In Vitro Estimation of Lead Content in Nepalese Traditional *Ayurvedic* Medicines Commonly Used in Children

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Abstract

Introduction: Ayurvedic remedies are popularly used in practice for long time in Nepal. It is regarded as safe and free from side effects. However there are published reports of the high content of heavy metals like lead in such preparations. No such study has been done in Nepal looking at the lead content in ayurvedic preparations. The aim of this study was to detect the level of lead in commonly used ayurvedic remedies used in paediatric population if any. **Materials and Methods:** Seventeen samples were selected for lead estimation based on frequency of prescription and over the counter dispense. All of them were analyzed using Atomic Absorption Spectrophotometer (AAS) 6300 using flame mode. **Results:** None of the samples had detectable level of lead in parts per billion. **Conclusion:** Though this study did not detect lead in the seventeen samples of ayurvedic medicine, a larger study is needed involving large samples of these medicines with use of more sensitive equipment for testing

Key words: Ayurvedic medicines, Complementary medicine

Introduction

In Nepal before the start of allopathic medicine alternative or complementary medicine was practiced since a long time back. Still this complementary medicine is very popularly used in children. It encompasses treatment with vitamins and mineral supplement, homeopathy, herbal and *ayurvedic* medicines[1]. It is a common belief that these complementary medicines are safe and non toxic and are dispensed over the counter. Unfortunately this is not always true. Though many of these medicines are used safely there has been recent concern about its toxicity in some of these herbal preparations. The concern is the adulteration of these remedies with heavy metals like lead and arsenic due to poor quality control of the manufacturers of these products. Moreover there can be other toxic substances in these medicines which have not been studied yet.

The most concerning aspect of *ayurvedic* remedies is its adulteration by lead during its preparation. This is because lead gets absorbed more rapidly in children than in adults. This affects their developing nervous system causing developmental disorder and other side effects. Even low to moderate levels of lead have been associated with deleterious effects in children[2]. Recently there is a report from Reuters Health Information 2012 that the migrated Burmese children from refugee camps in Thailand to United States had dangerously high levels of lead in their blood. Researchers found that these children were given traditional remedies.

Our children from the neonatal period to adolescence are given *ayurvedic* medicine quite frequently despite of limited studies on the toxicological aspects of these medicines. We intend to address this issue in one aspect by estimating the level of lead level in commonly used *ayurvedic* medicines in paediatric population in Nepal.

Materials and Methods

This was a cross sectional study. The study period was one month from 1st October 2012 to 1st November 2012. Eighteen samples of *ayurvedic* medicines were selected on their common use in clinical practice and over the counter prescription. The lists of the drugs are given below in Table 1.

Table 1: *Ayurvedic* drugs which were tested for lead content with their manufacture date and batch number.

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Table 1: List of *ayurvedic* products tested for lead

S.N.	Products	Batch number	Manufactured date
1	Dabur Chyawanprash	NB0083	August 2012
2	Patanjali Chyawanprash	Not available	Not available
3	Gorkha Chyawanprsh	Not available	Not available
4	Makar Wajra	SB0047	November 2012
5	Swarna Machikbhasma	2	June 2012
6	Colicarmin	177	March 2012
7	Smrittisagar rasa	S	April 2012
8	Yakrit Plihari	31/77	September 2010
9	Arvindasava	BD0010	July 2010
10	Livex	285	August 2010
11	Balamrit G syrup	0167	July 2012
12	Chitrakadi ghutika	B-4	July 2012
13	Makaradhwaj	SB0077	February 2012
14	Krimi Kuthar Rasa	E002	May 2011
15	Janmaguthi	SB0430	July 2012
16	Mriga Madasab	0151	August 2011
17	Ashwagandha Churna	094	November 2011

All the samples were analyzed at Department of Food Technology and Quality Control, Ministry of Agriculture and Cooperatives, Babarmahal, Kathmandu. The samples were encoded 69/CFL/3206 to 69/CFL/3223 and analyzed using Atomic Absorption Spectrophotometer (AAS) 6300. The flame mode was used during analysis. Using flame mode causes lesser atom excite as compared to graphite furnace analysis (GFA) causing lesser sensitivity in detecting the heavy metals. We used flame mode instead of GFA as the latter was not functioning in AAS.

Weighed 1-2 grams of each sample were kept in crucible and heated in a furnace at temperature of 500-600 C. The resulting ash is dissolved in 1:1 dilution of conc. hydrochloric acid and filtered and washed with distilled water to obtain a filtrate in volumetric flask. The filtrate is aspirated into the flame of AAS. The spectrophotometer analyzed the sample in parts per billion.

Discussion

Alternative medicine is in common practice in country like Nepal. However there are few studies looking at the contamination of these medicines by heavy metals like lead and its potential adverse effect on developing children. Lead is very toxic especially in young children. It has a direct toxic effect on haemopoetic and gastrointestinal system. Other organ like kidneys, liver, central and peripheral nervous system leading to anemia (sideroblastic), morphological changes in red blood cells, encephalopathy, abdominal pain, constipation and anorexia[1].

The heavy metals like lead are added to ayurvedic medicines intentionally along with other elements like copper, gold, iron, mercury, silver, tin and zinc. Ayurveda believes that diseases results from imbalance of these elements. This is reason why these elements are added in the remedies. However these minerals are added after they have undergone a 'detoxification' processes[3]. Those who practice ayurveda believe detoxification will make these heavy metals non toxic. This process is done through complex processes, which involves simultaneous heating and cooling of the lead > 30-times in a mixture containing buttermilk, cows urine and a mixture of three plants[4]. Unfortunately this process is unlikely to render heavy metals such as lead nontoxic, although they could influence bioavailability if combined with substances that chelated the metals by reducing absorption[3].

Our study did not detect lead adulteration in those medicines which were selected for the study. This may be because of proper quality control from the concerned authorities assigned for the purpose or it may be the

Results

Table 2: Test result for lead content in the *ayurvedic* medicines

S.No.	Products	Lead level in Ppb
1	Dabur Chyawanprash	Not detected
2	Patanjali Chyawanprash	Not detected
3	Gorkha Chyawanprsh	Not detected
4	Makar Wajra	Not detected
5	Swarna Machikbhasma	Not detected
6	Colicarmin	Not detected
7	Smrittisagar rasa	Not detected
8	Yakrit Plihari	Not detected
9	Arvindasava	Not detected
10	Livex	Not detected
11	Balamrit G syrup	Not detected
12	Chitrakadi ghutika	Not detected
13	Makaradhwaj	Not detected
14	Krimi Kuthar Rasa	Not detected
15	Janmaguthi	Not detected
16	Mriga Madasab	Not detected
17	Ashwagandha Churna	Not detected

lesser sensitivity of testing due to use of flame mode instead of graphite furnace analysis.

There are many ways of lead intoxication in children. It is least talked about the ayurvedic products as potential source of lead despite its rampant use. The earliest reporting of lead intoxication by the use of aphrodisiacs was in 1978[5].

Study by Saper RB et al in their study found 20% of ayurvedic herbal medicine products produced in South Asia contained potential harmful level of lead, arsenic and mercury[6]. In a similar kind of study done by Koch I et al, bioaccessible lead was found in in 72% of the 42 samples of traditional Indian medicines[7].

Study by Jayawardene I et al looking in vitro bioaccessibility of lead, arsenic, cadmium and mercury in five traditional Indian medicine samples was measured as a determinant of bioavailability. When compared with the most liberal published safety guideline, EDAB-Pb (estimated daily amount bioaccessible – lead) in Mahayograj Guggulu and Ekangvir Ras were 37 and 45 fold greater[8].

Conclusion

There has been an issue of safety of *ayurvedic* medicines as these can be adulterated with heavy metals like lead. Though our study did not detect lead in the seventeen samples of *ayurvedic* medicine, a larger study is needed involving large samples of these medicines with use of graphite furnace analysis for testing. It is equally important to make people aware that ayurvedic medicines can be toxic and not always safe as we have reviewed several reported cases of high lead content in these drugs.

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Conflict of Interest: None.

Disclaimer: This study was not done with the intention to promote or criticize any ayurvedic medicine companies and their products. It is a sincere effort to make doctors and health professionals aware about the possibility of adulteration of those medicines by lead if any.

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