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Correspondence to Dr D A Price, Royal Manchester Children's Hospital, Manchester M27 1HA.

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Accidents in Malawi

D SIMMONS

Charing Cross Hospital Medical School, London

SUMMARY The frequency and types of children's accidents during a two month period in Malawi are described, showing that these are at least as numerous as in developed countries. It is suggested that preventive measures and an improvement in immediate treatment are required.

Accidents are the most common cause of child death in developed countries.¹ In developing countries their importance is often overshadowed by the problems of infection and malnutrition; however, where valid statistics are available, accidents are at least as numerous.¹ This study describes the frequency and types of children's accidents in Malawi, Central Africa during a two month period.

Methods

The survey was carried out in Kamuzu Central Hospital, Lilongwe, which serves a district of 850 000 and includes an urban population in the nation's capital and a rural population. It is also a referral centre for the 2.6 million people of the Central Region of Malawi.

All admissions to the paediatric ward during July and August 1983 were recorded. Details of accidental injuries including age, sex, site of accident, objects involved, type and site of wound, and whether or not the child died were obtained from hospital records and where possible, parents were interviewed to corroborate this information.

In addition to the hospital study, a house to house survey was carried out in conjunction with a blood pressure survey in a housing estate in the city and in a rural village 22 miles from the city. Details on all children who had experienced an accident in the two months before the interview and whether this had

resulted in a visit to the local health centre were recorded.

Results

Seventy seven (9.7%) of the 777 paediatric hospital admissions in the two month period were the result of accidents (Table 1). Overall, more boys than girls were admitted to hospital because of an accident, but there was no significant difference in the proportion of admissions between boys and girls. The proportion of admissions due to accidents increased with age.

Burns and scalds accounted for 21 (27.3%) of the accidents and were the commonest cause of hospital admission in children aged under 4 years; two children subsequently died. All the burns resulted from falling into open fires in the home. Two thirds of the burns affected more than one area of the body. One of the burns followed an epileptic fit, a more frequent occurrence than is suggested by this study. The events described are an 'aura' of feeling cold, moving to the fireside for warmth, and subsequently fitting and falling into the fire.

Fractures (25 (32%)) were the commonest single

Table 1 *Accidents as a proportion of hospital admissions*

Age	Total no of admissions		Total no of accidents (% of admissions)	
	Boys	Girls	Boys	Girls
1	118	118	3 (2.5)	4 (3.4)
1-4	223	169	22 (9.9)	15 (8.9)
5-9	64	48	16 (25.0)	11 (22.1)
10-14	16	19	3 (18.9)	1 (5.3)
Not known	1	1	1	1
Total	422	355	45 (10.7)	32 (9.0)

χ^2/df boys v girls, $P > 0.05$.

Table 2 *Accidents reported in the house to house survey*

Area	No of children in area	No (%) of accidents in 2 months	Proportion (%) necessitating a visit to a health centre
Falls Estate (urban)	590	21 (3.6)	12/21 (57)
Gunde & Msinje (rural)	403	10 (2.5)	5/10 (50)

cause of hospital admission, especially in the 5 to 9 year age group, and most were caused by falls. Three children had fallen from their mother's or sister's back. Although five road traffic accidents occurred, most resulting in head injuries (one fatal), rural hazards were more frequent. Ox carts were involved in four accidents, resulting in fractures. Cattle injured three children, two of them seriously: one was gored in the abdomen, and the other, who was gored in the chest, fractured a number of ribs and subsequently developed a pneumothorax.

The remaining 31 (40.2%) accidents included 12 poisonings from various fruits, vegetables, tablets, and paraffin; four foreign body ingestions; and 15 other injuries, two of which were fatal. No snake bites were reported.

Five of the 87 (5.7%) deaths during the two months of the study were due to accidents. Besides the three deaths already mentioned, a further baby died from sepsis after accidental laceration and one child died after being bitten by a rabid dog.

The house to house survey, which covered 97.6% of women in the urban area and 98.6% of women in the rural area, showed that 3.6% of children in the urban area and 2.5% of children in the rural area had suffered an accident over the two month study period (Table 2). Nearly half of these children visited a health centre. This suggested that as many as 21% of urban children and 15% of rural children would experience an accident each year and half of these accidents would necessitate a visit to a health centre.

Discussion

The impact of accidents in children under 5 years is overshadowed by malnutrition and infection; they are still, however, an important cause of hospital admission in this group, and become increasingly so after this age. Although it is difficult to extrapolate to annual figures because of sample size and seasonal differences, this survey highlights accidents as a cause of both mortality and morbidity.

In the United Kingdom accidents are responsible

for 15 to 40% of paediatric admissions,^{2,3} 26.3% of deaths in children aged over 1 year,⁴ and 19.8% of all children admitted to hospital annually.⁵ It is possible that trivial injuries assume greater importance in developed countries and the easier access to medical facilities could partly explain this.

The most common accidents resulting in hospital admissions were those caused by fractures and burns. Similar findings were reported from rural Senegal,⁶ but other studies in developing countries have shown different causes to be of greater importance.⁷ In rural and urban schools in Benin, 41% of accidents were traffic accidents, 13.5% were bites, and 13% were from sharp pointed objects.⁶ These differences are possibly due to disparities in populations surveyed.

The role of Kamuzu Central Hospital as a referral centre biases the results towards more serious accidents. There could also be an underestimate in the number of accidents in children over 9 years as many were referred to adult wards and, therefore, could not be included in the survey.

Preventive measures and an improvement in immediate treatment are required to reduce the impact of children's accidents. Prevention requires a long term approach beginning with an increased awareness that children's accidents are an important cause of death and disability, and identification of the major areas where prevention is possible.

Health education, including road safety and the dangers to children of open fires and hot pans, needs to reach parents and children alike, and a school based health education programme would be beneficial. Specific measures, particularly for the prevention of burns and scalds, would be difficult without appreciation of the hazards. Cost would exclude many safety devices; fireguards and other simple measures may help, but could interfere with cooking. Most fires in the villages were on the floor, and raising them, if done cheaply and safely, would be beneficial.

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Correspondence to Dr D Simmons, 1 The Pennards, French Street, Sunbury on Thames, TW17 5JX.

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Re-evaluation of saliva for monitoring theophylline concentrations

G W RYLANCE, D T BESWICK, R E CULLEN, AND D G V ROBERTS

Children's Hospital, Ladywood Middleway, Birmingham

SUMMARY Variability of the mixed saliva/plasma theophylline relation was examined in seven children aged 2 to 13 years. Good correlation between plasma and saliva concentrations was found, but on the three occasions there was considerable inter- and inpatient variability. There was no significant or consistent relation between unstimulated and stimulated saliva concentrations or between saliva concentrations and sample volumes. Plasma theophylline concentrations cannot be predicted accurately from saliva values.

Theophylline is an effective bronchodilator for both acute medical treatment and prophylaxis of asthma. Bronchodilator effect and toxicity are closely related to plasma concentration, and optimum treatment in adults is usually achieved when the plasma theophylline concentration is maintained within the range 10 to 20 mg/l (55 to 110 $\mu\text{mol/l}$).¹ This therapeutic range has not been confirmed in children, although decreased symptoms have been noted in a group of children when concentrations averaged 13 mg/l (67 $\mu\text{mol/l}$) compared with a mean value below 10 mg/l.²

There are large intersubject differences in theophylline pharmacokinetics in children. Plasma theophylline concentrations need to be monitored, therefore, in order to establish the dose required to achieve concentrations within the therapeutic range, which, it is assumed, is equally applicable to children.

Saliva sampling is used to monitor drug concentrations of some anticonvulsants,³ and its use to monitor theophylline has been suggested.^{4,5} The evidence in the published reports, however, does not always support this view.^{6,7} This study aimed to examine the validity of using saliva for monitoring theophylline by examining the effects on the saliva/plasma theophylline ratio of certain factors known to affect the saliva/plasma relation of drugs generally.

Methods

Seven children aged 2 to 13 years were included in the study, which had been approved by our local research ethical committee: informed parental consent was obtained. None of the children had liver or kidney disease, and none were receiving drugs known to affect theophylline disposition. No attempt was made to minimise dietary xanthines on the day before or during the study periods.

Each child was studied on three separate occasions. Firstly, after a constant rate infusion into a peripheral vein of approximately 3.5 mg/kg aminophylline (79% theophylline, 21% ethylene diamine) over 20 minutes. Two saliva samples (one unstimulated, one stimulated by citric acid crystals) and a venous blood sample (1 ml – via an indwelling heparinised catheter) were obtained before and at hourly intervals for 10 hours after completion of the infusion. Saliva samples were collected in children aged under 4 years by a mucus extractor, and older children were asked to spit into a container until approximately 2 to 4 ml of mixed saliva was collected. Thorough mouth washing took place before and after each sampling.

The children were then studied on two subsequent occasions during regular, oral sustained release aminophylline or theophylline treatment given in equal 12 hourly doses at 8 am and 8 pm. Six children received Phyllocontin (Napp Laboratories) and one received Theo Dur (Fisons). Each study was within two weeks and after at least five days of the preceding study, and on each occasion hourly samples (two saliva, one blood as above) were collected between morning and evening doses. The weight related dose increased with time and was different on each occasion within each individual.

The volumes of the saliva samples were measured and the samples centrifuged and stored at -20°C until assayed for theophylline (EMIT (Syva)). The lower limit of the assay was 1.0 mg/l (5.5 $\mu\text{mol/l}$). The within run and between run coefficients of