

## A 24 year survey of amputees in Hong Kong

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### Abstract

A 24-year retrospective study of amputees was conducted at the Prosthetic and Orthotic Unit of the Kowloon Rehabilitation Centre, the first and largest rehabilitation centre in Hong Kong. A review was made of 1821 patients and a rising trend of amputee population was demonstrated probably related to the population growth. The ratio of lower limb to upper limb amputees was 1.83 to 1. The mean age of the amputees was 39 years. The commonest cause of upper limb amputation was trauma (89%) and of lower limb amputation was infection (35%). Vascular diseases were not as common in Chinese as in Caucasian communities. These patterns of amputee population indicate the demand for prosthetic service and provide guide-lines for future development.

### Introduction

The total care of an amputee should start before the amputation. There have been extensive studies on the rehabilitation of amputees. The medico-social aspect of the care should be based on accurate epidemiological data of the community, which will provide guide-lines for the planning and implementation of the prosthetic service. Hughes (1983) has emphatically indicated the urgent requirement for a survey of the needs of the prosthetic service in Hong Kong. This survey has been conducted with the intention of serving future planning in the local prosthetic service.

### Material and method

A retrospective study was carried out of all the records of the Prosthetic and Orthotic Unit at the Kowloon Rehabilitation Centre. The period of this study was 24 years, from January 1, 1960 to October 30, 1983. Each amputee was counted

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Table 1. Number of amputees attending the KRC Prosthetic Centre in different periods.

Periods	Number	Percentage	Percentage rise
60-63	261	14.33	
64-68	284	15.60	9
69-73	343	18.84	21
74-78	554	30.42	62
79-83	379	20.81	-32
Total	1,821	100.00	

once at his/her first registration at the centre. The following data were collected and analysed:

Total number of amputees, age, sex, cause of amputation, site and type of amputation. Five periods (one of 4 years and four of 5 years) were considered in the statistical analysis.

### Results

#### (1) Number of amputees (Table 1)

There had been a steady increase in the total number of amputees over the first 18 years. The growth rate had been moderate (<20%) at the start until the "74-78" period when a remarkable 62% increase was recorded. Thereafter there was a sharp decline of 32% in the last 5 years.

#### (2) Age

The mean age of amputees was 39.05, but the distribution ranged from less than 1 year to 89 years of age. Female amputees had a higher mean age (44.74) than males (37.03).

An interesting feature of the mean age distribution (Table 2) was that there was a definite rising trend from 31.79 in the "60-63"

Table 2. Mean age in each period.

	Period					60-83
	60-63	64-68	69-73	74-78	79-83	
Whole group	31.79	36.46	38.16	40.54	44.02	39.05
Male	33.90	35.52	36.13	38.80	39.49	37.03
Female	31.75	39.03	44.03	43.82	53.20	44.74

Table 3. Distribution of age groups.

Age group	60-63	64-68	69-73	74-78	79-83	Total
<20	40	55	72	118	53	338 (19.5%)
21-40	110	106	105	164	116	601 (34.7%)
41-60	70	86	116	148	88	508 (29.3%)
>60	7	23	38	116	101	285 (16.5%)
Total	236	270	331	546	358	1,732

period to 44.02 in the "79-83" period. This trend was more remarkable among the female amputees who had a mean age of 53.20 in the "79-83" period, compared with only 31.75 in the "60-63" period.

When the ages were broken down into 4 specific groups (Table 3), it was evident that the largest number of amputees fell within the 21-40 age group (34.7%) while those between 41-60 formed the second majority group (29.3%). The distribution did, however, change over the period of the survey.

### (3) Sex

Among the 1821 amputees, there was a strong male preponderance: 1363 male (74.9%), compared with 452 females (24.8%). The overall male to female ratio was 3:1 (ranging from 2.30:1 to 3.83:1 in different periods).

When the specific age groups were analysed with respect to sex distribution, there were several interesting features (Table 4). Among the younger amputees of 21-40, the male to female ratio was almost doubled to 6:1 compared to the overall pattern. On the other hand, there appeared to be a steady increase in the number of female amputees over the age of 61, so much so that among the oldest amputees of "79-83" period, there were more females than males.

Table 4. Male to female ratio in each age group

Age group	Period				
	60-63	64-68	69-73	74-78	79-83
<20	2.27	2.06	4.54	2.81	2.53
21-40	5.88	7.15	7.08	4.66	6.73
41-60	3.38	2.19	3.64	3.00	3.19
>60	6.00	1.30	1.24	1.64	0.68

### (4) Site and type of amputation

There were 1,178 (65%) lower limb amputees and 641 (35%) upper limb amputees, the ratio being 1.83:1.

The types of amputation are shown in Table 5, the commonest being below-knee amputation (37%), followed by above-knee (16%), below-elbow (15%) and hand amputation (13%).

Table 5. Level of amputation.

	Number	Percentage
<b>Upper limb</b>		
Shoulder disarticulation	15	0.85
Above-elbow	70	3.98
Below-elbow	269	15.30
Through-wrist	32	1.82
Hand	234	13.30
<b>Lower limb</b>		
Hip disarticulation	44	2.50
Above-knee	284	16.30
Through-knee	95	5.40
Below-knee	648	36.90
Syme	28	1.60
Foot	36	2.10
Others	3	0.20

The age distribution of 543 of the upper limb amputees was analysed (Table 6) and 248 patients (45.7%) were found to fall within the 21-40 age group. The commonest varieties were hand amputations and below-elbow amputations.

Table 6. Age distribution of upper limb amputees.

	S/D	A/E	B/E	T/W	Hand	Total
<20	4	11	47	8	78	148 (27.3%)
21-40	7	27	101	13	100	248 (45.7%)
41-60	3	17	58	9	43	130 (23.9%)
>60	0	2	11	1	3	17 (3.1%)
Total	14	56	217	31	224	543

The age distribution of 923 lower limb amputees was analysed (Table 7) and a different picture was revealed. The commonest age group was 41-60 (32.1%), followed by >60 (28.5%) and then 21-40 (24.6%). Below-knee amputation was the commonest variety among the lower

Table 7. Age distribution of lower limb amputees.

	H/D	A/K	T/K	B/K	SY	Foot	Total
<20	17	36	11	63	2	8	137 (14.8%)
21-40	13	64	20	109	10	11	227 (24.6%)
41-60	7	73	27	182	4	3	296 (32.1%)
>60	3	48	22	181	5	4	263 (28.5%)
Total	40	221	80	535	21	26	923

Table 8. Side of involvement.

	Upper limb	Lower limb	Total
Left	239	554	793
Right	306	549	855
Bilateral	21	42	63
Total	566	1,145	1,711

limb amputee, the incidence ranged from 48% in the 21-40 age group to 69% in the >60 age group.

Among the lower limb amputees, there were about equal numbers of left and right involvements. In the upper limb group, however, the right sided variety exceeded slightly that of left side but the difference was statistically insignificant (Table 8).

Altogether 63 bilateral amputees were registered, 3% of the total population in this study. There was an overwhelming male preponderance (81%) within this group of patients, 67% of whom were lower limb and 32% upper limb amputees. Only 1 patient had one upper and one lower limb amputated simultaneously. The common age groups of the bilateral amputees were "21-40" (35%) and "41-60" (22%).

#### (5) Causes of amputation (Table 9)

Trauma was the commonest cause of amputation (42.4%) for the combined upper limb and lower limb groups. The next common varieties were infection (26.4%), and vascular disease and diabetes mellitus 22.8%. In these 2 latter types, there was an overwhelming predilection for the lower limbs (>95%) while trauma was the leading cause of upper limb amputation (89%). Amputation due to vascular disease and diabetes have been increasing steadily over the last 15 years. In the same period there has been a significant increase in the number of older amputees.

Table 9. Cause of amputation.

Cause	Type		Total (%)
	Upper limb	Lower limb	
Congenital	9 (5%)	12 (2%)	21 (2.83)
Traumatic	169 (89%)	145 (26%)	314 (42.4)
Infective	4 (2%)	191 (35%)	195 (26.4)
Neoplastic	6 (3%)	35 (6%)	41 (5.54)
Vascular and diabetic	1 (1%)	168 (31%)	169 (22.8)
Total	189	551	740 (100)

Note: % of ( ) is to the column.

When the causes of amputation were tabulated against the 4 different age groups, specific correlations were obvious (Table 10), 78% of congenital amputees were found among the <20 age group; 41% (131) of traumatic amputees were found among the 21-40 age group; 47% (89) of infective amputees were found among the 41-60 age group; 34% (14) of neoplasms in the 21-40 age group; and 60% (104) of vascular and diabetic causes in the over 60 age group.

Table 10. Causes of amputation by age group.

Cause	Age group				Total
	<20	21-40	41-60	>60	
Congenital	18	4	1	0	23
Traumatic	82	131	81	26	320
Infective	16	47	89	37	189
Neoplastic	12	14	8	7	41
Vascular and diabetic	3	18	51	104	176
Total	131	214	230	174	749

#### Discussion

The Prosthetic and Orthotic Unit in the Kowloon Rehabilitation Centre, Hong Kong, was the first established and the largest of the local limb fitting centres. This 24 year survey demonstrated the need for the development of prosthetic facilities. The steady rise in numbers of amputees in the successive periods identified was explained by the equivalent population growth (Hong Kong Census and Statistical Department 1976). A sharp increase in the "74-78" period was probably related to rapid growth and industrialization (Hong Kong Commission for Labour Department, 1976). The subsequent decline in the next period "78-83" was related to the diversion of a significant proportion of the amputee population to a new regional prosthetic and orthotic centre which was developed as part of the regionalization programme in the medical services in Hong Kong.

It is envisaged that there will be significant differences between the population structures in different regions. The present study should therefore be extended to other regional prosthetic and orthotic centres in order to get a panoramic view of the real need for prosthetic services. It is only through comprehensive surveys that reliable statistics may be obtained and hence prospective planning on the provision

of facilities and man-power be made meaningful.

The overall ratio of lower limb to upper limb amputees is 1.83 : 1. Among the upper limb amputees, trauma is the single commonest cause (89%) (Table 9). A medico-social study of occupational hand injuries in Hong Kong (Leung and Chan, 1981) indicated that the majority of these injuries were related to occupational hazards. It is therefore not surprising to find in this study that the majority of upper limb amputees are relatively young, 73% of them have ages of below 40, representing the major working force in industry (Table 6). The same reasons might explain the male and right-handed predominance (Table 8).

Among the lower limb amputees, there is a spread of pathological causes and age groups. Infection is the commonest group (35%), followed by vascular disease and diabetes mellitus (31%) and trauma (26%). There is also a relatively even distribution in age groups, 32% for those in the 41-60 group, 28% for the >60 and 25% for those in the 21-40 group (Table 7). In the early 60's, leprosy was not uncommon in Hong Kong. This might account for a relatively high incidence of infection as a cause of amputation among the lower limb amputees. The problem of diabetes and peripheral vascular disease among the Chinese population seems to be less overwhelming than in most Caucasian communities, which commonly report a 60-70% incidence of vascular disease among lower limb amputees. In the same reports, a greater

proportion of lower limb amputees are above 60 years of age (50% to 60%) Kerstein et al, 1975). In the last 5 years in Hong Kong, there has been an observable increase in the number of elderly lower limb amputees, particularly among the females (Table 2). If this pattern continues in the next decade or so, the pattern of amputation among the local Chinese population may resemble more closely that of the Western communities.

Whether this is due to changing life styles of the local population or other reasons may be revealed by further studies. Whatever the cause, the demand for prosthetic service is expected to follow closely the rising incidence of amputation.

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