PAPERS AND ORIGINALS

Surma and lead poisoning

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Summary and conclusions

Blood lead concentrations were measured in 62 Asian children, of whom 37 had definitely had surma applied to their eyes and 25 were thought not to have done. The mean concentration in those who had not used surma was $0.98 \pm 0.42 \mu\text{mol/l}$ ($20.3 \pm 8.7 \mu\text{g/100 ml}$) compared with $1.65 \pm 0.68 \mu\text{mol/l}$ ($34.2 \pm 14.1 \mu\text{g/100 ml}$) in those who had. Analysis of 29 different samples of surma showed 23 of them to be composed largely of lead sulphide.

We conclude that the use of surma is associated with high blood lead concentrations. In our cases most of it had been obtained abroad, and hence government restrictions might be ineffective in limiting its use: a better method of prevention might be to inform the leaders of Asian communities of the risks.

Introduction

Surma is a fine powder that looks like mascara but is applied to the conjunctival surfaces 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, as originally its major constituent was antimony sulphide. Recently, owing to the scarcity of antimony sulphide, lead sulphide has been used instead.

In 1968 Warley *et al*¹ reported on an Asian child with lead encephalopathy whose only source of lead was surma. They suggested that applying surma to the eyes might lead to lead poisoning, and this resulted in a warning notice from the Home Office.² Five years later Snodgrass *et al*³ reported on 12 children in five families in which the blood lead concentrations were unexpectedly high—again, “cosmetic plumbism” was suspected.

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In a retrospective review of 38 children admitted to Birmingham hospitals with lead poisoning Betts *et al*⁴ observed that 15 of the children were Asians and suggested that surma was the main source of the poison. Several years later Josephs⁵ reported high lead concentrations in Asian children in Luton. The source of the lead was not identified.

Surma is still readily available in this country and commonly used by Asian families. The aim of this study was to investigate the association between the use of surma and blood lead concentrations.

Subjects and methods

During four months 62 Asian children who attended Nottingham Children's Hospital with various medical conditions needed a blood test as part of their management. Venous blood was obtained from each child, of which we took 1-2 ml to estimate blood lead concentrations using atomic absorption spectrophotometry. The coefficient of variation of the method was 2%. Relatives were then asked whether they applied surma to the child's eyes, and, if they did, why they used it and where they had obtained the material. Surma had reportedly never been applied to 25 of the children, who therefore served as controls. The remaining 37 children had at some time had surma placed in their eyes, in some cases as frequently as two or three times daily, but in others only on special occasions. We recognise that surma may have been used on some of the children in the control group but the parents did not wish to admit it. Whenever possible a sample of surma was obtained and analysed chemically using atomic absorption spectrophotometry and x-ray diffraction. Twenty-nine different samples were obtained.

Results

In 15 of the 37 cases we were unable to get a clear answer from the parents as to why they used surma: some said they were just following tradition. In 13 cases the parents used surma as a principle of hygiene or to relieve eyestrain, pain, or soreness. In only one case was it considered to be of value in improving visual acuity. In nine families surma was used cosmetically for both boys and girls.

In only one instance was the surma obtained in this country. Analysis of this sample showed it to contain 86% lead sulphide. Twenty-one of the families had brought the surma with them from abroad or had recently been given a supply by a visiting friend or relative. Two of the families had purchased a supply from a hakim, or “healer,” who had obtained it directly from Pakistan. Fourteen families were uncertain about the source.

Traditional, home-made, and commercial containers for surma with their respective applicators.

Whenever possible we obtained a sample of the surma, which was kept in elegant containers, home-made receptacles, and bottles bought direct from Asian shops (see fig). We analysed 29 different samples—six white, 18 grey, and five black. The six samples of white surma contained little or no lead. The 18 grey samples had high lead contents, 14 containing over 80% and three 75-80% lead as lead sulphide (the ore, galena, is 86.6% lead). The five black samples had lead contents varying between 12% and 32%.

Several of the samples contained menthol or similar chemicals that induce tear formation. Many of the infants responded to administration of these with profuse tear formation and invariably rubbed their eyes.

Table I shows the age and sex distributions and country of origin of the children. The two groups were not significantly different. The mean blood lead concentration in the 25 children who were thought not to have been given surma was $0.98 \pm SD 0.42 \mu\text{mol/l}$ ($20.3 \pm 8.7 \mu\text{g}/100 \text{ ml}$). In the 37 children who had been given surma, some of which may not have contained lead, the mean concentration was $1.65 \pm$

Our study found an association between the use of surma and high blood lead concentrations. Although lead might be absorbed across the conjunctiva, lacrimation, eye rubbing, and finger sucking are probably more important factors in the route of ingestion. Previous reports have incriminated surma as the cause of lead toxicity.^{1-3,4} More recently it was 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 might be obtained to establish beyond doubt that surma is responsible for the lead poisoning.

Surma is still used despite government health warnings. The voluntary ban on the importation of surma sought by the Home Office and the proposed EEC legislation prohibiting its sale might prove ineffective, for we found that most of the surma had been obtained direct from abroad by the user, his friends and relatives, or the hakim. A more appropriate approach would perhaps be to present all the available information simply and clearly to the leaders of the Asian communities so that they could advise their people about the hazards of using surma with a high lead content.

Further investigations need to be made into the possible harm caused by the mode of administering surma and the toxic effects of the other constituents of the samples. Surma is used by adults as well as children. Perhaps of particular concern is the use of lead-containing cosmetics by pregnant women.⁶

TABLE I—Details of Asian children studied

	No. in group	Sex		Mean age in years (± 1 SD)	District of origin	
		Male	Female		Punjab	Other
Controls	25	9	16	6.9 ± 3.5	21	4
Subjects	37	21	16	6.6 ± 4.5	29	8

TABLE II—Distribution of blood lead concentrations in the 62 Asian children studied

Blood lead concentrations ($\mu\text{mol/l}$)*:		0-0.2	0-0.4	0-0.6	0-0.8	1-1.0	1-1.2	1-1.4	1-1.6	1-1.8	2-2.0	2-2.2	2-2.4	2-2.6	2-2.8	3-3.0	3-3.2	3-3.4
Surma users (n=37)	..	1	1	1	3	1	6	4	6	6	3	1	1	1	1		1	1
Controls (n=25)	..	1	1	6	6	6	1	2		1		1						

*Generally accepted upper limit of normal is $1.8 \mu\text{mol/l}$ ($37.3 \mu\text{g}/100 \text{ ml}$).
Conversion: SI to traditional units—Blood lead: $1 \mu\text{mol/l} \approx 20.7 \mu\text{g}/100 \text{ ml}$.

$0.68 \mu\text{mol/l}$ ($34.2 \pm 14.1 \mu\text{g}/100 \text{ ml}$). The difference between the two was statistically significant ($P < 0.001$). Table II shows the distribution of the concentrations. Concern has been expressed about cases in which blood lead concentrations rise above $1.8 \mu\text{mol/l}$ ($37.3 \mu\text{g}/100 \text{ ml}$). Of the 37 children given surma, five had concentrations of $2.4 \mu\text{mol/l}$ ($49.7 \mu\text{g}/100 \text{ ml}$) or above, although none had evidence of lead toxicity.

Discussion

In this study of 62 unselected Asian children 37 (60%) had surma applied to their eyes. Results of similar inquiries in Bradford and Oldham suggest that surma is used even more widely in these communities, and perhaps also by local non-Asian teenage girls.

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