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DETERMINATION OF TOXIC HEAVY METALS IN DIFFERENT BRANDS OF TALCUM POWDER

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ABSTRACT

Talcum powder is a cosmetic product made from finely ground talc, an extremely soft mineral. One of the most common uses of talcum powder is in baby care, Talcum powders are widely used all over the world to keep the body dry due to sweat, for fragrance and for beauty purposes. The present research work is done for the determination of heavy metals like Cd, Co, Pb, Cu and Cr in 30 different brands of talcum powder. Determination of heavy metals was done by atomic absorption spectrophotometer and pretreatment of samples was done by acid digestion by using Conc. HNO_3 and H_2O_2. The lead contents in all brands were in the range of 0.0006-1.05 ppm, while cadmium contents were in the range of 0.001-0.080 ppm and chromium contents were 0.08-0.35 ppm, copper contents were 0.07-0.35 ppm, cobalt contents were 0.003- 0.180 ppm ranges were present. The lead concentration was extremely high in all brands followed by the cadmium. Cadmium concentrations were low in all brands. All the metals are present with in safe limits in under study all the brands.

KEYWORDS: Acid Digestion, Atomic Absorption Spectrometer, Heavy Metals Talcum Powder, Toxic

INTRODUCTION

Skin is thought to be the largest organ of our body and has many important functions. As the primary interface between us and our environment, the skin serves several distinct functions which are protection, sensation, thermoregulation and communication. Skin is also self-repairing after injury. A long time ago it was thought that skin is impermeable barrier but now a day we know it differently. Substances that come in contact with skin are penetrating and ultimately find their way in the bloodstream. Toxins and other harmful products accumulate into the fundamental organs over a period of time causing many problems in bodies [1]. Because the skin having the property of absorbing the thing so anything which is applied on the body comes into contact with skin and penetrate into the body. Likewise when powder is applied on body to keep the body dry due to sweat then the harmful thing present in it penetrate into the body [2]. Some of the harmful compounds are soluble in water they dissolve in the sweat and penetrate into body. Talcum powder comes in direct contact with only our skin and causes many skin problems and babies sometimes inhale it then they have to suffer the problem of inhalation. Out of 35 heavy metals some are useful for our health but in small quantities and the higher quantity of these metals becomes harmful for our health [3]. Other than these useful heavy metals are dangerous to our health their small quantities are bearable and show no effects on the body. But higher quantities are much dangerous for human health [4].

In trace amounts some heavy metals are essential for a healthy life. These heavy metals are present in our body in trace amounts e.g. Fe, Mn, Cu and Zn. These heavy metals are present in our food stuff, in vegetables and fruits. In industries the heavy metals have much importance as these are used in manufacturing of dyes, steel, alloys, batteries and much more. Many products of these in our daily life and add to quality of life when used properly [5]. These trace metals are of biological importance in trace quantities. But the large quantities are of these metals are of main concern. So the

need of proper understanding about the amount and oxidation states of these metals are of much importance [6]. Heavy metals when are not metabolized by body and gathered in soft tissues of our body then they become toxic. Heavy metals are entered into body by inhalation, ingestion and absorption through the skin when humans become in contact with heavy metals in industrial and agricultural environments. The most common way of heavy metal exposure is by industrial environment through inhalation in adults. In children the most common route of exposure is ingestion.

Increasing industrialization in the world is the main cause of heavy metal pollution [7]. The Agency for Toxic Substances and Disease Registry (ATSDR) has formed a list in 2001 known as "Top 20 Hazardous Substances" in collaboration with the US Environmental protection Agency. The heavy metals are in this list due to their hazardous effects. Arsenic, Lead and Mercury are ranked at 1^{st}, 2^{nd} and 3^{rd} in the list. Researchers done this study to check the presence or absence and the quantity of these toxic metals in collected talcum powder samples by using Atomic Absorption Spectrometry (AAS). The concentration of heavy metals is to be measured in ppm. The resultant values are compared with the tolerable values given by World Health Organization (WHO) [6]

Cosmetics are the products use for the personal care and change the look of our face and body. Cosmetics are used for personal hygiene and for beauty purposes since start of civilization. It is a part of our routine life and these are not only used by the upper class of the society but also used by the middle and low class of the society. Recently there is a great change in cosmetics industries have been seen by the production of cosmetics of various types for beauty and care purposes.

These products are produced for the beauty purposes of hair, skin, nails, teeth and body [8] Cosmetics include: Creams, hair oils, Hair dyes, Kajal, Lotions, Perfumes, Lipsticks , Talcum powders, Face powders. Beauty consciousness of the people has increased the demand of beauty products in the market. As the demand of cosmetics increased the side effects of cosmetics also come forward due to the use of these [9]. Cosmetics are used to keep the beauty of body parts and give fragrance. The side effects of cosmetics are the main cause of attention of the researchers and clinician to check out the probable reason behind these side effects. Due to use of cosmetic products users observe the skin irritation and skin allergy type problems so the researcher find out the reason of these problems. Then they reach to the problem that it caused due to the heavy metals present in beauty products. Heavy metals contamination is one of the main causes for these side effects of cosmetic products.

Talc is an important industrial mineral. It is hydrated magnesium silicate. Talc is an important industrial mineral. It is hydrated magnesium silicate and its chemical formula is $H_2Mg_3(SiO_3)_4$. Talc is an important industrial mineral. It is hydrated magnesium silicate. Talc name is derived from an Arabic word *talq*, meaning "pure." Talc is naturally occurring pearly white mineral and it found in deposits all over the world. Now a day's talc is used in many different industries and used in consumer products like plastic, lubricants, paints. Talc is an important raw material for the manufacturing of talcum powder. Talc contains 4.8% H_2O, 31.7% MgO, 63.5% SiO_2. Talc is a secondary mineral manufactured by the metamorphism of the different rocks. Talc is used in many industries as it is the softest mineral on this earth. Due to its softness it is used in many industries.

Talc is not present on the earth but it is manufactured by the magnesium rocks through different reactions. In anything in which talc mineral is present it is known as talcum. Talc has property of absorbing moisture so it is also used on places where we want to keep the place dry [10]. Talcum powder is the source of talcosis disease. Talcosis diseasis occurred due to the abundant use of talcum powder Talcosis is a silicate induced disease of lungs. It is mostly found in the people which are exposed to the talc and also experienced in the peoples using cosmetic talcum powder in excess.

MATERIAL AND METHODS

Study Plan

An experimental process of research was done to evaluate the presence or absence of heavy metals in different samples of talcum powder collected from local market; and the concentration of each heavy metal which present in the samples [6].

Collection of Samples

Most popular thirty samples of different brands of talcum powders widely used in Faisalabad were purchased from cosmetic shops, open markets and super markets in and around towns and cities around Faisalabad. Total thirty different brands are of thirty different manufacturing companies. The talcum powder brands studied are: Black cat, D&S Products, Black Beauty, Medicam Valentine, White Lily, Nisa Floral, Blue Diamond, Olivia, Touch Me, Medora, Wild Flower, Max Lavander, Mother Care, Genny Energetic, Johnson's baby powder, Dove, Poison, Goree black, Tibet, Havoc, Corel, One Man Show, Follow Me, Enchanter and Sensation.

Sample Preparation for Analysis

Preparation of samples for heavy metal analysis was done by standard procedure. Each of talcum powder samples was analyzed by using the acid digestion protocol.

Preparation of Powder Samples for Analysis

Following method was followed for the wet digestion of the collected talcum powder samples. Accurately weighed powder samples (1g) were placed in digestion flasks and concentrated nitric acid (10 ml) was added. The digestion flasks were heated (70 to 80 ^{o}C) on a hot plate for 30 minutes. After cooling, 5 mL of H_2O_2 was added in the flasks and heated vigorously till the white fumes appeared and mixture volume reduced to 2-3 ml. Finally, the contents were diluted up to desired volume by adding de-ionized water.

RESULTS AND DISCUSSIONS

The concentration of heavy metals was determined by atomic absorption spectrometer. Metals are essential nutrients due to their functioning in metabolism. Metal play an important role in many enzymes, as antioxidants and catalysts in human life [11].

Some of these trace elements like manganese (Mn), cadmium (Cd), chromium (Cr), zinc (Zn) and copper (Cu) are necessary micronutrients and perform various types of biochemical functions in all living organism. Humans need a specific amount of micronutrients like Zn and Fe, but excess uptake of non essential metals like Pb and Cd can be highly harmful. Living beings cannot synthesize minerals element, these are usually required through food [12].

The present research work is focused on the determination of concentration of heavy metals in talcum powder brands. Table 1 tells about the mean concentration of lead, cadmium, cobalt, chromium and copper. It also tells about the standard deviation in the readings.

Heavy metals are common contamination in various brands of talcum powder. Heavy metals cause many problems in our body like pain , unconsciousness, and stomach problems. Heavy metals present in the talcum powder are come from the contaminated environment where it manufactured. Heavy metals come from the fragrant materials added in talcum powder. In present research work the heavy metals are determined by AAS in this technique the heavy metals are determined qualitatively and quantitatively. Quantity of heavy metals is determined in ppm. There are many of heavy

metals are present in cosmetic talcum powder and the manufacturers also don't know about these heavy metals. There are some heavy metals and their effects

Cadmium is a heavy metal which is present in talcum powder. The safe limit of cadmium is 0.9ppm to 3ppm. When a large amount of talcum powder is inhaled then the amount of heavy metal is also becomes high in the body. Cadmium higher concentrations are harmful for the health and the target organs of cadmium are bones, brain and nervous system. Figure 1 shows the amount of cadmium in 30 different brands of talcum which is in the range of 0.001-0.080 ppm. This concentration is in the safe limit.

Cobalt is a heavy metal present in talcum powder. The safe limit of cobalt is 1 ppm. The target organs of cobalt are kidney, brain and bones. When cobalt value becomes high then it effects the functioning of different organs of human beings. Figure 2 shows about that the concentration of cobalt in different brands of talcum powder present in the range of 0.003- 0.180 ppm.

Figure 3 shows the concentration of chromium in the talcum powder brans. Chromium is a heavy metal present in talcum powder it is harmful in small amounts for the human beings. The safe limit of chromium is less than 5ppm. This is really harmful for infants if they inhaled it along with talcum powder. The concentration of chromium is present in the range of 0.08-0.35 ppm

Table 1: Concentration in ppm of Heavy Metals in Different Brands of Talcum Powder by Mean ± Standard Deviation

Sample	Pb	Cd	Co	Cr	Cu
P1	0.016±0.005	0.013±0.006	0.013±0.005	0.127±0.005	0.35±0.001
P2	0.203±0.130	0.001±0.001	0.023±0.005	0.22±0.01	0.226±0.005
P3	1.053±0.056	0.08±0.01	0.02±0.01	0.14±0.01	0.286±0.015
P4	0.001±0.001	0.006±0.005	0.013±0.006	0.24±0.01	0.25±0.01
P5	0.166±0.005	0.003±0.005	0.023±0.006	0.123±0.006	0.146±0.006
P6	0.16±0.008	0.023±0.005	0.007±0.005	0.187±0.006	0.286±0.005
P7	0.013±0.005	0.033±0.005	0.01±0.001	0.26±0.01	0.19±0.001
P8	0.24±0.029	0.013±0.005	0.001±0.001	0.11±0.01	0.216±0.005
P9	0.001±0.001	0.001±0.001	0.016±0.001	0.30±0.01	0.213±0.005
P10	0.011±0.008	0.03±0.001	0.013±0.005	0.237±0.005	0.227±0.006
P11	0.163±0.005	0.013±0.006	0.003±0.006	0.157±0.006	0.186±0.005
P12	0.047±0.005	0.013±0.006	0.013±0.005	0.127±0.006	0.11±0.01
P13	0.38±0.008	0.02±0.01	0.013±0.005	0.146±0.006	0.21±0.01
P14	0.001±0.001	0.016±0.005	0.013±0.005	0.143±0.006	0.183±0.005
P15	0.013±0.005	0.033±0.005	0.027±0.006	0.35±0.01	0.08±0.01
P16	0.08±0.008	0.001±0.001	0.09±0.01	0.19±0.01	0.086±0.005
P17	0.126±0.005	0.002±0.005	0.006±0.005	0.083±0.005	0.079±0.061
P18	0.35±0.008	0.013±0.006	0.013±0.005	0.12±0.01	0.18±0.01
P19	0.15±0.008	0.02±0.01	0.18±0.02	0.21±0.01	0.336±0.005
P20	0.09±0.008	0.02±0.01	0.013±0.005	0.186±0.006	0.187±0.006
P21	0.07±0.008	0.02±0.01	0.006±0.005	0.11±0.01	0.143±0.005
P22	0.17±0.008	0.04±0.01	0.013±0.006	0.20±0.01	0.18±0.01
P23	0.54±0.008	0.02±0.01	0.006±0.005	0.147±0.006	0.187±0.006
P24	0.176±0.013	0.013±0.006	0.013±0.006	0.133±0.006	0.123±0.006
P25	0.27±0.008	0.027±0.005	0.01±0.01	0.143±0.006	0.147±0.005
P26	0.17±0.008	0.003±0.005	0.023±0.005	0.20±0.01	0.173±0.005
P27	0.08±0.008	0.013±0.005	0.09±0.01	0.143±0.005	0.26±0.001
P28	0.013±0.005	0.013±0.005	0.013±0.005	0.19±0.01	0.236±0.005
P29	0.29±0.008	0.02±0.01	0.016±0.005	0.173±0.007	0.186±0.005
P30	0.19±0.008	0.027±0.008	0.003±0.006	0.27±0.01	0.167±0.008

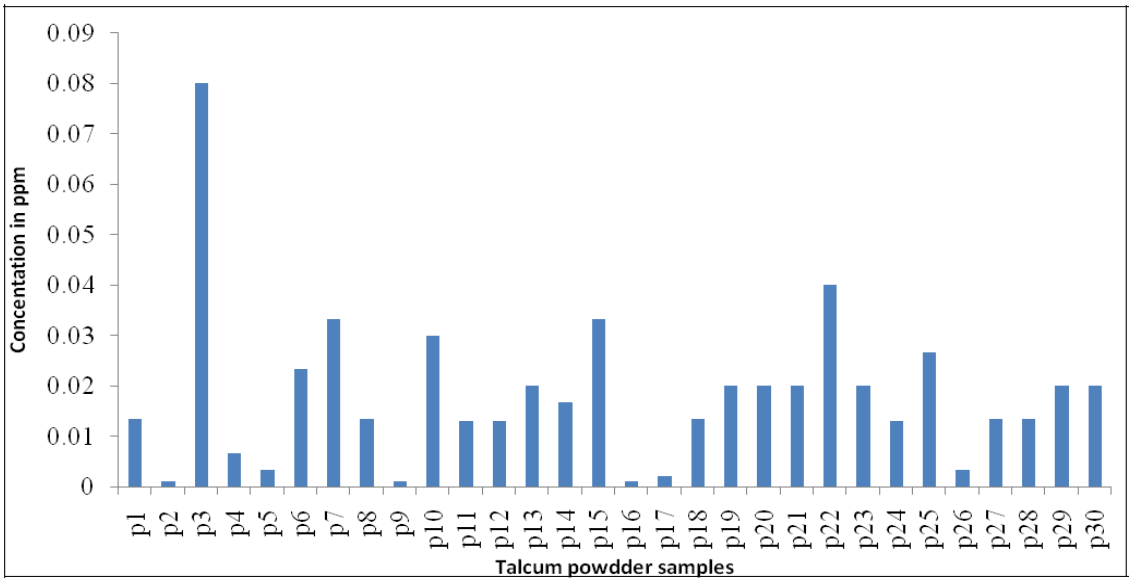

Figure 1: Concentrations of Cd in ppm 30 Different Brands of Talcum Powder Sample

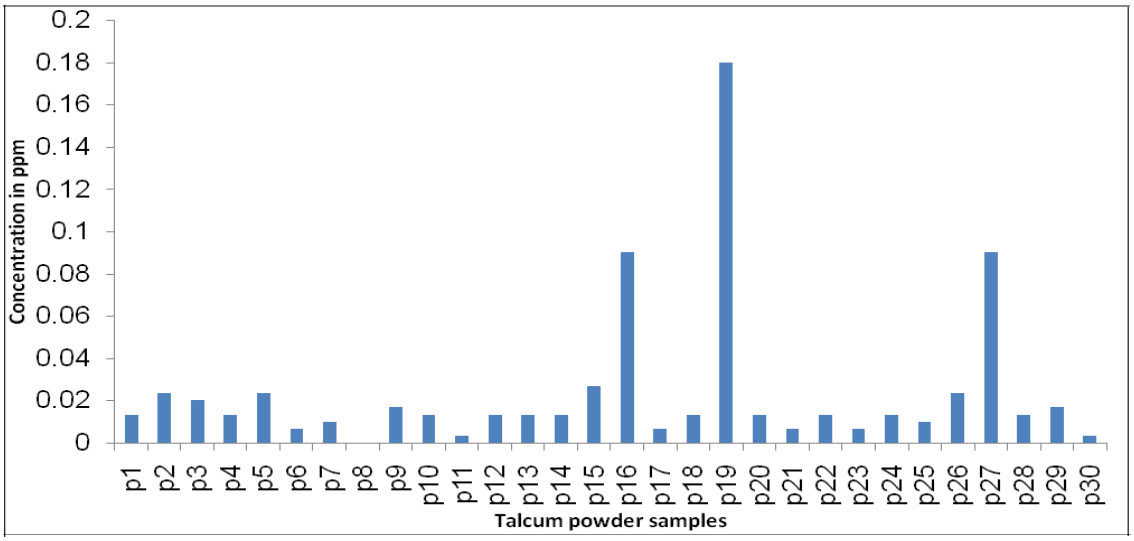

Figure 2: Concentrations of Co in ppm in 30 Different Brands of Talcum Powder Samples

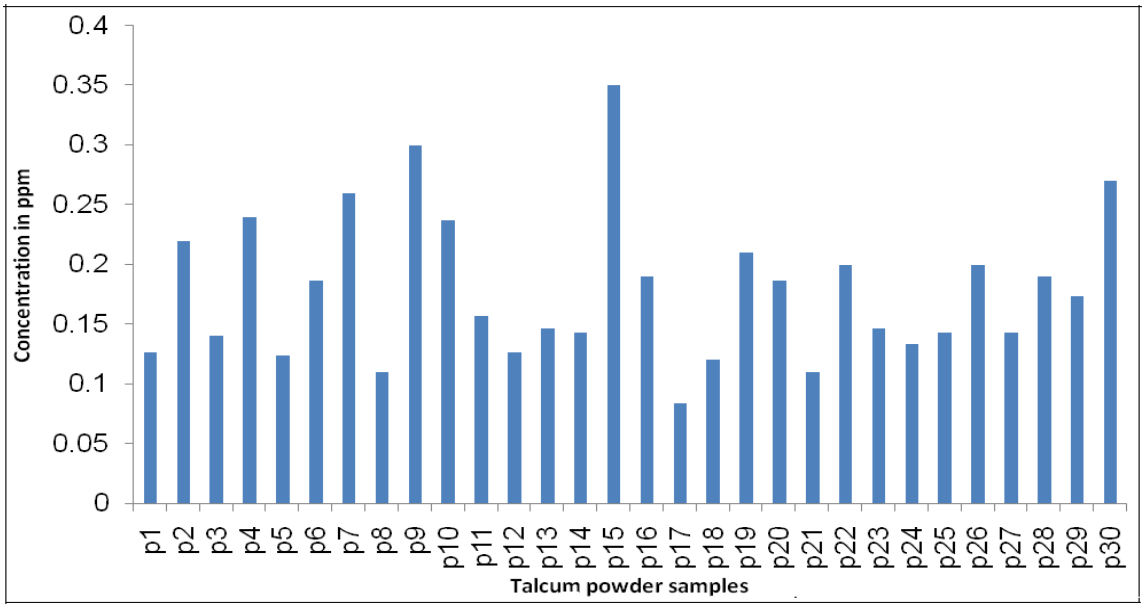

Figure 3: Concentrations of Cr in ppm 30 Different Brands of Talcum Powder Samples

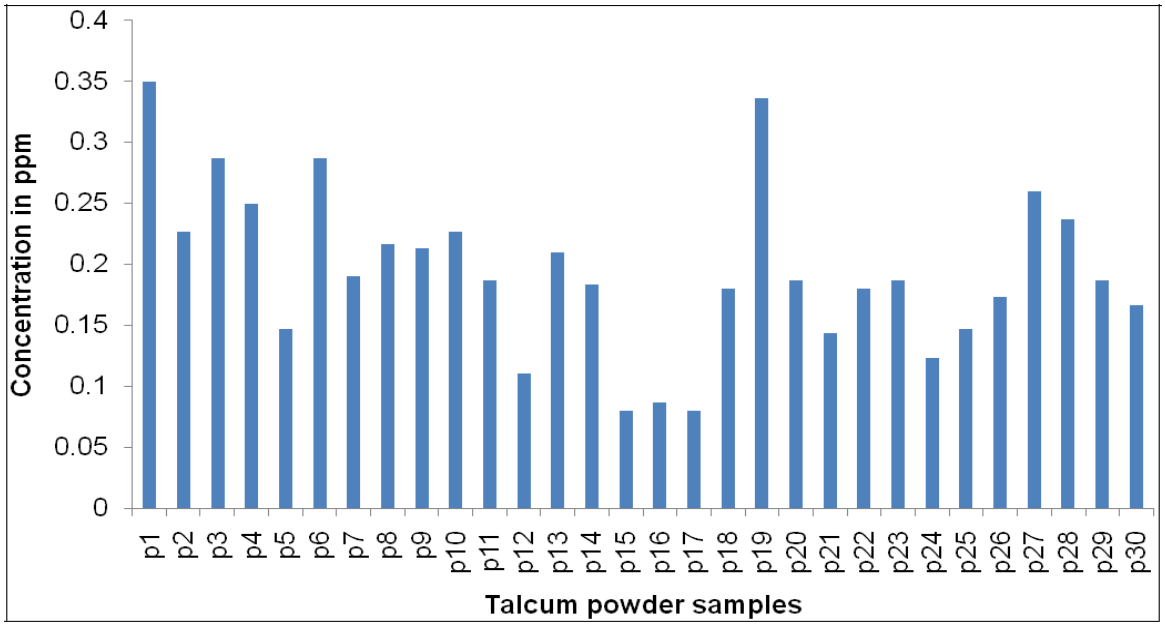

Figure 4: Concentrations of Cu in ppm 30 Different Brands of Talcum Powder Samples

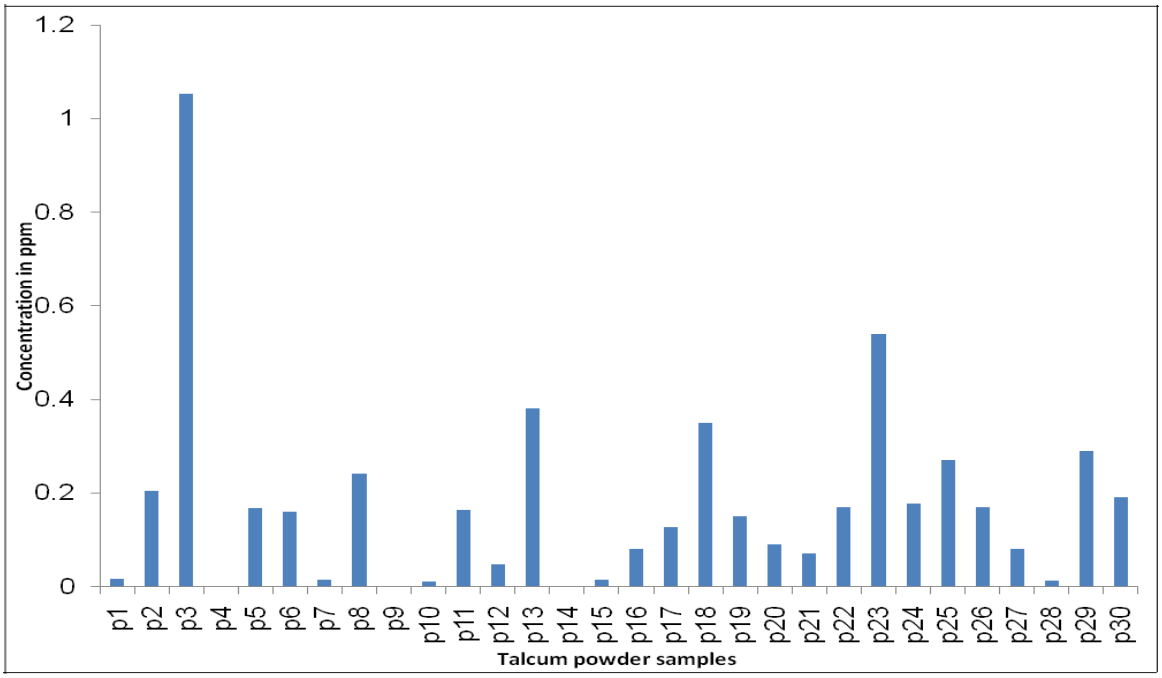

Figure 5: Concentrations of Pb in ppm in 30 Different Brands of Talcum Powder Samples

Copper is present in small amounts useful for our health but its higher amounts are dangerous for the health. The safe limit of copper is13 ppm. Figure 4 tells that the concentration of copper is present in the range of 0.07-0.35 ppm. When it is inhaled above than the bearable limit then it causes many health problems in the body. The target organs of copper are liver, kidney and brain. It effects the functioning of these target organs.

Figure 5 tells about the concentration of lead in different brands of talcum powder. The concentration is in the range of 0.0006-1.05 ppm in all brands under study. Lead is a heavy metal present in our body in small quantity. The safe limit of lead is 20ppm by FDA. In trace amounts it is useful or many metabolic processes in the body of human being. The target organs of lead are bone, brain and kidney. Lead heavy metal effect the functioning of these organs.

CONCLUSIONS

All the metals are present in safe limits in 30 brands of talcum powder. But the excess use of talcum powder affects the health of consumer. When infants inhale the talcum powder in excess amount accidently then the heavy metals present in it affect them.

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