

Paraffin ingestion — the problem

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Paraffin ingestion is the commonest cause of accidental childhood poisoning in South Africa. Children from the lower socio-economic group are affected most. They drink paraffin in the summer months from bottles or intermediate containers, mistaking it for water or cold-drink. The children are predominantly male with a mean age of 24 months. The clinical picture is one of respiratory distress with a hospital case fatality rate of 0,74%. The use of paraffin as a source of household energy in South Africa is on the increase. Based on a modernisation index it would seem that this trend will continue into the next century. It can therefore be expected that the number of cases of paraffin ingestion will steadily increase if no active steps are taken to address the problem.

Prevention should entail a wide spectrum of measures, the basis of which should be a child-resistant container. An effective durable, low-cost child-resistant container which is easy to pour from should be made available by petroleum companies and/or entrepreneurs and distributed through their network. This should be combined with health education on the danger of paraffin. Health care workers and administrators should be made more aware of the problem and become involved in health education and prevention.

Further research should be undertaken on the effect a change in the colour of paraffin and the use of child-resistant caps would have on the incidence of paraffin ingestion in South Africa.

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Paraffin ingestion was responsible for 78% (427 cases) of acute accidental poisoning in children at Ga-Rankuwa Hospital during 1992. Agricultural poisons, household poisons, herbal poisons, drugs and other poisons were responsible for the remaining 22% (Fig. 1).

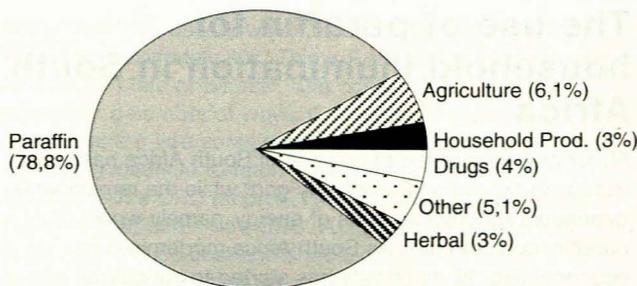


Fig. 1. Causes of acute poisoning, Ga-Rankuwa Hospital, 1992.

Ga-Rankuwa Hospital serves mainly the urban black community of the Odi district of Bophuthatswana, just north of Pretoria. A survey of the other 6 academic complexes in South Africa undertaken during 1992 showed a similar trend in that paraffin ingestion was the commonest cause of childhood poisoning in the institutions that serve mainly the black community. There was a total of 1 478 cases of paraffin ingestion at the 6 academic complexes during 1992. Thirteen rural hospitals in the northern Transvaal were also surveyed during 1992. There was a total of 1 378 cases at these hospitals. If this figure is extrapolated to the 60 hospitals in the northern Transvaal that refer patients to Ga-Rankuwa Hospital, there would be approximately 6 000 cases of paraffin ingestion each year in the northern Transvaal. Paraffin ingestion is clearly the commonest source of childhood poisoning in South Africa, as is the case in other developing countries.¹⁻⁴

Children with a mean age of 24 months (SD 16; range 1 - 147 months) are at greatest risk. These are black children from the lower socio-economic group who mistake paraffin for water or cold-drink. Paraffin is usually stored in cold-drink bottles, so it is not surprising that a toddler should mistake it for liquid refreshment. Rom *et al.*⁵ found that 33% of children ingested paraffin from intermediate containers. These are containers used to dispense paraffin into appliances. Overcrowding and limited storage space often result in paraffin being left within easy reach of children. The incidence of paraffin ingestion is higher in the summer months. This is because children's fluid intake increases on hotter days. Ingestion is commoner in males (M/F — 1,3:1); this is also true of other childhood accidents. A review of 200 cases of paraffin ingestion at Ga-Rankuwa Hospital during 1992 showed that 80% of patients were admitted with respiratory distress. The mean hospital stay was 2,21 days with a hospital case fatality rate of 0,74% (3 cases). The deaths were all the result of respiratory failure. The prognosis was poor if respiratory distress was so severe that the patient required intermittent positive-pressure ventilation (IPPV). A new form of treatment for respiratory distress caused by paraffin ingestion, in cases where the patient requires IPPV, is the use of surfactant. There has been one report of the successful use of this treatment at Baragwanath Hospital (unpublished data).

Twenty randomly selected patients who had ingested paraffin were billed at Ga-Rankuwa Hospital during 1992, where the average cost per patient was R348 per day. The total cost to Ga-Rankuwa Hospital for these patients was in excess of R328 000 and for the northern Transvaal in the region of R4 million.

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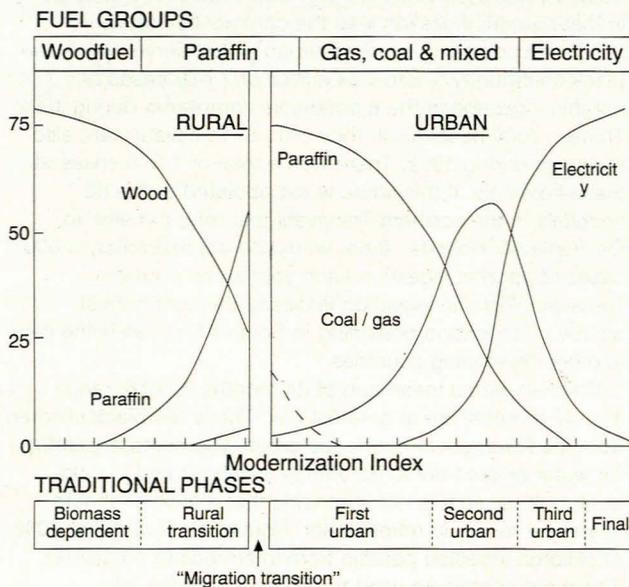
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The use of paraffin for household illumination in South Africa

About one-third of the population of South Africa has access to the national electricity grid⁶ while the remainder is dependent on other sources of energy, namely wood, paraffin, coal and gas. As South Africa modernises its economy (Fig. 2), its society has started to substitute transitional fuels (paraffin) for biomass fuels (wood) before finally becoming completely dependent on electricity. The household use of paraffin in South Africa increased from 314 million litres in 1976 to 536 million litres in 1989 (Fig. 3).

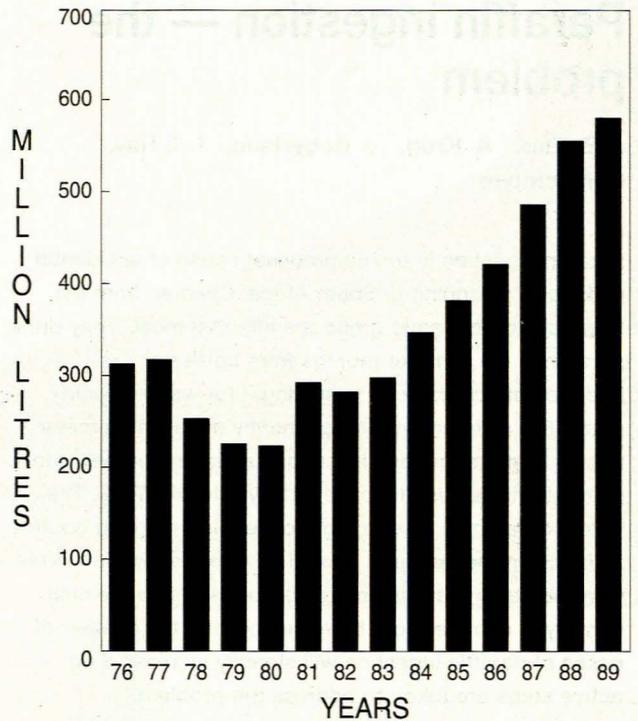


Source: Viljoen RP. Domestic Energy Transition in South Africa in the Context of Rapid Urbanisation. Unpublished M. App. Sci. Dissertation, University of Cape Town, 1989.

Fig. 2. The domestic energy transition process in South Africa.

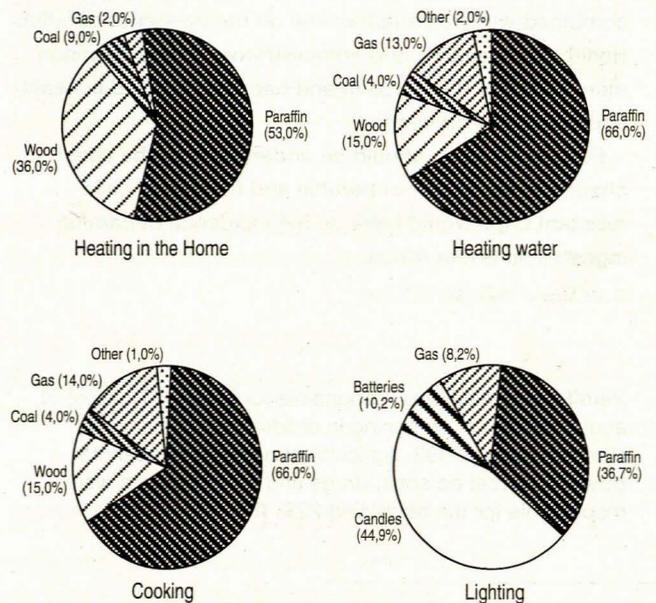
Modernisation, determined by economic systems, level of education, income level, and time urbanised, is a dynamic process and it is impossible to predict how long it will take. It can be assumed that South Africa still has many years to go before it will be modernised and thus fully dependent on electricity and that paraffin usage will increase well into the next century, as will paraffin ingestion if something is not done to prevent it.

At the recent Black Consumer Conference and Exhibition held in Johannesburg, Bangani Khumalo (Communication Manager, Corporate Affairs: ESKOM) spoke about the importance of electrification in South Africa. Topics covered included the different kinds of energy that people use in their homes. Paraffin supplied 55% of the non-electrical energy used (Fig. 4). Paraffin was the commonest fuel used for heating the home (53%), heating water (66%) and cooking (66%). Only when it came to lighting did paraffin (36%) take second place to candles (44%).



Source: Barchers ML, Eberhard AA. Household energy supply and price trends. Energy Research Institute, University of Cape Town, May 1991.

Fig. 3. Total consumption of illuminating paraffin in South Africa.



Source: ESKOM.

Fig. 4. Fuel for heating the home, heating water, cooking and lighting in areas without electricity.

Paraffin distribution networks

Illuminating paraffin is produced at 4 refineries in South Africa: 2 in Durban, 1 in Cape Town and 1 in the PWV area. These refineries are owned by the major petroleum companies (Fig. 5).

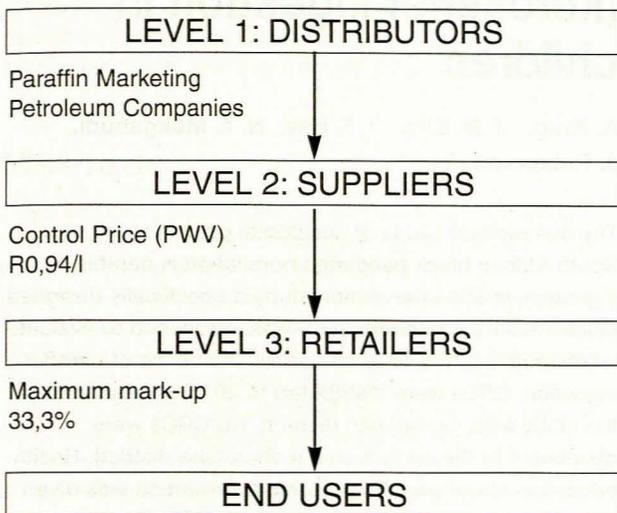


Fig. 5. Illuminating paraffin distribution network.

At level 1 are the distributors, i.e. the petroleum companies, who market paraffin either obtained from their own refineries or purchased from those companies that have refineries. Paraffin is then transported in bulk containers to level 2, the suppliers, which are distributed throughout the country. From level 2 paraffin is supplied to level 3, the retailers. As paraffin is distributed from level to level, more and more people become involved, making control difficult. Bulk illuminating paraffin had a wholesale selling price of 94,03 c per litre in the PWV area in April 1993. There is a maximum mark-up of 33%. Prices vary greatly at retailer outlets. The mark-up is often more than 33% and the price often increases if a larger quantity is purchased, e.g. 1 litre costs R1,30 and 2 litres cost R3.

Possible solutions

Modernisation

The most effective way to prevent paraffin ingestion is to modernise South Africa and to ensure that each household becomes dependent on affordable electricity. This is the long-term solution and every effort should be made to accomplish this goal. In the short term we need a solution that will prevent hundreds of thousands of children from ingesting paraffin during the next few decades.

Child-resistant containers (CRCs)

In this issue an intervention study is presented which showed that CRCs can have a significant impact on the incidence of paraffin ingestion. This supports other studies on CRCs that have shown their effectiveness.^{7,8} A major

restraint on their use, however, is cost. The cost of a 1-litre CRC is approximately 80c. This will effectively nearly double the cost of 1 litre of paraffin. The cost of CRCs can be reduced in a number of ways. Consumer research has shown that a 5-litre container is preferred. This will enable a standard household to fetch paraffin only once a week. The cost of a 5-litre CRC (approx. R4) would be proportionally less than that of a 1-litre CRC. A durable, re-usable CRC would also reduce cost and enable a family to prevent paraffin ingestion in their home for less than R5 a year. We propose that a durable, re-usable CRC is the most appropriate short-term solution to the problem. Legislation in this regard should be considered as it has been shown to reduce childhood ingestion accidents in the USA.⁹ Rom *et al.*⁵ found that intermediate containers were involved in 33% of cases of ingestion. To eliminate the need for intermediate containers it should be possible to pour paraffin directly from the CRC into an appliance. It is also imperative to inform and educate petroleum companies, distributors, retailers, consumers and health care workers on the effectiveness of CRCs in the prevention of paraffin ingestion.

Education

A national education programme should also be instituted. This must involve everyone who deals with paraffin: children, consumers, retailers, distributors, the petroleum companies and health care workers. If all parties are not involved, poor results similar to those reported in other health education studies may be achieved.^{10,11}

Children should be taught, through appropriate school education programmes, about the dangers and correct use of paraffin. Older siblings are often child minders and could be the first line of prevention.

Consumers need to be taught the importance of storing paraffin in CRCs in a place out of the reach of children. Retailers should be encouraged to sell paraffin in CRCs and also to educate the consumers. Distributors and the petroleum companies could make a contribution to the education programmes. Health care workers, and especially health care administrators, must consider the cost-effectiveness of prevention of paraffin ingestion by the use of CRCs. If health care centres distribute CRCs in their areas it may prove to be cost-effective. Ga-Rankuwa Hospital spent over R300 000 treating paraffin ingestion in 1992. This amount could have purchased 60 000 5-litre CRCs which would have reduced the problem significantly. The long-term morbidity costs also need to be calculated and considered.

Colour

Australia changed the colour of its paraffin to blue¹² with a resultant drop in the incidence of ingestion. This option requires further investigation.

Child-resistant caps

A child-resistant bottle cap has been suggested. This cap should be able to fit a variety of standard bottles that are retailed in South Africa. When a retailer sells paraffin, a child-resistant cap would be put on the bottle. This option could be more cost-effective than CRCs but has the disadvantage that 30% of accidental paraffin ingestion is not from bottles.¹ Further research is required.

Conclusion

Paraffin ingestion is the commonest cause of accidental childhood poisoning in South Africa. There will be an increase in the household use of paraffin well into the next century with a resultant increase in childhood ingestion. Effective durable, re-usable CRCs are the most attractive short-term solution to the problem. Disadvantaged families are not always ignorant or apathetic about hazards, but face practical difficulties in converting their concerns into actions. The availability of CRCs will enable those families at risk to protect their children.

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