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The trauma burden in Port Moresby

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Introduction

Port Moresby is the capital city of Papua New Guinea and has a population of 200 000 with a further 130 000 in the surrounding Central Province (1). Surgical audit figures show that 30% of surgical admissions are due to trauma but no formal study of the epidemiology of trauma has been published. In the highlands town of Mendi 11% of hospital and 43% of surgical admissions are due to injury (2) and in Milne Bay Province Barss showed that even in a rural community trauma is a common health problem (3, 4).

This study was conducted to determine in Port Moresby:

1 the trauma burden

2 the pattern of injury

3 the outcome of trauma care in patients admitted.

It was hoped that the results of this study would enable an estimate of the cost of trauma to be made although detailed information on the costs of hospital treatment in Papua New Guinea are not available. It was also hoped that areas for improvement in trauma care could be identified.

Patients and methods

Port Moresby General Hospital (PMGH) is the only hospital serving the National Capital District. It also acts as a referral hospital for the Central Province and, for elective cases, the whole country.

Three related studies were performed:

1. To assess the trauma burden presenting to hospital a prospective study of Casualty referrals was made for 35 days (5 for each day of the week) between March and May 1993. The 35 days selected over the 90-day period were chosen at random before the study commenced. The cause and nature of injury, and treatment received, was recorded.

2. All trauma admissions to one of four general surgical units were audited prospectively throughout the year. All trauma admissions with the exception of ophthalmology and otolaryngology are treated by the general surgical units. The management and outcome of all surgical patients were also discussed in weekly audit and mortality meetings.

   The Abbreviated Injury Scale was used to calculate the injury severity score (ISS) (5) and the revised trauma score was calculated from the Glasgow coma score, the systolic blood pressure and the respiratory rate (6,7). During 1993 an intermittent orthopaedic service was available, but there was no neurosurgeon and there were no CT (computerized tomography) scanners.

3. In order to assess mortality, deaths occurring after admission were reviewed over 18 months. This identified 50 trauma deaths. Records were also available for 8 months in 1993 of those patients brought in dead by the police or who died on arrival in the Accident and Emergency Department. 88 patients were certified dead on arrival in Accident and Emergency between 1.5.93 and 31.12.93 — the equivalent of 131 per year. The causes of death were cross-checked with Pathology Department records for cases where an autopsy had been performed.

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Results

Trauma in the Accident and Emergency Department

In 35 days 667 patients presented to the Department as a result of injury, which is the equivalent of 1739 patients in 3 months and 6956 patients in a year. 61% of trauma referrals occurred at the weekend (Friday, Saturday, Sunday). Trauma accounted for 20% of the Emergency Department workload. Detailed information was accurately recorded on 508 of the 667 patients (76%). 348 were male and 160 female with an age range of 1 to 73 years and a mean of 23 years (SD=10). 63% of patients were aged between 16 and 30 years, and only 4 patients were aged 50 and over. 31% of cases had made a journey of more than one hour's drive to reach hospital. Accidents (44%) and assault (38%) were the commonest causes of injury. Wounds (60%), fractures (14%) and bruising (14%) were the commonest types of injury. The different treatments prescribed, their costs and the estimated annual costs (excluding salaries) of K550 000 are shown in Table 1. 11% of patients with injuries were admitted to hospital.

Trauma admissions

There were 154 admissions to one surgical unit in twelve months, the equivalent of 616 in all four units. The age range is shown in Figure 1. There were 120 males and 34 females. Figure 2 shows the causes of injuries. Assaults were the commonest causes of admission (42%) but motor vehicle accidents (30%) were responsible for the longest stay in hospital (Figure 3).

Type of injury

There were 58 admissions due to fracture (38%), 50 due to wounds (32%), 17 head injuries (11%), 15 abdominal injuries (10%) and 8 chest injuries (5%). There were only 4 burns and 2 spinal injuries.

Hospital stay

154 trauma admissions resulted in 2473 inpatient days — a mean duration of 16 days (SD=23, range 1-149). Patients with fractures had a mean stay of 24 days (SD=31), abdominal injuries 13 days (SD=19), wounds 11 days (SD=13), chest injuries 9 days (SD=2) and head injuries 6 days (SD=4).

Injury severity and outcome

The mean injury severity score of patients admitted was 7.5 (SD=6.3), ranging from 1 to

TABLE 1

COST OF TREATMENT IN THE ACCIDENT AND EMERGENCY DEPARTMENT OF PMGH FOR 508 TRAUMA PATIENTS IN 1993

Treatment	Number of patients	Percent[a]	Unit cost	Annual number[b]	Estimated annual cost (K)
Antitetanus toxoid	290	57	1.00	3965	3 965
Wound repair	291	57	1.50	3965	5 948
Oral drugs	235	46	1.00	3200	3 200
Procaine penicillin	392	77	1.00	5356	5 356
X-rays	125	25	4.00	1739	6 956
Intravenous fluids	15	3	2.00	209	418
Plaster of Paris	10	2	2.00	139	278
Clinic referral	20	4	6.64	278	1 846
Admission (16 days)	58	11	688.00	765	526 320
Total					**554 287**

PMGH: Port Moresby General Hospital

[a] Percentage of the total of 508 studied

[b] Calculated from the percentage and the estimated annual total of 6956 patients

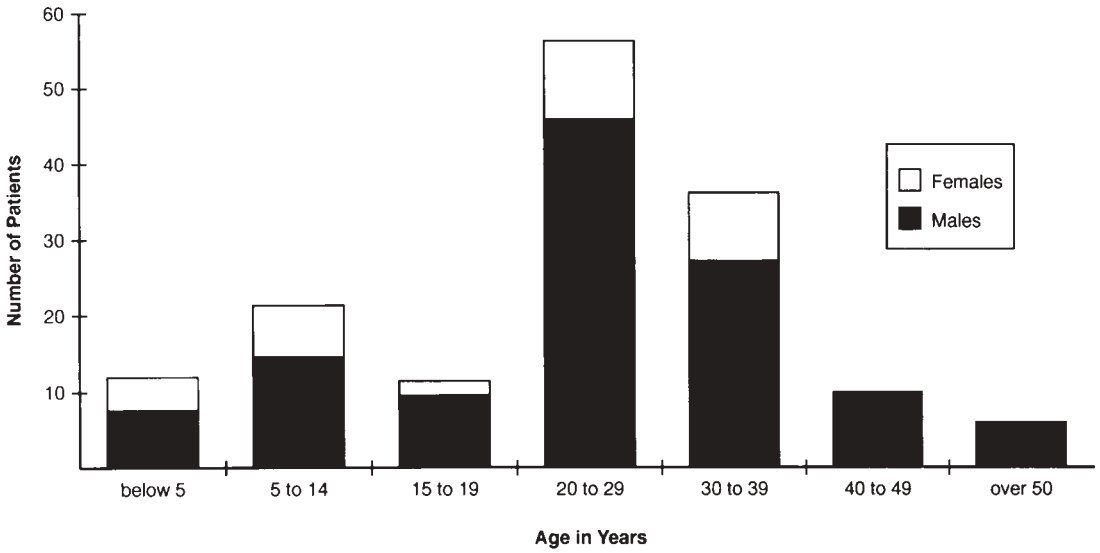

Figure 1. Age and sex data of trauma admissions to Port Moresby General Hospital in 1993.

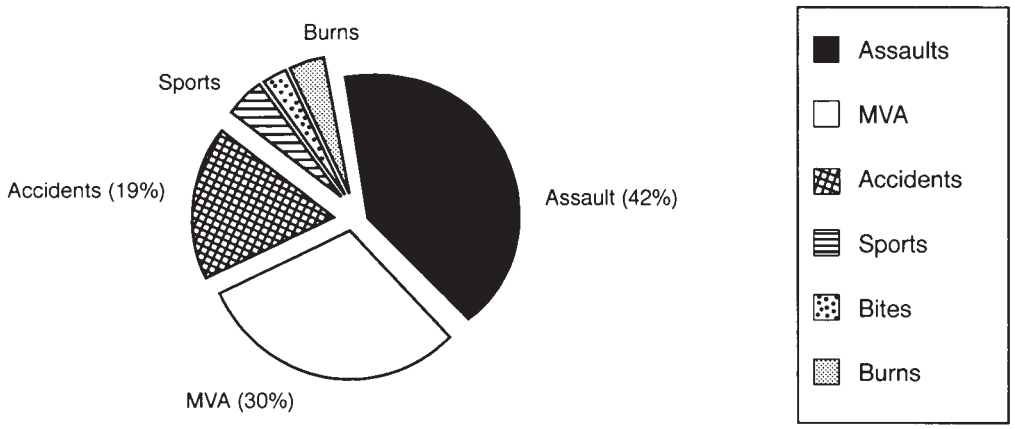

Figure 2. Causes of trauma admissions to Port Moresby General Hospital in 1993.

29. Only 25 patients had an ISS of 16 or more, 5 of whom died (20%). No patient with an ISS of less than 16 died. The mean revised trauma score (RTS) was 7.3 (SD=1.9) with only 20 patients having a score of 5.1 or less. The causes of death were severe head injury in three patients, stress ulceration causing persistent gastrointestinal haemorrhage despite three operative procedures including gastrectomy in one patient, and abdominal trauma with extensive liver injury in one patient.

Treatment and outcome

The operative procedures performed are shown in Table 2. There were 44 major and 87 minor operations. Laparotomy and internal fixation were the most common major procedures. Wound repair and closed reduction of fractures were the most common minor operations. 21 patients (14%) required 2 or more procedures. No operation was needed in 30 patients (19%). Only 5 patients died after

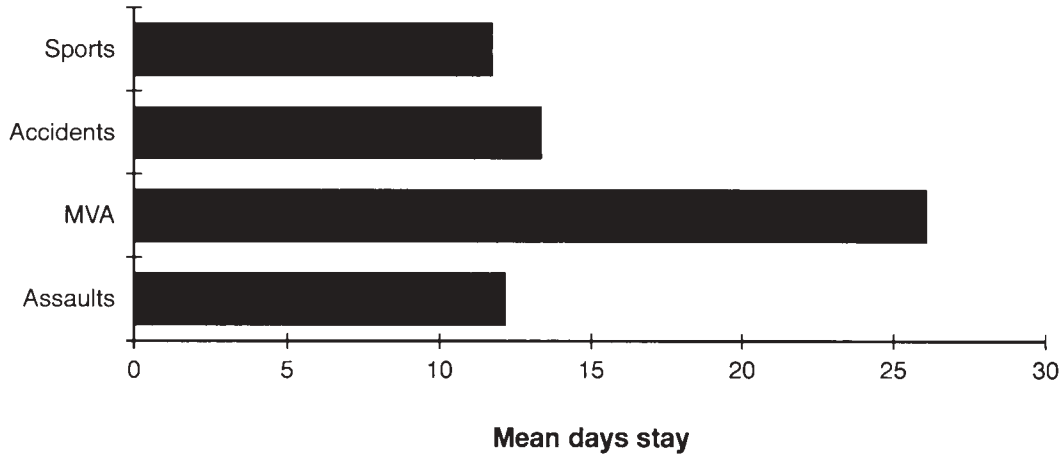

Figure 3. Causes of injury and duration of hospital stay, Port Moresby General Hospital, 1993.

admission to hospital (3%) but 14% of survivors (20 of 148) left hospital with some significant disability or required further surgery after discharge. These included 3 lower limb amputations, 2 digit amputations, 3 patients with shortening of more than 2 cm following a fractured femur, and 5 who required further surgery for malunion or nonunion.

Trauma mortality

Death outside hospital

There were 88 deaths from trauma outside hospital in the last eight months of 1993, which is equivalent to 131 per year. 70 were adults, 18 children and there were 63 males and 25 females. The mean age was 27 years (SD=16, range 1-80). Only 4 of the adults were estimated to be over the age of 50 years although the age of the patient was not always known. Head injuries were the commonest cause of death (37%, 33 cases), 24 of which were due to a motor vehicle accident (MVA). 45% (40 deaths) were due to assault (11 gunshot) and 30% (26 deaths) to MVA. 12 deaths were due to drowning, 7 in children. 2 deaths were due to shark bites and 1 to snake bite.

TABLE 2

OPERATIONS FOR TRAUMA IN 154 PATIENTS ADMITTED TO PMGH IN 1993

Major (44)		**Minor (87)**	
Laparotomy	12	Wound repair	43
Thoracotomy	3	Closed reduction of fracture	26
Burr holes	3	Skeletal traction	5
Arterial repair	4	Incision and drainage	5
Amputation	3	Intercostal drain	8
Tendon repair	7		
Internal fixation	11		
Neck exploration	1		

Two or more operations in 21 (14%)

No operation in 30 (19%)

PMGH: Port Moresby General Hospital

Death in hospital

Of the 50 trauma deaths occurring in patients admitted to the surgical wards over 20 months (March 1992 to November 1993) (Table 3), head injury accounted for 30 (60%), burns for 9 (18%) and multiple injuries for 4 (8%). 14 (28%) of the deaths had avoidable factors which may have contributed to death: 2 patients were sent home initially from Casualty with head injuries, 2 head injuries had substandard care in hospital, surgery was either not performed in 3 patients or delayed in 2, 4 of the burns deaths were in burns less than 30%, and 1 patient with paraplegia due to spinal injury died of gastrointestinal haemorrhage (see above).

Discussion

This study will have underestimated the trauma burden in Port Moresby for several reasons. First, patients with minor trauma present to a variety of places in addition to Port Moresby General Hospital. These include 4 urban health clinics, private doctors and company clinics. Some paediatric trauma cases are also seen in Children's Outpatients. Snake bites are admitted to the medical wards and some stable cases with single injuries to the eye, nose or jaw are admitted to the respective specialist units.

A study of user charges at urban health clinics was made by Thomason et al. (8) and they estimated 40 injury presentations per week, the equivalent of 2080 cases per year. The Children's Outpatient Department saw 1125 children with injuries in 1992 (no registry figures were available for 1993). In 1993, the ophthalmology service admitted 41 eye injuries and treated a further 15 as outpatients. 46 cases of maxillofacial trauma were treated by the maxillofacial surgeon but unfortunately no figures were available for otolaryngology. There is also no register of cases seen by private general practitioners, who may do minor procedures such as wound repair under local anaesthetic or put on a plaster for a patient who does not need to have a fracture manipulated. Private general practitioners did not perform major operations for trauma because in 1993 there was no private hospital and no hospital surgeons were offering a service to the private clinics.

Excluding the cases seen by private doctors, the public health system sees in excess of 10 000 cases per annum in Port Moresby. The figures presented here for trauma in Port Moresby are an underestimate due to underrecording and the unknown number of cases seen in private clinics. However, since 31% of cases seen in the Accident and Emergency Department had journeyed from the Central Province outside the National Capital, the true population at risk is probably 330 000 rather than 200 000. This means that the annual incidence of trauma in Port Moresby is somewhere between 3000 and 5000 per 100000. In those 16-30 years old the incidence is 9000 per 100000 and in males 16-30 years old it is 11000 per 100000 (1 in 9 per annum).

Accidents were the commonest cause of injury. Most accidents occurred at home rather than at work, and it was surprising that only 2% of injuries were work-related. Some injuries may be treated at work and others treated in private surgeries at the employer's expense but, since most occupational injuries provide the opportunity for compensation, we

TABLE 3

TRAUMA DEATHS IN PORT MORESBY GENERAL HOSPITAL, MARCH 1992 - NOVEMBER 1993

Unavoidable (36)		**Avoidable (14)**	
Head injury	26	Head injury	4
Burns	5	Burns	4
Multiple injuries	4	Neck	1
Chest	1	Chest	1
		Abdomen	3
		Spine	1

would expect to see a reasonable proportion in the hospital.

74% of assaults were caused by family members rather than criminals. Men and women were equally affected by family violence (68 and 66 cases) but in cases of female assault 94% (66 out of 70) were by members of the family, usually the husband. These figures suggest that Port Moresby's problems with violence and the costs that it incurs are predominantly family-related rather than criminal. Alcohol appears to be a significant factor from talking to patients although we were not able to measure alcohol levels in this study. Reducing the number of injuries due to domestic violence will require a concerted public education program beginning in the schools. It may take a generation or more to change attitudes. Stricter penalties by the courts may help but many cases of family violence do not come to court. Earlier studies in PNG suggest that not only are two-thirds of women and men involved in domestic violence (man against woman) but 57% of women and 66% of men believe it is an acceptable form of behaviour (9-11). However, family violence also affects men, with men at risk from other men in the family and sometimes from their wives.

Motor vehicle accidents were responsible for only 6% of injuries seen in the Accident and Emergency Department but constituted 30% of cases admitted. They incur a high cost because of the severity of injury and long hospital stay. The number of deaths due to road accidents is similar to assaults. Seat belts are compulsory in Papua New Guinea but there is no testing by breathalyser. A roadside study of drivers showed that 23% of weekend drivers had a blood alcohol over 80 mg% (80mg/100ml, also called 0.08g/100ml or .08% or 0.8g/l) (12). Over a decade ago a study of road accident fatalities showed that 85% of drivers and 90% of adult pedestrians had recently consumed alcohol and 53% had a blood alcohol greater than 0.08g/100ml (13). Road accident fatalities are high in most developing countries when measured per 10000 registered vehicles (14). For example, although New Zealand has twice the number of motor vehicle accident fatalities as PNG (729 in 1990 versus 327 in 1989), the rate per 10000 registered vehicles is over 20 times higher in PNG (3 versus 71 per 10000) (15). Lourie (16,17) estimated that motor vehicle accidents cost PNG over US$10 million per year and road accidents cost most developing countries at least 1% of their GNP (14).

Only a small proportion of the 160 trauma deaths per year occurred after admission to hospital (18%). Two-thirds of these deaths were considered unavoidable at the time of admission. Thus any attempt to reduce the mortality of trauma must involve preventing accidents and violence. Meaningful action will involve the commitment of the police, courts, transport department and political will. Better first aid at the scene of injury and provision of basic resuscitation during the journey to hospital might also reduce the mortality. However, only a small proportion of trauma cases are transported to hospital by the St John Ambulance Service. In Port Moresby 21% of non-obstetric emergency ambulance requests are for trauma, on average 130 per month (18). The ambulance service is underfunded, with a budget of only K274 000 in 1993, most of which was in the form of a grant from the Department of Health plus donations from sporting and other bodies. Although the service is still free for trauma emergencies, the average cost is K15 per journey for 18 000 ambulance transfers per annum. This is similar to the cost of a taxi fare.

The estimated annual cost of treatment for trauma victims was K550 000 (Table 1) which represents 9% of the hospital's K6 419 000 budget. These figures are based on the hospital management's estimates of K43.23 per inpatient day and K3.32 per outpatient consultation. The management are not able to cost or charge for individual operations so procedure costs cannot be calculated. The above figures do not include the cost of salaries of consultant specialists, interns and registrars in training that are borne by the national Department of Health or University. Many pharmaceuticals are also provided by the Department of Health. Since 30% of surgical admissions are due to trauma the additional cost is over K300 000 in salaries and allowances plus pharmaceuticals (value unknown). All of the above figures are likely to be underestimates because of undercounting. The true expenditure from the public purse for the acute treatment of trauma is in excess of K1

million per year for Port Moresby.

The cost of trauma is not only incurred by hospital care but also by the community. Loss of work output, loss of earnings, relatives' expenses in visiting the patient and the effect of disability contribute to this cost. The actual cost of rehabilitation is probably small because there is no effective service. In 1993 an artificial limb cost the patient over US $2000 to travel to Townsville, Australia, where the fitting and manufacturing of the limb was provided free. Now there is one centre (Lae) in PNG which has the facility to make artificial limbs. There would also be less disability if a better physiotherapy service could be provided, particularly for hand injuries.

Improving hospital care, particularly for fractures, should reduce the morbidity of trauma and the length of hospital stay and therefore the cost. Better orthopaedic management has already been achieved since this study was undertaken as two national surgeons have been trained in orthopaedics. Significant reduction in the cost of trauma is only likely to be achieved by preventing trauma (19) and to do this the causes of trauma in PNG need to be addressed. This study has identified the principal causes of trauma in the nation's capital, audited the outcome of trauma admissions and attempted to estimate the costs of treatment.

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