

# Surma (Eye Cosmetic): The Gift that can be Dangerous

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### Abstract

Surma is a fine powder that looks like mascara but is applied to the conjunctival surface rather than to the outside of the eyelids. It has been used for medical and cosmetic purposes for many centuries. Its name derives from the Urdu word for antimony sulphide. Recently, owing to the scarcity of antimony sulphide, lead sulphide has been used.

Samples of surma have been collected from around the world, and an analysis has been found it contains up to 80-90% lead, usually as sulphide. Since lead sulphide is not absorbed into the body through the eye, it remained a mystery for a while as to why blood lead levels were abnormally and dangerously high in some children. The claim was revealed later: The children rub their smarting eyes, then suck their fingers as comforters. The lead passes down into the digestive system, where, after a series of complex interactions with the gastric juices, the lead is absorbed into the body.

In Oldham, United Kingdom, a child who was exposed to lead-based surma (blood lead levels greater than 80 µg/dL) died due to lead-induced encephalopathy. It is for this reason that the dangers of surma have been most widely publicized, promoting educational campaigns in many countries. In the United Kingdom, these have been in the form of leaflets and posters on surma, translated into Hindi, Punjabi, Gujarati, Bengali, and Urdu. This paper will show the importance of having continuous campaigns against surma. Despite concerted programs of information and education by the British government, the problems associated with the use of this lead-based eye cosmetic remain.

**Key words:** surma, plumbism, lead sulphide, lead-induced encephalopathy

**L**ead and its compounds are potentially toxic. The element has no known physiological functions; it is widely distributed in the environment both naturally and as a result of man's activities.

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The health hazard associated with the use of surma, the Asian lead-based eye cosmetic, has been demonstrated frequently. Many aspects of the dangers it presents have been investigated in depth in Nottingham, including sources of supply, how it is used, the effects of application, routes for ingestion, and the distribution and physiological consequences once absorbed.

Attempts have been made to educate the Asian community about the dangers of surma in order to discourage its use, particularly on children. Campaigns have primarily included posters and leaflets. The most recent campaign was launched by Britain's Michael Howard, Parlia-

mentary Undersecretary for the Department of Trade and Industry in combination with the Department of Health and Social Security.

The campaign now has been in effect long enough to assess its success. Previous campaigns have not been looked at, apart from a pilot survey in 1986 in Nottingham by Healy et al.<sup>1</sup> From this study, it was found that of the 46 Asian women interviewed, 15 (approximately 33%) said they still used surma regularly on themselves and their children. Although Healy et al. said that the results of their survey could reflect only an outline of the national situation, the study did show that potentially many Asian women still use surma and that a significant proportion do not yet accept that it is deleterious to their health. However, they were often aware that it contains lead. In addition, the mothers continued to use it on their children. The report concluded that a problem of some magnitude still existed, thus illustrating the need for a rigorous and more extensive reexamination of the use of traditional preparations and health care practices among the Asian community as a follow-up to the first study that Healy et al. initiated.

Bhopal<sup>2</sup> carried out a study in Glasgow at about the same time as the Healy, et al. study. Sixty-five Asians were interviewed in their homes to determine their knowledge of and behavior concerning health issues, including smoking, alcohol, heart disease, pregnancy, rickets, malaria, prophylaxis, and surma. He found that only a minority (18%) currently used surma. Yet 25% were aware of the hazard of lead poisoning. The majority (57%) gave superficial answers relating to damage to the eyes. Though comparisons between these studies are difficult because of a variation in the methodologies employed, Bhopal's results differ from those obtained by Healy et al. In addition, Bhopal did not identify the presence of traditional healers practicing in Glasgow and known to the current authors.

Since these two studies have been carried out, the surma campaign has become well established and publicity about the hazards of the material has been reinforced by a variety of programs. The study reported here assesses the present situation by the following:

1. Establishing the extent of the continued use of surma in the Asian community and its relation, if any, to various parameters. For example: culture, religion, length of residence in the United Kingdom, and level of education.
2. Examining the effect that the surma campaign has had in influencing Asian parents to stop using surma on themselves and their children, and to have their surma tested for lead and to change to a type that does not contain lead.
3. Determining the role of health professionals in health education with references to surma in particular.

The study was performed using questionnaires directed at Asian women living in either Nottingham, Doncaster, or Loughborough. Health visitors and general practitioners also were questioned, and the results obtained are detailed.



Figure 1. A metal applicator is used to streak eye powder across the eyeball.

#### *Surma's Background*

Surma is a fine powder that is applied to the eyes and has the appearance of mascara. However, application is not to the outside of the eyelid, but to the conjunctival surface. This can be done by dipping the metal applicator rod into the eye powder and streaking it across the eyeball (Figure 1.).

Its use by Asian families, especially in the Muslim community, can be traced back many centuries. Its name derives from the Urdu word for antimony. Originally, its major constituent was antimony sulphide. Recently, owing to the scarcity of antimony sulphide, lead sulphide in the form of finely ground galena has become a major component.

Early studies by Asiam et al. (1979)<sup>3</sup> showed that of 10 proprietary surmas manufactured in India or Pakistan, six contained lead as lead sulphide. Quantitative analysis using atomic absorption spectroscopy showed a mean lead concentration of 59.8% w/w. Of an additional 72 homemade surmas obtained in Manchester, Nottingham, Bradford, Birmingham, and London, 46 were found to contain lead with a mean lead concentration of 54% w/w (range: 20-86% w/w). Further studies have confirmed these findings.

Surma ranges in color from black, through various shades of gray, to white. Carbon is added in varying amounts, the proportion used to modify the characteristic dark coloration. Various herbs, pearls, menthol, plant juices, and vegetable ashes often are added. Surma is kept in elegant containers, homemade receptacles, and bottles bought directly from Asian shops.

#### *Is Surma Responsible for Lead Poisoning?*

Dr. Attenburrow and colleagues from Glasgow studied the relation between surma use and the level of lead in the blood.<sup>4</sup> They concluded that "surma remains a theoretical,

rather than a practical, health hazard." They found mean blood lead concentrations of  $0.799 \pm 0.285 \mu\text{mol/L}$  in surma users and  $0.760 \pm 0.302 \mu\text{mol/L}$  in controls. The mean lead concentration for seven surma samples analyzed was 21% (w/w), the highest value was 30%.

However, Warley et al.<sup>5</sup> reported on an Asian child with lead encephalopathy whose only source of lead was surma. Five years later, Snodgrass et al.<sup>6</sup> reported that 12 children in five families that had unexpectedly high blood lead concentrations were expected to have "cosmetic plumbism." In a retrospective review of 38 children admitted to Birmingham hospitals with lead poisoning, Betts et al.<sup>7</sup> observed that 15 of the children were Asians and suggested that surma was the main source of the poison. Several years later, Josephs<sup>8</sup> reported high lead concentrations in Asian children in Luton. The source of the lead was not identified.

Ali et al.<sup>9</sup> examined blood lead levels of 62 Asian children in Nottingham and found that surma users had a mean blood lead level of  $1.65 \pm 0.68 \mu\text{mol/L}$  while the nonsurma users had  $0.98 \pm 0.42 \mu\text{mol/L}$  ( $p < 0.001$ ). In Bradford, 117 Asian children, 45 of whom had been surma users and 49 white controls, had their blood lead levels tested and similar results were obtained. Fourteen percent of the 117 Asian children had lead levels above  $1.45 \mu\text{mol/L}$ , and 5% had values greater than  $1.7 \mu\text{mol/L}$ .

They also monitored the progress of an Asian child admitted to hospital in 1976 with plumbism. This was believed to be attributed to surma since no other source of lead could be found. The child was receiving regular applications of a surma containing 86% lead. Despite warnings, the mother continued to apply the material. In 1976, the child's blood lead level was  $2.4 \mu\text{mol/L}$ ; in 1977, the lead rose to  $3.0 \mu\text{mol/L}$ ; and on readmission to hospital with lead poisoning in 1978 he had  $3.4 \mu\text{mol/L}$  of lead in his blood.

Surma has been considered to have contributed to the death due to lead encephalopathy of a 4-year-old Asian boy in Oldham. It is difficult to see what further evidence must be obtained to be certain that surma is responsible for lead poisoning, particularly in young children.

In Great Britain, the amount of lead in food is controlled by the Lead in Food Regulations 1979. These regulations restrict the amount of lead in food to a maximum of 1 milligram/kilogram, with the exception of foods specially prepared for infants or young children, and certain foods and drinks tabulated in the regulations for which limits ranging from 0.2-10 mg/kg are specified.

#### *Routes for Ingestion*

Healy et al. (1982)<sup>10</sup> carried out a pilot animal study with respect to the eye cosmetic to examine the possibility of transcorneal transport of the applied lead. Blood and aqueous humor lead levels of control rabbits and rabbits that had surma administered in the same way as mothers administer it to their children was measured. The analysis showed discernible differences in lead levels. The lead levels in the

aqueous humor and blood was less than  $0.1 \mu\text{mol}^{-1}$  and  $0.3 \pm 0.1 \mu\text{mol}^{-1}$  for all the animals.

Clearly, from these results it appears unlikely that transcorneal transport is a contributory mechanism for absorption of the lead. The possibility of some of the material being washed into the nasolachrial duct on tear formation after application should not be excluded in the children. However, the authors concluded that the principal route for ingestion in man appears to be orally, via the fingers on lacrimation, which follows application.

Measurements indicated that on each application of the eye cosmetic, approximately 20 mg of the material is transferred onto the conjunctival margins from the applicator rod. Analysis of swab samples taken from the fingers of the children who have just had surma applied reveal that about 0.2% of this applied lead is transferred to the mouth via the fingers. If the eye cosmetic is assumed to have a lead content of 50% (generally much less than in many surmas in use), the possible weekly absorption of lead from this single source is 35-70 mg. This figure is dependent on factors including diet, state of health and, principally, solubility of the ingested lead compound. Once ingested, conversion of the sulphide to the more soluble (and hence more readily absorbed) chloride form is shown to occur in gastric fluid and, significantly, a marked dependence of the rate of dissolution on particle size is found.<sup>10</sup>

#### *The Surma Campaigns*

The first report of plumbism occurring in an Asian child as a result of surma was reported by Warley et al.<sup>5</sup> in 1968. Following this, the government issued a warning about surma to the medical profession, and the Home Office sought a ban on the sale of lead-containing cosmetics. The use of lead acetate in hair care products was the only permitted exception. Work by Aslam<sup>3</sup> and Ali<sup>9</sup> in 1979 and 1980 respectively, however, showed that the problem still existed. In 1980-81, the government issued further guidelines. The chief medical officer wrote to all general practitioners and regional health authorities in the country about surma.

After the report on the analysis of surma samples bought in Bradford and Nottingham<sup>3</sup>, a new safety code was announced by the then Prices Minister John Fraser in August 1978. It is now a criminal offense for cosmetic manufacturers, importers, or retailers to market any lead-based product that is liable to damage health.

In 1982, after further publications on surma<sup>11</sup> the first information leaflets on the hazards of surma were issued with a simple test to be performed at home to test for lead content in surma.<sup>12</sup> Following this campaign, it was realized that there was a need for health education. As a result, another leaflet and poster campaign was launched by the parliamentary undersecretary for trade and industry in November 1985. This is the most recent surma campaign.

#### *Conclusions and Recommendations*

Asian immigrant communities have special require-

ments concerning health care due to the presence of traditional practices. The illegality of such practices should not be considered synonymous with their nonexistence. Such an approach has contributed to failure to diagnose cases such as lead poisoning in Asian children. Many problems may be overcome by better communication. Some problems may require one or two generations to pass before they are solved. While the long-term prospects are, therefore, not of major concern, many difficulties remain to be overcome with the first generation children.

Health education may only partially succeed, as it is very difficult to change century-old attitudes. People who have been carrying out a practice with no outward ill-effects are unlikely to change their ways. The antismoking campaign highlights this. People continue to smoke despite warnings and statistics that show smoking is extremely harmful. The use of surma occurs in almost every household in India/Pakistan and has for many years. It is easy to see why there is such a frank disbelief that the cosmetic can cause lead poisoning.

In conclusion:

1. This study shows that surma is still being used regularly by a significant proportion (18%) of Asian women. The extent of use is not as great as indicated in the pilot study, but is of sufficient size to be of concern.

2. Legislation (ban on importation and sale) is only a partial solution because the majority of the users obtain surma directly from abroad. Legislation would be difficult to implement.

3. Surma is used primarily for medicinal reasons and thus suggestions to employ an alternative cosmetic may not altogether be productive. However, encouragement to use "kaaial," a harmless carbon-based Asian cosmetic/medicinal product would be helpful. In cases where surma is being used as a cosmetic, a safer alternative should be suggested (a variety of safe "kohl" eyeliners are available at many shops).

4. Women in the Asian society, particularly within Muslim groups, have a subservient role and are usually subject to the commands of their husbands and elderly members of the family (for example, the mother-in-

law). Thus, advice given by these persons will be adhered to. Publicity should be directed to the heads of the (extended) families.

5. Surma is used by Asian women of all religions. There is a misconception that the practice is confined to the Muslim community. Health visitors and doctors should be aware of this.

6. There was no relationship between the use of surma and the user's social status, length of residence in the United Kingdom, and number of British-born children. However, there was some indication that the users were likely to have a low level of education and be in older than 45. There was also some indication that young mothers were being pressured into using surma on themselves and their children by

the resident mother-in-law.

7. A portion of the Asian community does not actually believe that surma is bad for them and may be deleterious to their health. Many have stopped the practice without actually realizing that surma contains lead, which is toxic, and are likely to recommence the practice on returning to the homeland or when the publicity of surma has stopped. Health education should be such that the information about the dangers of a practice should be presented to a person and that person should then decide whether they are going to continue that practice.

8. Publicity about the surma problem was found to be widespread, but perhaps not in the most suitable form. Television was rated the best source of information about surma and the medium that would convince women to stop using surma. Clearly, this should be taken into consideration in the formulation of future educative programs. Most Asian households own televisions and a video recorder is near the top in their list of priorities. The addition of a brief program into the Asian video films would be very productive.

9. Very few women stated that knowing that their surma contained lead would convince them to stop using it.

10. Discussion about surma and lead poisoning was found to be minimal between the health professionals and the Asian community. Health professionals must play a greater role in health education.

11. While the DHSS/DTI poster/leaflet campaign is to be commended, there are problems. They include:

- (a) the inaccessibility of the leaflet to certain groups
- (b) the occurrence of illiteracy

The leaflet was more effective in educating the first generation children who could then pass the message to their parents.

12. There is a requirement for the surma campaign to be as determined in other areas of the country as it has been in Nottingham. The latter location was the prime target for publicity on surma as many of the studies and much of the research on this subject has been done in Nottingham.

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