herbal materials in Canada is 2.0 ppm (Table 2).

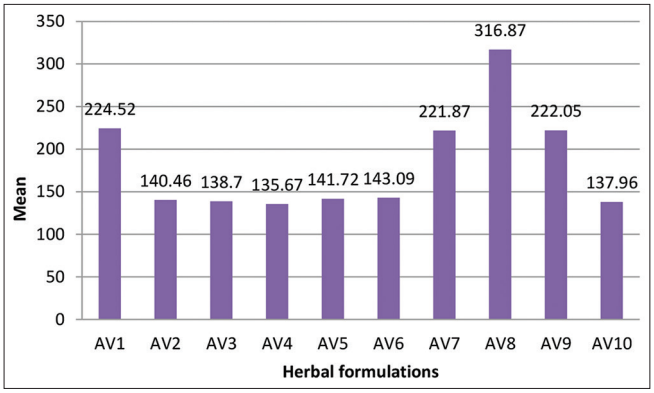

Fig. 5: Summarized chromium level in herbal formulations. Result are given in mean

Table 2: Permissible limits for toxic heavy metals in raw medicinal herbs (ppm) as per WHO (WHO, 2007)

S. No	Countries	As (ppm)	Pb (ppm)	Cd (ppm)	Hg (ppm)	Cr (ppm)
1	Thailand	4	10	0.3	-	-
2	China	2	10	1	0.5	-
3	Canada	5	10	0.3	0.2	2
4	General	-	10	0.3	-	-

All of the formulations in this study had chromium levels that were higher the WHO's permitted Canadian limits (Table 1 and Fig. 5). At all levels of five potentially harmful heavy metals examined in all ten herbal formulations were determined more than the acceptable limits in all ten medicinal herbs analyzed. When dealing with therapeutic herbs for human consumption, the suggestions of the current research should be considered.

The findings recommended that regular and systematic qualitative evaluation of extracted herbal materials is required to find out the over limits of heavy metal contaminants before using them for human use or the processing of finished products of herbal drug dosages, so that possible heavy metal impurities do not reach to the herbal products. Medicinal unregistered herbal formulations utilized for human use, as well as the creation of herbal finished formulations and purified herbal parts, should be harvested from an unpolluted natural habitat.

CONCLUSION

The conclusion of this investigation shows that heavy metal content was found in the herbal formulations studied. Heavy metals like Arsenic levels were over permitted limits in commercialized unregistered herbal formulations were found to be AV1 (15.21), AV2 (9.39), AV7 (291.43), and AV8 (632.34). Lead levels were found to be over the permitted limits in AV2 (13.32ppm), AV4 (12.865 ppm), AV6 (13.569 ppm), AV7 (160.809 ppm), AV8 (398.664 ppm), and AV9 (12.969 ppm). Cadmium levels of all herbal formulations were found below the limits (0.1 ppm). Mercury level was AV1 (14.54 ppm), AV2 (7.39 ppm), AV3 (14.87 ppm), AV4 (12.28 ppm), AV6 (8.06 ppm), AV7 (8.23 ppm), AV8 (4.13 ppm), and AV9 (8.84 ppm) and Chromium level was AV1 (224.52 ppm), AV2 (140.46 ppm), AV3 (138.7 ppm), AV4 (135.67 ppm), AV5 (141.72 ppm), AV6 (143.09 ppm), AV7 (221.87 ppm), AV8 (316.87 ppm), AV9 (222.05 ppm), and AV10 (137.96 ppm) all highest than the allowed limits. As per the aim of this research work on the basis of gathered information it reflects to follow Standard Agricultural Practices for cultivation, collection, processing of herbal plants.

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AUTHORS CONTRIBUTION

These researches were investigated by Mr. Sarfaraz Kazi and the research data were concluded by Prof. Dr. S. K. Bais.

CONFLICT OF INTEREST

The scriptwriter has not conflict of interests regarding publication of this article.

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