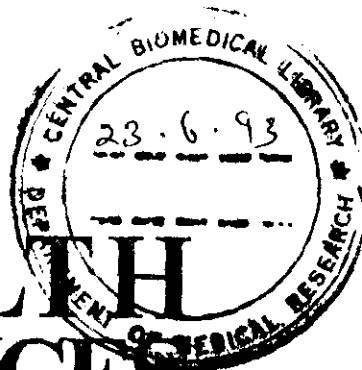


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Nutritional status and rate of growth in children of rural Taikkyi

Thein-Hlaing & Myat-Lay-Kyin

Department of Medical Research

An investigation comprising a cross-sectional component to determine nutritional status and a longitudinal component to determine rate of growth of 2-12 year old children was carried out over a period of 2 years ending in August 1986 in a rural area of Taikkyi township. The boys had higher values than girls for height for age, and weight for age from 2 to 11 years, and for mid-arm circumference from 2 to 10 years, after which the girls had higher values for the above nutritional indicators. Moreover, the girls had more triceps and subscapular skinfold thickness than boys by age. However, younger ages (2 to 4 years) had higher skinfold thickness than older ones (5 to 12 years) among the boys or girls. The malnutrition rate was about 50% by height for age or weight for age, but was only 4.7% by weight for height. The girls had non-significant higher growth rate than boys and the rates for both sexes at 1 year were respectively 5.78 cm and 5.18 cm among the 2-5 year and 6-10 year olds in terms of height, and 2.06 kg and 2.66 kg in weight among the above age groups. The data of the present study could form some basis for future assessment of nutritional status of children in the country.

INTRODUCTION

Malnutrition has been identified as a national priority health problem in Myanmar since 1978, and nutritional status of preschool and school children has been monitored by maternal and child health, and school health personnel (1-3). However, there were only a few proper studies on nutritional status in Myanmar children and most of them were carried out in cities (4,5). A study was thus undertaken in rural Taikkyi on nutritional status and rate of growth among 2-12-year old children, as part of a two-year field intervention trial on the relationship between ascariasis and child nutrition.

MATERIALS AND METHODS

Study area and villages

The study area is located in the west of Taikkyi town, covering an area of 64 square Km and consisting of 21 villages with a total population of about 4700. A more detailed description of the study area including the area map was given elsewhere (6).

Study population and methods

The study population comprised 1206 children aged 2-12 years old for nutritional-status study and 611 of these (from non-intervention villages of

the trial (7) for growth velocity study.

To each child of the study cohort, a cross-sectional survey of anthropometric measurements was undertaken in August 1984. The study parameters included height for age, weight for age, weight for height, upper mid-arm circumference, subscapular and triceps skinfold thickness. All were measured according to the standard methods (8). Height was taken in standing position by Harpenden pocket stadiometer. This, an arm circumference and skinfold thickness were measured to the nearest 0.1 cm, while weight was taken in minimum clothing on Detecto bathroom scale to the nearest 0.5 kg. The measurement procedures for height and weight were repeated every 6 months over a period of 2 years for the rate-of-growth study which formed the longitudinal component of the study. The nutritional status was graded using National Centre for Health Statistics (NCHS) growth charts (9).

Data analysis was done by means of IBM PC AT at the Computer Division of the Department of Medical Research. Computation was made of mean $\pm$ standard error of the mean (S.E.M.) for the various nutritional indicators, prevalence of malnutrition and mean increment in growth $\pm$ standard deviation (S.D.) among the children between the initial and subsequent periods. Student's *t* test was used for testing statistical significance.

RESULTS

Nutritional status

The mean values $\pm$ S.E.M. for both sexes at ages 2 and 12 years old were found respectively to be 80.5 ± 0.5 and 132.2 ± 1.2 cm for height for age; 10.2 ± 0.2 and 26.6 ± 0.7 kg for weight for age; 13.8 ± 0.1 and 17.2 ± 0.4 cm for midarm circumference; 0.69 ± 0.01 and 0.53 ± 0.03 cm for triceps skinfold thickness; and 0.53 ± 0.01 and 0.51 ± 0.02 cm for

subscapular skinfold thickness (Tables 1 & 2).

By sex, while the boys had higher values than girls for height for age, weight for age from 2 to 11 years, and for mid-arm circumference from 2 to 10 years, the girls had higher values for height and weight for age at 12 years, and for the mid-arm circumference at 11 and 12 years (Table 1). In terms of triceps and subscapular skinfold thickness, the girls had higher value at each age (Table 2).

By age, there was an increasing trend of the values for height for age, weight for age and mid-arm circumference (Table 1). However, younger ages (2 to 4 years) had higher skinfold thickness than older ones (5 to 12 years) among the boys or girls (Table 2).

Malnutrition

The malnutrition rates for grades 2 and above were about 50%, when either height-for-age or weight-for-age nutritional indicator was used. However, the rate was only 4.7% when weight-for-height parameter was employed (Table 3).

Rate of growth

Using height-for-age indicator, the rates of growth $\pm$ S.D. for both sexes were 3.57 ± 0.90 , 5.78 ± 1.19 , 8.73 ± 1.37 and 11.57 ± 1.59 cm after 6, 12, 18 and 24 months respectively among the 2-5 year age groups, and the rates were 2.76 ± 0.79 , 5.18 ± 1.01 , 7.15 ± 1.28 and 9.64 cm after the above time periods respectively among the children of 6-10 years old. In both the age-groups, girls had higher rates of growth than boys in each period (Table 4), but the rates were not significantly different.

With reference to weight for age, the rates of growth $\pm$ S.D. for both sexes

Table 1. Nutritional status of children as indicated by height (ht), weight (wt) and mid (upper)-arm circumference (MAC) according to sex and reliable age in the study area in Iaikkyi township, 1984

Age in Years	Male				Female				Both sexes			
	No	Ht (cm) ($\bar{x} \pm \text{SEM}$)	Wt (kg) ($\bar{x} \pm \text{SEM}$)	MAC (cm) ($\bar{x} \pm \text{SEM}$)	No	Ht (cm) ($\bar{x} \pm \text{SEM}$)	Wt (kg) ($\bar{x} \pm \text{SEM}$)	MAC (cm) ($\bar{x} \pm \text{SEM}$)	No	Ht (cm) ($\bar{x} \pm \text{SEM}$)	Wt (kg) ($\bar{x} \pm \text{SEM}$)	MAC (cm) ($\bar{x} \pm \text{SEM}$)
2	40	82.1 $\pm$ 0.7	10.7 $\pm$ 0.2	14.0 $\pm$ 0.2	58	79.3 $\pm$ 0.7	9.9 $\pm$ 0.2	13.7 $\pm$ 0.2	98	80.5 $\pm$ 0.5	10.2 $\pm$ 0.2	13.8 $\pm$ 0.1
3	36	88.5 $\pm$ 0.7	12.4 $\pm$ 0.2	14.5 $\pm$ 0.2	40	86.7 $\pm$ 0.6	11.4 $\pm$ 0.2	14.2 $\pm$ 0.2	76	87.5 $\pm$ 0.4	11.9 $\pm$ 0.2	14.3 $\pm$ 0.1
4	33	93.8 $\pm$ 0.9	13.4 $\pm$ 0.3	14.4 $\pm$ 0.2	36	91.1 $\pm$ 0.8	12.6 $\pm$ 0.2	14.6 $\pm$ 0.2	69	92.4 $\pm$ 0.6	13.0 $\pm$ 0.2	14.5 $\pm$ 0.1
5	41	100.3 $\pm$ 0.9	14.9 $\pm$ 0.3	14.3 $\pm$ 0.2	33	99.6 $\pm$ 0.9	14.6 $\pm$ 0.3	14.7 $\pm$ 0.2	74	100.0 $\pm$ 0.6	14.8 $\pm$ 0.2	14.4 $\pm$ 0.1
6	40	105.4 $\pm$ 0.9	16.3 $\pm$ 0.3	14.8 $\pm$ 0.2	29	105.8 $\pm$ 1.0	16.1 $\pm$ 0.4	14.8 $\pm$ 0.2	69	105.6 $\pm$ 0.7	16.2 $\pm$ 0.2	14.8 $\pm$ 0.1
7	17	111.6 $\pm$ 1.9	18.2 $\pm$ 0.6	14.6 $\pm$ 0.6	21	108.7 $\pm$ 1.3	17.0 $\pm$ 0.5	14.7 $\pm$ 0.3	38	110.0 $\pm$ 1.1	17.5 $\pm$ 0.4	14.7 $\pm$ 0.3
8	35	116.8 $\pm$ 1.2	19.7 $\pm$ 0.4	15.3 $\pm$ 0.2	37	114.0 $\pm$ 1.1	18.4 $\pm$ 0.4	14.9 $\pm$ 0.2	62	115.6 $\pm$ 0.8	19.1 $\pm$ 0.3	15.2 $\pm$ 0.1
9	29	123.2 $\pm$ 1.2	22.1 $\pm$ 0.5	15.7 $\pm$ 0.2	33	121.8 $\pm$ 0.9	21.3 $\pm$ 0.4	15.8 $\pm$ 0.2	62	122.5 $\pm$ 0.7	21.7 $\pm$ 0.3	15.7 $\pm$ 0.1
10	18	126.3 $\pm$ 1.4	23.6 $\pm$ 0.6	16.4 $\pm$ 0.3	28	127.1 $\pm$ 1.1	23.4 $\pm$ 0.6	16.4 $\pm$ 0.2	46	126.8 $\pm$ 0.9	23.5 $\pm$ 0.4	16.4 $\pm$ 0.2
11	16	133.0 $\pm$ 1.5	26.5 $\pm$ 0.7	16.8 $\pm$ 0.2	19	131.6 $\pm$ 1.4	25.5 $\pm$ 0.7	17.2 $\pm$ 0.3	35	122.2 $\pm$ 1.0	26.0 $\pm$ 0.5	17.0 $\pm$ 0.2
12-12.5	7	131.4 $\pm$ 1.4	25.9 $\pm$ 0.5	16.4 $\pm$ 0.5	9	132.9 $\pm$ 1.8	27.2 $\pm$ 1.3	17.8 $\pm$ 0.5	16	132.2 $\pm$ 1.2	26.6 $\pm$ 0.7	17.2 $\pm$ 0.4

Table 2. Nutritional status of children as indicated by skin fold thickness in cm ($\bar{X} \pm \text{SEM}$) according to sex and reliable age in the study area Taikkyi township, 1984

Age in year	Male			Female			Both sexes		
	No	Triceps skinfold	Subscapular skinfold	No	Triceps skinfold	Subscapular skinfold	No	Triceps skinfold	Subscapular skinfold
2	40	0.69 $\pm$ 0.02	0.50 $\pm$ 0.01	58	0.70 $\pm$ 0.02	0.56 $\pm$ 0.01	98	0.69 $\pm$ 0.01	0.53 $\pm$ 0.01
3	36	0.71 $\pm$ 0.02	0.54 $\pm$ 0.02	40	0.74 $\pm$ 0.02	0.55 $\pm$ 0.02	76	0.73 $\pm$ 0.02	0.54 $\pm$ 0.01
4	33	0.65 $\pm$ 0.02	0.48 $\pm$ 0.02	36	0.72 $\pm$ 0.02	0.52 $\pm$ 0.01	69	0.69 $\pm$ 0.02	0.50 $\pm$ 0.01
5	41	0.57 $\pm$ 0.02	0.45 $\pm$ 0.01	33	0.66 $\pm$ 0.03	0.51 $\pm$ 0.02	74	0.61 $\pm$ 0.02	0.47 $\pm$ 0.01
6	40	0.53 $\pm$ 0.01	0.44 $\pm$ 0.01	29	0.58 $\pm$ 0.02	0.48 $\pm$ 0.02	69	0.55 $\pm$ 0.01	0.46 $\pm$ 0.01
7	17	0.52 $\pm$ 0.03	0.45 $\pm$ 0.02	21	0.53 $\pm$ 0.02	0.45 $\pm$ 0.01	38	0.53 $\pm$ 0.02	0.45 $\pm$ 0.01
8	35	0.49 $\pm$ 0.02	0.45 $\pm$ 0.01	27	0.54 $\pm$ 0.02	0.44 $\pm$ 0.01	62	0.51 $\pm$ 0.01	0.45 $\pm$ 0.01
9	29	0.48 $\pm$ 0.02	0.44 $\pm$ 0.01	33	0.58 $\pm$ 0.02	0.50 $\pm$ 0.02	62	0.53 $\pm$ 0.02	0.47 $\pm$ 0.01
10	18	0.46 $\pm$ 0.03	0.44 $\pm$ 0.02	28	0.57 $\pm$ 0.03	0.53 $\pm$ 0.02	46	0.53 $\pm$ 0.02	0.50 $\pm$ 0.01
11	16	0.48 $\pm$ 0.03	0.44 $\pm$ 0.02	19	0.55 $\pm$ 0.04	0.51 $\pm$ 0.03	35	0.52 $\pm$ 0.02	0.48 $\pm$ 0.02
12-12.5	7	0.50 $\pm$ 0.04	0.47 $\pm$ 0.03	9	0.56 $\pm$ 0.04	0.53 $\pm$ 0.03	16	0.53 $\pm$ 0.03	0.51 $\pm$ 0.02

Table 3. Malnutrition rate by grade* among children of 2-12 years old as indicated by nutritional indicators in the study area in Taikkyi township, 1984

Nutritional indicator	No. of children	Grade 0		Grade 1		Grade 2		Grade 3		Grade (2+3)	
		No.	%	No.	%	No.	%	No.	%	No.	%
Height for age	1220	167	13.2	363	29.8	404	33.1	292	23.9	696	57.0
Weight for age	1220	150	12.3	485	39.8	503	41.2	82	6.7	585	48.0
Weight for height	1220	760	63.2	403	33.5	37	3.1	20	1.6	57	4.7

* Grade 0 = Median to median -1SD [Standard deviation]; grade 1 = > 1SD to 2 SD below median; grade 2 = > 2SD to 3SD below median; grade 3 = more than 3SD below the median value of height for age or weight for age for National Centre for Health Statistics reference population (9).

Table 4. Mean net increment in height or weight per child in the study cohort of reliable age group in Iaikkyi, August 1984 to August 1986*

Age in years	Height for age [cm $\pm$ S D]				Weight for age [kg $\pm$ S D]			
	M6 vs M0	M12 vs M0	M18 vs M0	M24 vs M0	M6 vs M0	M12 vs M0	M18 vs M0	M24 vs M0
2 - 5 Boys	3.23 $\pm$ 0.92 [65]**	5.70 $\pm$ 1.62 [58]	8.72 $\pm$ 1.38 [48]	11.50 $\pm$ 1.47 [47]	1.65 $\pm$ 0.90 [65]	2.11 $\pm$ 0.87 [58]	2.50 $\pm$ 0.81 [48]	2.24 $\pm$ 0.72 [47]
Girls	3.48 $\pm$ 0.88 [84]	5.84 $\pm$ 1.14 [76]	8.74 $\pm$ 1.37 [63]	11.62 $\pm$ 1.68 [62]	1.62 $\pm$ 0.87 [84]	2.03 $\pm$ 0.95 [76]	2.33 $\pm$ 0.94 [63]	2.30 $\pm$ 0.79 [62]
6 - 10 Boys	2.77 $\pm$ 0.74 [64]	5.11 $\pm$ 0.96 [61]	6.95 $\pm$ 1.15 [51]	9.42 $\pm$ 1.39 [47]	2.04 $\pm$ 0.94 [64]	2.54 $\pm$ 1.03 [61]	3.25 $\pm$ 1.19 [51]	3.05 $\pm$ 1.24 [47]
Girls	2.76 $\pm$ 0.84 [63]	5.26 $\pm$ 1.07 [58]	7.34 $\pm$ 1.39 [52]	9.85 $\pm$ 1.29 [49]	2.17 $\pm$ 1.06 [63]	2.79 $\pm$ 0.89 [58]	3.41 $\pm$ 1.11 [52]	3.08 $\pm$ 1.10 [49]
2 - 10 Boys	3.00 $\pm$ 0.86 [129]	5.40 $\pm$ 1.15 [119]	7.81 $\pm$ 1.54 [99]	10.46 $\pm$ 1.77 [94]	1.85 $\pm$ 0.94 [129]	2.33 $\pm$ 0.98 [119]	2.88 $\pm$ 1.09 [99]	2.65 $\pm$ 1.09 [94]
Girls	3.17 $\pm$ 0.93 [147]	5.59 $\pm$ 1.14 [134]	8.11 $\pm$ 1.54 [115]	10.84 $\pm$ 1.75 [111]	1.86 $\pm$ 0.99 [147]	2.36 $\pm$ 1.00 [134]	2.82 $\pm$ 1.53 [115]	2.64 $\pm$ 1.07 [111]

* Abbreviations: M0, M6, M12, M18, and M24 indicate at month 0, month 6, month 12, month 18 and month 24 of the study respectively.

**The numbers of children included for analysis are given in parentheses.

were 1.64 ± 0.88 , 2.06 ± 0.91 , 2.40 ± 0.89 and 2.28 ± 0.76 kg after 6, 12, 18 and 24 months respectively among the 2-5 years old children, and the rates for children of 6-10 years after each respective period were 2.11 ± 0.98 , 2.66 ± 0.97 , 3.33 ± 1.15 and 3.07 ± 1.16 kg. By sex and age, while the rates of growth were higher among boys in the former age group in almost successive periods, the rates were higher among girls in the latter age group (Table 4). The differences between boys and girls were not statistically significant.

DISCUSSION

In comparison with the earlier study in 1957-1958 on school children in Aung-San area, Insein township (10), the general growth patterns of children in the present study did not show much significant difference in terms of height for age and weight for age, after a lapse of 27 years that may be noted between a developed and developing countries as mentioned in the Ko Ko's paper. Although the children of 8 years and older in the current study had better growth than those children in 1957-1958, the younger children, aged 5 to 7 years of the past generation even showed favourable growth than those of present group. However, on comparing with the recent surveys, the boys or girls at 5 through 9 years old had height-for-age values more similar to those school boys in peri-urban and urban areas of Yangon studied during 1982 (5) than those school boys from Insein and Thuwuna in 1972 (4). As for weight for age, they either had similar values or were a little more heavier than those school children of same sex within the 5 to 9 year age group in 1982.

In the present study, although boys and girls had similar mid-arm circumference size from 5 to 10 years of age, girls had a little bigger arm size than boys at ages 11 and 12 years. In the case of skinfold thickness, girls almost always

had more thicker skinfold than boys at each age. The rate of growth in height per annum for 2-5 years old children are within the expected value and that for children of 6-10 years are well below the normal standard (11). However, the rate of growth in weight per year seems to lie within the normal range of growth for the two age groups(11).

The almost normal weight for height, the relatively low weight for age and low height for age of the children in the study group indicated that they were normally fed with past history of malnutrition. It is expected that the data of the present study would be useful for future assessment of nutritional status of children in the country.

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✓ Highly selective vagotomy in the treatment of chronic duodenal ulcer

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A presentation of nineteen cases of D.U. treated by HSV is made. Its advantages and long term sequelae are discussed. The initial safety record of this procedure has continued unblemished and it remains the safest operation in treating duodenal ulcer disease. With proper selection of cases, approximately 10-15% of our D.U. cases are treatable by this method.

INTRODUCTION

It is twenty years now that highly selective vagotomy (HSV) was adopted for clinical use by two groups of scientists working independently in U.K. and in Denmark. Johnston and Wilkinson (1,2) used the anatomic landmarks, determined by the nerve of Latarjet, to define their operative procedure of HSV. Amdrup and Jansen (3,4), on the other hand, used a pH probe to determine the boundaries of the parietal cell mass whereby the procedure was called parietal cell vagotomy (PCV).

It is generally assumed that HSV is not suitable for our duodenal ulcer (DU) patients. Reasons behind this assumption being,

1. Late presentation usually in a very chronic stage with history exceeding over 10 years in many cases.
2. Presence of moderate to severe stenosis, as a result of scarring and fibrosis, with resulting dilatation of stomach.

In this study, an attempt is made to select a group of patients where HSV is applicable. HSV has certain advantages over conventional Truncal vagotomy with drainage or over Partial Gastrectomy; it also has fewer gastro intestinal side effects.

PATIENTS AND METHODS

The period of study was one year, starting from 1st July 1989. All patients with suspected DU were taken into consideration. Case selection for HSV depended on history taking, Barium study and gastroduodenoscopy. By means of gastroduodenoscopy, patients with stenosis were totally excluded from the study; at the same time the presence of the ulcer and the chronicity was confirmed.

Having accepted for HSV, Pentagastrin test was done pre-operatively using Peptavlon I.C.I. This test was repeated 1-2 months after surgery to enable to calculate the amount of gastric acid reduction. Due to the shortage of Peptavlon, this test was done pre-operatively and post-operatively in only eleven patients.

Post-operative gastro duodenoscopy was done in all the cases at one month, three months, six months and twelve months. At each endoscopic examination the healing of D.U. was assessed and any evidence of recurrent ulceration also examined.

The operative procedure chosen was that described by Johnston & Goligher (6), anatomical landmarks were used for the distal point of dissection. The antrum-

corpus boundary was taken to be distal to the first branch of the crow's foot. The importance of performing a complete skeletonisation and dissection of distal 5.0-7.5 cm of the oesophagus, as stressed by Golligher & Hallenbeck (6) was also taken into account (Figure 1).

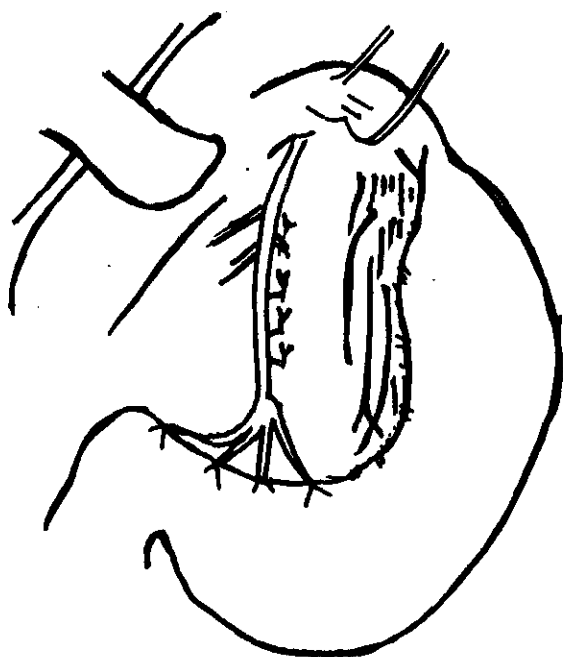


Figure 1. HSV - Skeletonisation of distal 5-7.5 cm of oesophagus (Hallenbeck et al.)

RESULTS

Out of the total number of 235 D.U. patients treated, 19 were chosen for HSV (Table 1). Out of 19, 14 were males and 5 were females. The ages ranged from 18-57 years, the mean age being 34. History of D.U. varied from 1-7 years, with an average of 4.2 years.

Most of the patients selected presented either with bleeding (haematemesis and melaena in 17) or with epigastric pain (acute exacerbation of D.U. in 2). All the patients were operated upon either by the Professor or by Consultant Lecturer.

There was no operative mortality. Post-operatively, recording was made concerning all possible complaints and complications (Table 2).

Table 1. Total D.U. cases treated during one year period

	No. of patients	Percentage
1. Total no. of D.U. patients	235	
2. Total no. of D.U. patients (operated)	117	
3. Truncal vagotomy	77	65%
4. Partial gastrectomy	21	19%
5. Highly selective vagotomy	19	16%

Table 2. Post - op: complaints/complications

Complaints/complications	No.
1. Post prandial distension	2
2. Hiccup	1
3. Dysphagia	14
4. Diarrhoea	Nil
5. Early dumping	Nil
6. Late dumping	Nil
7. Belching	1
8. Recurrent ulceration	1
9. Others	Nil

Dysphagia as noted in fourteen cases, was often temporary and the complaint totally disappeared after 1-2 months. Post prandial distension was noted in two cases, especially after heavy meals. This is believed to be due to minimal stenosis of the duodenum. One patient complained of severe hiccup, but got relieved after 72 hours. Belching is another complaint noted in one patient; however, there was no further complaint after four weeks. No patient ever complained of diarrhoea or dumping. One patient complained of epigastric pain and melaena three months after surgery. She was later found to have developed recurrent ulceration.

Pentagastrin test

Out of eleven cases with pre-operative and post-operative results, reduction in acidity was noted. Basal Acid Output reduction of 54% and Maximum Acid Output reduction of 62% was calculated (Table 3).

Table 3. Pentagastrin test

	Pre-Operative	Post-Operative	Acid Reduction (%)
BAO	8.2 mmol	3.8 mmol	54%
MAO	33.5 mmol	12.5 mmol	62%

Gastroduodenoscopy

In eighteen cases, ulcer healing was noted within 1-2 months after operation; and at the end of the third month healing was more or less complete. One female patient complained of recurrent epigastric pain 3 months post-operatively. This is the only patient where the ulcer appeared to have healed, but developed symptoms of pain later. At the third re-check endoscopy done at the 6th month, an active ulcer was again detected. This is the only patient where we consider HSV to be a failure. She was later subjected to Polya gastrectomy.

Blood and fluid requirements

None of our patients required blood transfusion during operation. Eighteen patients required only 3 bottles of Dextrose water or Dextrose saline drip. Only one patient required 7 bottles of drip infusion.

No antibiotics were given or required in any of the patients. The amount of volume obtained by Ryle's tube suction was minimal and all the patients have naso-gastric tube removed in the evening of operation and allowed to take oral fluids.

DISCUSSION

This study shows that HSV is applicable in our duodenal ulcer patients, and with proper case selection, 16% of total D.U. patients with surgical indications can be treated by HSV. Comparison with other conventional operative procedures such as Polya Gastrectomy and Trunkal Vagotomy with drainage shows definite advantages especially in blood and fluid requirements, hospital stay, sepsis rate, mortality rate and in early removal of Ryle's tube (Table 4).

Table 4. Comparison of results between PG & GJ, TV & GJ, HSV

Sr.No.	PG & GJ	TV & GJ	HSV
1. Blood requirements (unit)	1-2	0-1	Nil
2. fluid requirements (bottles)	10-16	8-10	3
3. Naso gastric tube	48-72hrs	48hrs	6hrs
4. Operating time	90mins	75mins	70mins
5. Post-op: hospital stay (days)	10-12	8-10	7
6. Wound sepsis			
minor	7/21(33%)	5/77(6.4%)	1/19(5.2%)
major	2/21(9%)	7/77(9.0%)	0 (0%)
7. Ulcer recurrence	Nil	5/77(6.4%)	1/19(5.2%)
8. Mortality	1/21(4.5%)	Nil	Nil

Upto now, post-operative complaints and complications are minimal and eighteen of our patients can be rated Visick Grade I or II. The relatively high rate of recurrent ulceration after HSV is currently the main criticism of this procedure. Hershlag & Argov reported a recurrence rate of 5% and some series have reported a long term recurrence rate as high as 15%. The follow up period of our study ranges only from 4-16

months now with one case of recurrent ulceration i.e. (5.2%) and in the long run more cases of recurrent ulceration could be expected.

Most of our patients 17 presented with bleeding. In all these cases conservative treatment was given primarily and endoscopic assessment made after 24-48 hrs. HSV was performed only as an elective procedure. As yet no patient has any recurrent bleeding. Hoffmann *et al.* (7) treated D.U. with haemorrhage by HSV combined with ulcer sewing. Gorey *et al.* (8) reported no rebleeding but 8% recurrent ulcer rate for twenty five patients. Since majority of our cases have had bleeding episodes, continued follow-up not only for ulcer recurrence, but also for rebleeding is essential.

In our study patients with pyloric stenosis were totally excluded. Johnston *et al.* found that a moderate degree of pyloric stenosis can be overcome intra operatively by the use of Hegar's dilators to dilate the pylorus. Hooks *et al.* (9) strongly advocated the use of HSV with either pyloric dilation or concurrent performance of a duodenoplasty (Figure 2). This is especially indicated for relieving post-bulbar duodenal stricture. Thus, there may be a role for HSV with dilatation/duodenoplasty in the treatment of selected cases of obstructing pyloric or duodenal ulcer. This procedure has not been tried in any of our patients and differing opinions in the literature suggest that more data are needed for a final conclusion to be made.

An argument can be made whether some of our patients can be benefited by medical treatment alone. Gear (10) compared HSV to maintenance therapy with 400 mg cimetidine. He reported a 54% recurrence rate for cimetidine group as opposed to 10% recurrence rate in the HSV group. Moreover, medical treatment for our patients is expensive and a full 2 year course of cimetidine

would cost approximately K.10000 and still with a high chance of recurrent ulceration.

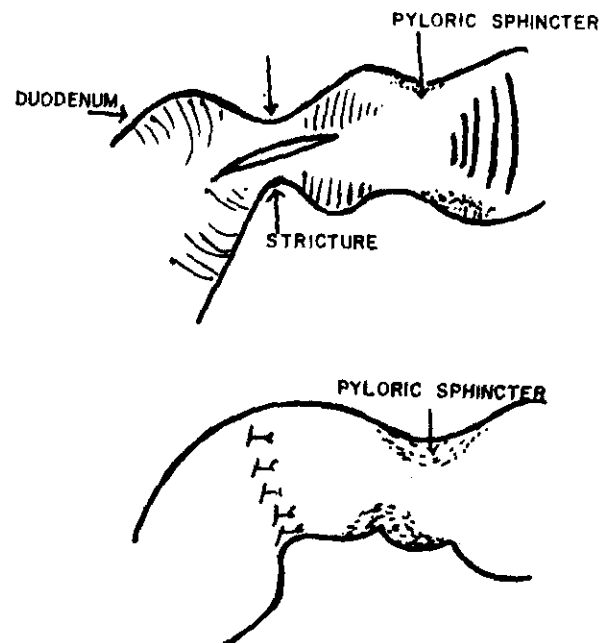


Figure 2. Duodenoplasty (Hooks *et al.*)

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Pharmacognostical and pharmacological study on TAW-KYET-THUN reputed for anthelmintic action

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TAW-KYET-THUN, an indigenous Myanmar medicinal plant whose bulb is being claimed by the country-folks to be effective in purging intestinal roundworms, was identified to be Urginea indica Kunth. Phytochemically, it consists of steroidal and flavonoid glycosides. On the in vitro test model of Ascaris suum the 50% alcoholic bulb extract indicated its anthelmintic efficacy by significantly immobilizing the parasite within 4-6 hours, with respect to both the frequency and the magnitude of motility of the worm; however, an initial stimulatory action on the parasite was observed, a situation which is undesirable. Acute toxicity of the bulb extract tested on mice showed the LD 50s to be 52(41-66) mg/kg when administered intraperitoneally, and 680(555-833) mg/kg, orally.

INTRODUCTION

An annual indigenous herbaceous plant TAW-KYET-THUN, growing naturally in open fields and sandy soil in Tanyin, Pyinmanar, Maymyo and Mandalay, is medicinally reputed among local people in Central Myanmar as an anthelmintic agent when its underground bulb consumed together with jaggery purges worms. A profusion of Myanmar name such as TAW-KYET-THUN and PADAING-KYET-THUN together with discrepancies of botanical classification by Hundley & Chit-Ko-Ko (1) and San-Khin (2). Proper botanical identification is required to be made on these specific plants claimed for its anthelmintic action, to which appropriate anthelmintic investigation needs to be pursued.

MATERIALS AND METHODS

(1) Plant extraction

The underground bulb was collected during the rainy season in the month of

August. Botanical identification was made to both the fresh and dried specimen. They were extracted with 50% alcohol. The alcohol soluble portion was concentrated and dried under vacuum. The 50% alcohol extract was chemically tested for their respective chemical constituents using standard chemical methods.

(2) On the anthelmintic activity using A. suum test model

(a) Collection of A. suum

For the in vitro specific screening, the worms were collected from the pigs intestine at post-mortem at the slaughter house. They were picked up free from mucus and other debris and temporarily perfused in Tyrode's solution media. The worms were washed twice with Tyrode's solution and were kept at 37°C for at least one hour before exposure to the drug. Worms, both male and female found vigorous after this, were selected for testing.

(b) Set-up of the *in vitro* preparation for specific screening

Each selected worm then underwent a "stocking" process and mounted for recording using the method of Goodwin (3) as modified by Thawka-Kyin (4). The cotton thread was then attached on to the Myograph Transducer (A-188, E & M Instrument Company, Inc., Houston, Texas, U.S.A.), which was directly connected to the amplifier of a four channel direct writing ink recorder (Physiograph, E & M). Motility of the worm was recorded at suitable time intervals, on a machine at a speed of 0.1 cm/sec. Measurements on the motility of the worm were then made on both their frequency and the magnitude, both before and after the addition of test substance into the bathing medium. Recordings of 15 minutes session were made at every hour throughout each experiment. The motility frequency of each individual worm was calculated on the value obtained at the 15 minutes recording session of each hour, and then expressed in terms of the percentage of its own "control" pre-drug addition values. Similarly, the motility magnitude of each individual worm was calculated on the value at the 15 minutes recording session of each hour (i.e. the average of contraction height in mm), and then expressed in terms of the percentage of its own control pre-drug addition values.

At least half an hour was allowed for a worm to settle down before adding a drug. Dosages of the 50% alcohol extract of *U. indica* employed was varied from 2-6 mg/ml final bath concentration in modified Tyrode's solution. A continuous recording was taken for two hours after adding the drug. Then the tracings were recorded for 15 minutes period every hour, up to six hours. Thus, drugs were left in contact with the worm for the whole period of observations. Control test was concurrently performed employing only the Tyrode's solution. The results were compiled and analysed statistically.

(3) On the acute toxicity study using LD₅₀ on mice

The acute toxicity test for 50% alcohol extract of *U. indica* bulb was carried out on mice by determining the LD₅₀ according to the method of Litchfield & Wilcoxon (5). Routes of administration employed were either orally or intraperitoneally. A wide range of dosages had been employed in both cases, with a minimum observation for each point of investigation being 10 animals. The results obtained were analysed statistically.

RESULTS

(1) Plant extraction

The crude extract tested revealed the presence of steroidal and flavonoid glycosides which were detected qualitatively.

(2) On the anthelmintic activity test

The effect of the test agent on the test model is shown in Figure 1). Initially there occurred all apparent stimulation of parasite activity resulting in both the increase in frequency and the heightening of the magnitude when compared with that of the control. However, mobility of the worm reduced later on resulting in paralysis with significant immobilization in 4-6 hours for both the frequency ($p < 0.005$) and magnitude ($p < 0.025$), after which the test parasite never recovered ultimately leading to death. There was no test parasite that could outlast 6 hr of the experimental period, and thereby the test agent significantly caused ($p < 0.005$) mortality of the parasite when compared with that of the control. Therefore the test agent possessed the anthelmintic activity by effecting both the morbidity and mortality of the worm, and the effects were also dose related.

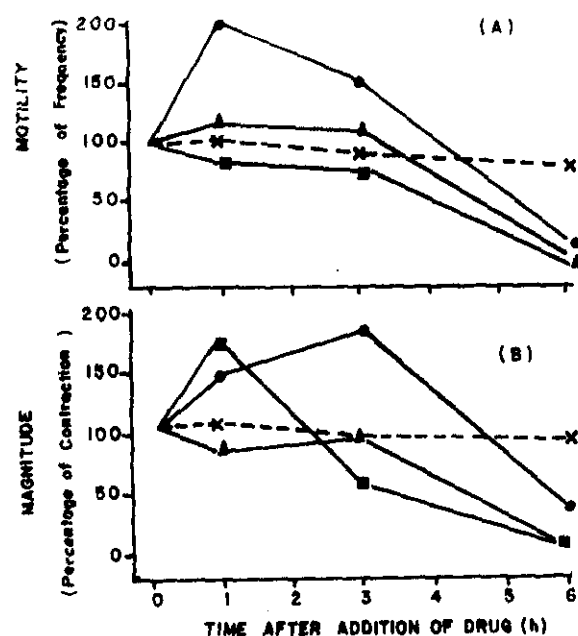


Fig. 1. Time course of the effects of *Urginea indica* (law-kyet-thun) extract on the motility (A) and magnitude (B) of *Ascaris suum*.

The motility of the parasite is expressed in terms of percentage frequency of its own control per 15 min, and the magnitude in terms of percentage height of contraction of its own control per 15 min. Each point represents the mean of at least (2-6) observations. Various concentrations of the drug used are: 2mg/ml (—●—); 4 mg/ml (—▲—); and 6mg/ml (—■—).

(—x—) indicates the average frequency and the magnitude of control tracing.

(3) On the acute toxicity test

The LD₅₀ of the test agent was determined on mice. When the extract was administered intraperitoneally the LD₅₀ was found to be 52 mg/kg, with a range of 41-66 mg/kg. Using the oral route of administration, the LD₅₀ was found to be 680 mg/kg, with a range of 555-833 mg/kg. Even the lesser toxicity with the oral route, that is 0.7 gm/kg was too toxic for

predetermined safety level of 1 gm/kg of crude substance tested. The substance was therefore found to be too toxic if ever applied to clinical trial in its present form.

DISCUSSION

An annual herb, Taw-kyet-thun possessing ovoid underground bulb consisting of intericr fleshy leaves is a night flowering plant. It flowers in the cold season, and the flowers last only one night. The plant is devoid of leaves when in bloom, and the thin leaves with parallel venation appears after the flowering period, that is during the rainy season. These characters agree with the findings of Roxburgh (6), Cooke (7), Collett (8), Haines (9) and Maheshwari (10). The distinctive histological features of the lower surface of the inner fleshy leaves are the raphides of calcium oxalate in the form of acicular bundles and circular stomata as mentioned in Youngken (11), Trease and Evans (12) and Wallis (13). Presence of steroidal glycoside in this plant was also in conformity with the informations gathered from Youngken (11), Wilson and Gisvold (14) and Wallis (13). An additional new chemical substance detected was the flavonoid glycoside, where no mention was being made in any of the literatures cited. From these taxonomic and pharmacognostical characters, this plant was confirmed to be *Urginea indica* Kunth, commonly known as the Indian squill belonging to the family Liliaceae.

Based on the results of the *in vitro* test model where the definite dose will be 6 mg/ml, extrapolation on to human trial could be expected to an equivalent of 60 mg/kg body weight. Therefore the test agent was very potent for its anthelmintic action. A study into its toxicity was performed using acute toxicity test on the justification that anthelmintic agents are intended to be employed usually in a single-dose form. Further, work of administration was mainly done orally and therefore the present study had been done

accordingly. An intraperitoneal route of administration was also investigated. The LD50 orally on mice was found to be 680 mg/kg, and if extrapolated to men a ten fold according to Paget and Barnes (15) reduction had to be allowed thereby resulting in a narrow therapeutic index of approximately 1.3. The intraperitoneal route of study for the LD50 was performed to study for any accidental damage along the gastro-intestinal tract lining which might thus result in a direct way of absorption into the circulation. The latter LD50 obtained was 52 mg/kg. It was by itself very close to the therapeutic dose. Moreover the test agent was liable to cause initial stimulation to the parasite (Figure 2) resulting in increasing activity of the worm as well as strengthening the motor power of the parasite.

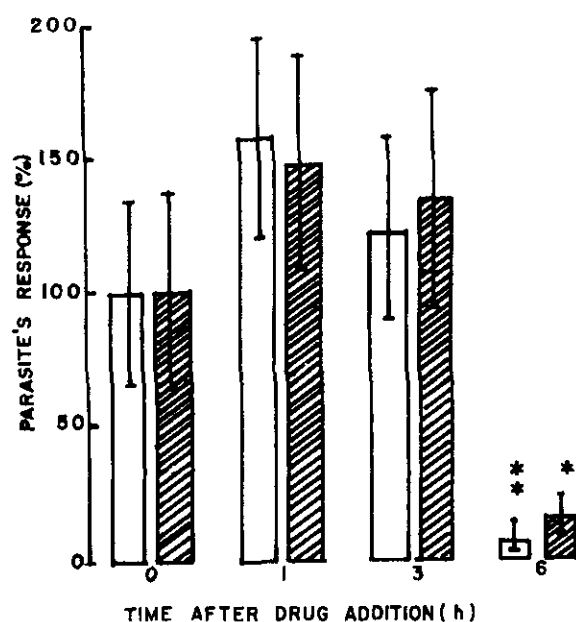


Fig. 2. Effects of *Urginea indica* (law-kyet-thun) parasite's activity on *in vitro* model.

Each column is the mean of 11 observations with vertical bars indicate standard errors of the means, for the frequency (□) and magnitude (▨) of parasite's motility following the treatment of 2-6 mg/ml final bath concentration. Asterisks denote significant level of

difference when compared to control at 0h, being (*) $p < 0.05$ and (**) $p < 0.025$.

Both these unwanted responses lasted for 1-3 hr and therefore it has an inherent risk to cause complications such as intestinal obstruction and perforation to the host. In addition, its narrow therapeutic index is a restraint to its likely therapeutic values.

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Chemical aspects of locally produced oral rehydration honey salts

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Oral rehydration honey salts developed by Department of Traditional Medicine, Ministry of Health, replacing glucose with honey was investigated for its chemical aspects, comparing with standard oral rehydration salts. Three physico-chemical test parameters pH, electrolytes and total reducing sugar contents were tested. pH value of honey salts solution was found to be very similar with standard oral rehydration salts (ORS) solution. There were slight increases in electrolyte concentrations and total reducing sugar contents of honey salts when compared with standard ORS. Results obtained were discussed and recommendations proposed for therapeutic effectiveness of oral rehydration honey mixture preparation.

INTRODUCTION

Diarrhoea is one of the most prevalent diseases occurring in developing countries including Myanmar. World Health Organization (WHO) has recommended the oral rehydration salts (ORS) for the treatment of dehydration due to diarrhoea (1). Department of Traditional Medicine (DTM) developed an oral rehydration honey mixture by replacing glucose usually present in the standard oral rehydration salt preparation with honey. Honey was introduced since it is assumed as a traditional medicine and is also locally available. Therefore to find out whether the honey salts could be used like other standard oral rehydration salts, the present study was undertaken by investigation of the chemical aspects of the honey mixture preparation.

MATERIALS AND METHODS

Materials

A packet of oral rehydration honey salts contained 3.5g of sodium chloride 1.5g of potassium chloride, 2.9g of sodium bicarbonate, 25ml of local honey and 20ml of distilled water. The water used in the preparation of samples was first boiled and then cooled. Distilled water was used in the electrolyte determination for obtaining the calibration curve of the standard solutions of analar salts. The standard oral rehydration salts to be compared with honey salts are the products of UNICEF (NUTRICHEM, West Germany) and Myanmar Pharmaceutical Industry (MPI). Ingredients of each rehydration salts are shown in table 1.

Table 1. Ingredients of each rehydration salts

Ingredients	Rehydration Salts		
	UNICEF	MPI	DTM
Glucose	20.0 g	20.0 g	
Sodium chloride BP	3.5 g	3.5 g	3.5 g
Potassium chloride BP	1.5 g	1.5 g	1.5 g
Sodium bicarbonate BP	2.5 g	2.5 g	2.9 g
Honey			25 ml
Distilled water			20 ml

Method

Each packet of all types of oral rehydration salts was dissolved in one liter of water. Since oral rehydration salt solutions are to be used within 24 hrs, chemical investigations of samples were conducted at 24 hrs after preparation of salt solutions. The packets of honey salts used in this study had been kept for 2 months prior to the chemical investigation.

pH values of the sample solutions were determined by pH meter (model HM 208) using Beckman standard buffer calibrating solutions.

Atomic absorption spectrophotometer (PYE UNICAM SP 9) was used for the electrolyte determinations using reference hollow cathode tubes.

Total reducing sugar contents of the sample solutions were determined according to the AOAC procedure (2).

RESULTS AND DISCUSSION

The results were obtained from the analysis of four samplings, each prepared by dissolving one packet in one liter of water.

Since sodium bicarbonate, although stable in dry air, slowly decomposes in the moist air (3) it is necessary to investigate whether there is any decomposition of sodium bicarbonate in the

presence of honey water. If the decomposition takes place in the honey salts mixture, then the sodium carbonate solution that is formed will be much more alkaline than the bicarbonate solution, and consequently will be dangerous and unsuitable for therapeutic use. Since pH determination is a distinguishing test between aqueous solutions of sodium bicarbonate and normal carbonate, pH of different sample solutions were measured and shown in table 2. Judging by the pH values of the solutions of pure sodium carbonate (10.61) and sodium bicarbonate (8.40), the observed pH of the honey salts solution (8.26) may indicate that little or no decomposition of bicarbonate to carbonate has taken place in the honey salts within two months storage period. Moreover, the fact that no obvious difference observed between the pH value of the honey salts solution (8.26) and those of standard ORS solution (8.22) further supports the stability of bicarbonate in the honey salts.

Table 2. pH values of different sample solutions

Samples	pH values
25 ml of honey in 1 lit of water	5.141 [±] 0.012
Rehydration salts solution (UNICEF)	8.223 [±] 0.006
Rehydration salts solution (MPI)	8.221 [±] 0.007
Rehydration honey salts solution (DTM)	8.260 [±] 0.007
2.5 g of sodium bicarbonate solution	8.400 [±] 0.022
1.58 g of sodium carbonate solution	10.610 [±] 0.032

Table 3 shows the electrolyte concentrations of each rehydration salts. Comparison of the electrolyte concentrations of the solutions of honey salts and standard ORS discloses that

potassium content is relatively higher in the former than in the latter ones. Since equal amounts of KCl (1.5 g) were added originally into each rehydration salt preparations, such a marginal increase in the K^+ content of the honey salts may simply be due to the contribution of K^+ by the honey per se. In fact, notably high amount of K^+ (0.02 g/l) were found to contain in honey as shown by electrolyte determination of a solution of honey in water (25 ml/l). In contrast, the Na^+ content of honey was found as only 0.0006 g/l, an amount that is insignificant to cause any detectable changes by its contribution in the honey salts preparation.

Table 3. Electrolyte concentrations of different sample solutions

Sample	K^+ (g/l)	Na^+ (g/l)
25 ml of honey in 1 lit of water	0.019 ± 0.001	0.0006 ± 0.0004
Rehydration salts solution (UNICEF)	0.793 ± 0.004	1.961 ± 0.006
Rehydration salts solution (MPI)	0.795 ± 0.003	1.906 ± 0.023
Rehydration honey salts solution (DTM)	0.84 ± 0.005	2.015 ± 0.016

However, despite the low Na^+ content of honey, that of honey salts as a whole was still found to be slightly increased when compared with those of standard ORS. This might probably be due to the addition of slightly more sodium bicarbonate in the honey salts mixture (2.9 g) than the amount usually added into the standard rehydration salts (2.5 g).

The total reducing sugar contents of honey and the honey salts were found to be more or less the same (26.5 g/l), indicating that the honey sugars remained unchanged in the preparation for at least up to 2 months or even

longer. However, by comparison with the standard rehydration salts, the total reducing sugar content of the honey salts was still found to be considerably higher (Table 4).

Table 4. Total reducing sugar contents of different sample solutions

Samples	Total Reducing Sugar (g/l)
25 ml of honey in 1 lit of water	26.5 ± 0.342
Rehydration salts solution (UNICEF)	20.5 ± 0.34
Rehydration salts solution (MPI)	20.5 ± 0.34
Rehydration honey salts solution (DTM)	26.5 ± 0.0342

From this study it may be concluded that the contents of electrolytes (K^+ & Na^+) and the reducing sugars of the honey salts formulation are slightly higher than the corresponding contents usually present in standard ORS. Since no ingredients other than honey possibly account for such small increase in the present formulation, it may be suggested that by reducing the volume of honey from 25 ml to about 20 ml, and using proportions of salts ($NaCl$, $NaHCO_3$ and KCl) as normally found in the standard ORS would correct the surplus of electrolytes and reducing sugars in the honey salt preparation and balance its contents with those of standard ORS preparations.

We would also recommend exclusion of 20 ml of distilled water from this honey salts formulation as no additional chemical advantage is evident by the presence of water. Hence reformulation of the honey salts as suggested herein, would make possibly the replacement of glucose with honey without necessarily altering the essential electrolyte composition nor losing its

therapeutic effectiveness.

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Time usage and energy expenditure of volleyball players during training

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Fifteen male Myanmar national volleyball players, selected for 11th Asian Games, 1990, were studied during training. This is the first assessment of energy expenditure on Myanmar volleyball players. The average daily training period of the players was 4.23 h. They utilized 1508.8 kcal for training activities out of the 24 h energy expenditure of 3088.6 kcal. The mean $\pm$ SD energy intake was 3965.3 ± 469.4 kcal per day and was found to be sufficient for twenty four-h energy expenditure. The individual training activities belonged to heavy type of activities but the daily training period was short compared to those of other countries.

INTRODUCTION

That the athletes need adequate nourishment during training is well accepted. The amount of energy required could only be assessed by determination of their energy expenditure. The energy expenditure studies had been carried out on Myanmar athletes engaged in other events such as track and field and football (1,2), but not on volleyball players. Moreover, if the energy cost of the individual training activities were known, it would be useful for future studies. Hence, this study was conducted with the aim to measure the energy cost of individual activities and to determine the daily energy intake and expenditure of Myanmar national volleyball players.

MATERIALS AND METHODS

Fifteen male volleyball players, selected for 11th Asian Games, 1990, were studied during their camp training from June to August 1990.

Twenty four-h energy expenditure was measured by the time-activity record method (3). One observer was assigned to record the activities of two subjects at a time from 07:00 h till 18:00 h. The subjects recorded their own activity diaries from 18:00 h to 07:00 h on the next day. Twenty four-h activity diary was recorded for three consecutive days including Sunday because it was the only rest day of the week in their training schedule. Energy cost of the activity was determined by indirect calorimetry method based on the determination of oxygen consumed per minute for performing that activity. Daily energy expenditure was then calculated from activity diary and energy cost of activity as follows:

Daily energy expenditure = time spent in each activity (min) $\times$ energy cost of each activity (kcal/min)

The dietary intake was measured by weightment method on the same day as

for the measurement of energy expenditure. All raw foods, cooked and prepared dishes for the players, food served to the players, plate left over were weighed and individual food intake was calculated. The energy and nutrient intake of the subject was then calculated by food composition table for use in Asia and the Far-East (4).

Body weight was recorded daily in the morning before having breakfast. Skinfold thickness from biceps, triceps, subscapular and suprailiac were recorded twice throughout their camp training, one at the beginning and the other at the end. Total fat percentage was calculated from skinfold thickness by using the method of Durnin and Rahaman (1967) (5).

RESULTS

The mean $\pm$ SD twenty four-h energy intake and expenditure were shown in Table 1. The players trained two sessions per day from 07:00 h to 09:00 h in the morning and from 14:00 h to 17:00 h in the afternoon. Lunch and dinner were taken at 10:30 and 17:30 h respectively. They went to sleep at about 22:00 h and woke up at 06:30 h.

Table 1. Mean $\pm$ SD age, height, energy intake and expenditure of the volleyball players.

Age (y)	24.0 $\pm$ 2.0
Height (cm)	181.9 $\pm$ 4.9
Energy intake (kcal)	3695.3 $\pm$ 469.4
Energy expenditure (kcal)	3088.6 $\pm$ 223.1

The players were not allowed to go outside the camp during leisure time except to the nearby teashop. These leisure hours were spent reading in bed, talking to each other, watching television and taking a nap. The time used for training totalled to 4.23 h only, but the energy consumed for training amounted to almost half the total

twenty four-h energy expenditure of 3088.6 kcal.

Figure 1 illustrated the energy cost of different activities of volleyball players. The changes in body weight and body composition during three months training period were shown in Table 2.

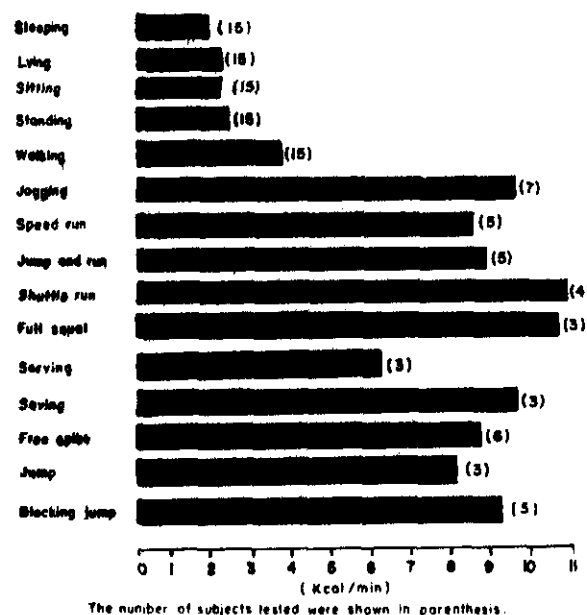


Figure 1. The energy costs of individual activities performed by volleyball players.

Table 2. Changes in body weight and composition of volleyball players during 3 m training period

	Test 1	Test 2	Difference
Body weight (Kg)	67.04 $\pm$ 3.06	68.29 $\pm$ 2.81	+1.25*
Skinfold (mm)			
Biceps	3.40 $\pm$ 0.31	3.50 $\pm$ 0.44	+0.10
Triceps	5.48 $\pm$ 1.11	5.25 $\pm$ 0.84	-0.23
Subscapular	8.42 $\pm$ 0.81	8.45 $\pm$ 0.84	+0.03
Suprailiac	4.93 $\pm$ 0.59	5.08 $\pm$ 0.85	+0.15
Sum of 4 skinfolds	22.23 $\pm$ 2.4	22.28 $\pm$ 2.29	+0.05
Fat percentage	9.8 $\pm$ 1.11	10.07 $\pm$ 1.19	+0.27
Lean body mass (Kg)	60.46 $\pm$ 2.61	61.47 $\pm$ 2.48	+0.95*

* denotes significant difference between test 1 and test 2 at $p < 0.01$ level.

DISCUSSION

Three days energy expenditure and intake data showed a surplus of about 100 kcal/day energy intake over energy expenditure. The gain in body weight and lean body mass indirectly supported the fact that the subjects might be in positive energy balance. However, a 24-h activity diary of at least seven days is needed to determine the true balance between energy intake and expenditure. On the other hand, the fact that the subjects were inactive for most of their leisure hours, might indicate that their energy intake was just sufficient for their training.

The twenty four-h energy expenditure of 3088.6 kcal found in the present study amounted to moderately active category according to FAO/WHO classification (1973) (6). This may be due to the relatively short duration of daily training sessions. In other countries, such as Japan, the athletes preparing for Olympic Games were trained eight-h a day (7) (vs to 4.23 h per day in the present study).

Our data on energy cost of standard activities such as sleeping, lying, sitting, standing and walking were in accordance with that of Durnin and Passmore (1967) (8). In the present training schedule the training activities could be roughly divided into two categories; those that aimed to maintain the physical capacities and others for technical improvement. The training activities for maintaining physical capacities consisted of jogging, speed run, jump and run, shuttle run (running back and forth between two points several times) and full squat (where three balls were placed in a triangular position about ten feet apart from each other and the player had to run and sit on one ball to another for ten times). The training activities used for improvement of technique consisted of serving the ball, saving the ball, free spike, free jump and blocking

jump (jumping close to the net with hands stretching up as in blocking the ball).

In general, the activities under the physical training were heavier in terms of kcal/min than those for technical training. All the training activities, except serving, belonged to heavy type of activity (i.e. 7.5 kcal/min and above) according to Durnin and Passmore (1967) (8) classification.

In conclusion, the duration of daily training sessions should be prolonged to an International level of 8-h a day. More research works are needed to identify the optimal duration and intensity of training for athletes.

ACKNOWLEDGEMENTS

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Urinary mercury excretion in Myanmar workers occupationally exposed to metallic mercury vapour

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Urinary excretion of mercury was determined in 32 workers of Chemical Plant of No. (1) Pulp and Paper Mill in Sittaung. For comparison, it was also measured in 10 Clerical Staff (nonexposed) of the said factory and 10 Technician Grade I students of Health Department. Signs and symptoms of chronic metallic mercury poisoning were looked for in all subjects. The air concentration of mercury vapour at different times of the working hours in the Chlorine Plant was measured. The Mean $\pm$ SD urinary mercury excretion was significantly higher in exposed workers 59.22 ± 22.44 $\mu\text{g}/\text{L}$) than non exposed workers of the factory (29.3 ± 8.64) ($p < 0.001$). Comparison of the mean $\pm$ SD urinary mercury levels of the nonexposed workers of the factory and technician students (19.4 ± 8.59) indicated that the former had significantly higher mercury excretion ($p < 0.001$). There was an increasing trend of mercury excretion with increased duration of exposure ($r = 0.54$; $p < 0.05$). Signs and symptoms of chronic mercury poisoning were not found in any subject. The concentration of mercury vapour in Chlorine Plant during the working hours was found to 0.1 to 0.25 mg/m^3 of air (2 to 5 times TLV).

INTRODUCTION

Since time immemorial man has known about the industrial mercury poisoning (1) and yet no proper investigation has been done on Myanmar workers who are occupationally exposed to mercury. Mercury and mercurial compounds are used in many industries and manufacture processes and may, if improperly used or if hygienic conditions are not adequate, give rise to toxic symptoms (2). The most important uses of metallic mercury and inorganic compounds include the treatment of gold and silver ores; the manufacture of dental amalgams, incandescent electric bulbs, mercury vapour tubes etc., as a catalyst for the production of chlorine and alkalines,

gold, silver and bronze plating etc (3). The aim of the present study was to investigate whether Myanmar workers, working at the chlorine plant of No. (1) Pulp and Paper Mill were exposed to excessive mercury vapour or not and to assess their health status for early detection of chronic metallic mercury poisoning.

MATERIALS AND METHODS

Plant layout

There are 24 different sections in the Mill including Chemical Plant. Chemical pulps are bleached with chlorine dioxide which is produced by the electrolysis of sodium chloride where

mercury cell is used for the electrolysis process. Chlorine production section of the Chemical Plant consists of one big room with a small anteroom at one corner which is well ventilated. The administrative section is about 2 furlongs away from the Chemical Plant.

A cross-sectional study was carried out on the workers of the No. (1) Pulp and Paper Mill from 11.12.89 to 17.12.89 and Technician Grade I students of Health Department on 1.1.90.

Subjects, chosen by the simple random sampling method, were allocated into following five groups

1. Currently exposed workers (Group 1): those who were working at the Chlorine Plant at the time of the survey.
2. Intermittently exposed workers (Group 2): maintenance workers who had to work at the Chlorine Plant only when they had to repair or to tend the disfunctioning parts.
3. Ex-exposed workers (Group 3): workers who had previously worked at the Chlorine Plant but at the time of survey, they had been shifted to other department at least 6 months ago.
4. Non exposed workers of the factory: clerical staff of the mill who had never worked at the Chlorine Plant.
5. Technician grade I students from Health Department: who had no known history of exposure to mercury.

Symptoms of metallic mercury poisoning, occupational history, and other relevant past medical and surgical histories were taken. Thorough clinical examination was also done for signs of chronic mercury poisoning. End of workshift urine samples were collected into the mercury free plastic containers, that did not absorb mercury. Urine mercury analysis was done according to the method described by Sidney Kaye (1968) (5). Standards included in each batch of

analysis were used for calibration. The concentration of urinary mercury were adjusted to a mean specific gravity of 1020. Mercury vapour concentration in the Chlorine Plant was measured at four different periods of workshift (at the start, just after the start, in the middle and just before the end of shift) using the Drager's Tubes.

Data analysis

Student's "t" test was employed for the comparison of the mean urinary excretion of the exposed and nonexposed workers of the factory and between the non exposed workers of the factory and technician grade I students. For the comparison of urinary mercury concentration among the exposed workers of different exposure categories, analysis of variance was used. Correlation between the urinary mercury excretion level and work duration of the currently exposed group was determined by using the Least Square Method. Statistical significance was accepted at the 5% level for each of the tests ($p < 0.05$).

RESULTS

Table (1) shows the mean urinary concentration of exposed and nonexposed workers of the factory and technician students. Mercury excretion of exposed workers was found to be significantly higher than the nonexposed workers of the factory ($t = 6.21$; $p < 0.001$). It was also found that those of the nonexposed workers of the factory was significantly higher than those of the technicians ($t = 6.05$; $p < 0.001$). In table (2), comparison of the urinary mercury excretion among the exposed workers of three different categories; currently exposed, intermittently exposed and ex-exposed is shown. From the analysis of variance it was found that mercury excretion of currently exposed

Table 1. Urinary mercury excretion of workers of No. (1) Pulp and Paper Mill and technician students

Category of Subjects	No. of Subjects	Mean $\pm$ SD ($\mu\text{gm/L}$)
Exposed workers	32	59.22 $\pm$ 22.43
Nonexposed workers	10	29.30 $\pm$ 8.64*
Technician students	10	19.40 $\pm$ 8.59**

* $p < 0.001$ (Exposed vs nonexposed workers)

** $p < 0.001$ (Nonexposed workers vs technicians)

Table 2. Means and levels of urinary mercury excretion of exposed workers of different exposure categories

Category of exposure	Mean $\pm$ SD ($\mu\text{gm/L}$)	Level			
		30 $\mu\text{gm/L}$		30-300 $\mu\text{gm/L}$	
		n	%	n	%
Currently exposed (n=21)	69.29 $\pm$ 20.96	0	-	21	100
Intermittently exposed (n=5)	39.20 $\pm$ 4.38	0	-	5	100
Ex-exposed (n=6)	40.67 $\pm$ 10.42	1	16.67	5	83.33

$P < 0.001$

group had significantly different level than the other groups ($F = 43.86$, $p < 0.001$). Those of the intermittently and ex-exposed groups were almost the same. All the workers of currently and intermittently exposed groups had urinary mercury excretion of more than 30 $\mu\text{gm/L}$. Only one subject from the ex-exposed group had urinary mercury excretion of less than 30 $\mu\text{gm/L}$. Not a single subject excreted mercury in the urine of more than 300 $\mu\text{gm/L}$.

Correlation between the urinary mercury excretion level and work duration (range

1-19 years; mean 9.95 ± 3.23) of the currently exposed is shown in figure (1). There is a significant trend towards increasing urinary mercury level with increase in work duration was found ($r = 0.54$; $p < 0.05$). Levels of mercury vapour concentration in the Chlorine Plant are given in table (3). Mercury vapour level measured at the start of workshift was zero, just after the shift was 0.1 mgm/m^3 of air volume, in the middle of and just before the end of the shift was 0.25 mgm/m^3 .

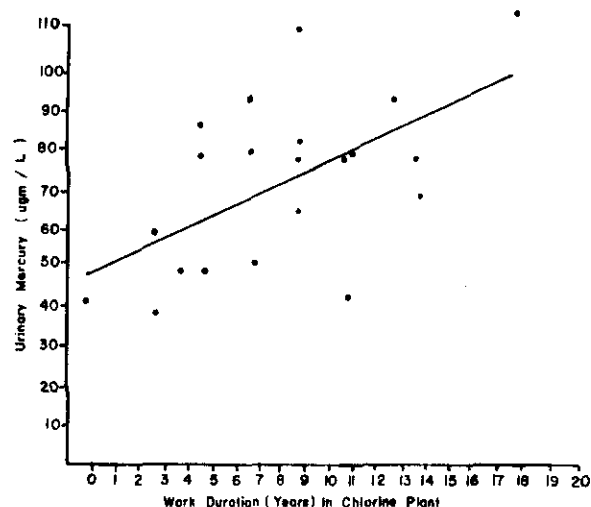


Fig. 1. Regression line drawn on scatter diagram relating work duration (years) in Chlorine Plant and urinary mercury concentration ($\mu\text{gm/L}$). ($Y = 45.69 + 2.55 X$; $r = 0.54$; $n = 21$; $p < 0.05$)

Table 3. Mercury vapour concentration in the air at Chlorine Plant

Time of Measurement	Mercury vapour concentration (mgm/m^3)
At the start of the shift	0
Just after the start of the shift	0.1
At the middle of the shift	0.25
Just before the end of shift	0.25

DISCUSSION

Excretion of mercury in the urine is believed to be a good index of exposure to and absorption of metallic mercury. It probably reflects the care and precautions taken during its use (4). There is some dispute about the upper limit of urinary mercury excretion in nonoccupationally exposed workers, but a reasonable figure would seem to be 20-25 $\mu\text{g}/\text{L}$ as suggested by Goldwater (4). Battistone et al (7) found that the urinary mercury excretion in nonoccupationally exposed worker did not exceed 17 $\mu\text{g}/\text{L}$ and Steward et al (8) found a median value of 14 $\mu\text{g}/\text{L}$. Taking an upper limit of normal 30 $\mu\text{g}/\text{L}$ it is clear that all the exposed workers except one from the ex-exposed group had increased mercury excretion reflecting the exposure to excessive mercury vapour. Finding of significantly higher urinary mercury excretion in exposed workers than the nonexposed workers and higher than threshold limit values (average 3 times) of mercury vapour concentration in the workroom air indicated that these workers are facing the problem of excessive exposure to mercury vapour. Nevertheless, no worker showed clinical evidence of mercury poisoning, and the urinary mercury excretion levels of all were still below the level at which clinical manifestations of mercurialism become likely. Noe (9) suggested a danger level of 300 $\mu\text{g}/\text{L}$; West and Lim (10) found that, out of 35 cinnabar miners with urinary mercury concentration in excess of 300 $\mu\text{g}/\text{L}$, 23 had symptoms of mercury poisoning. According to WHO criteria (11), clinical evidence of mercury poisoning is unlikely to occur when the urine mercury concentration is below 300 $\mu\text{g}/\text{L}$. All exposed workers in the present study were safely below this level, with maximum level of only 110 $\mu\text{g}/\text{L}$. Although the workers were working in Chlorine Plant where mercury vapour concentration reached 5 times more than TLV at some times, not a single worker had urinary mercury concentration of $\geq$ 300 $\mu\text{g}/\text{L}$

and suffered from chronic mercury poisoning. The possible explanation may be that the measured concentrations of mercury vapour were just the spot measurements and thus the time weighted average during the working hours could not be known. TLV TWA is a guide in the control of health hazards and may be considered as a demarcation between safe and dangerous concentrations. It can be obtained by taking measurements on airborne concentrations of it at different time intervals for full shift. It is the time weighted average concentration for a normal 8 hourwork a day and a 40 hour workweek, to which nearly all workers may be considered repeatedly exposed, day after day, without adverse effect (12). Another point is that although the workers were working at the Chlorine Plant, the working system was provided in such a way that they need not to work there full 8 hours straight a day, but could stay in an anteroom at the worksite during most of the working hours.

Workers who were intermittently exposed to mercury had only slightly higher mean urinary mercury concentration than upper limit of normal, which is significantly lower than those of currently exposed workers because they had to work at the Chlorine Plant only when they had to repair or to tend the disfunctioning parts. Thus their exposure to mercury vapour was well below the currently exposed workers.

Workers who had previously exposed to mercury vapour, but at the time of survey, were working at the other sections were found to have significantly lower urinary mercury excretion than currently exposed workers. This indicates that change of job area would reduce the body burden of mercury and thus workers with high mercury excretion should be recommended to change the job so as to avoid from harmful effects of pro-

longed effects of mercury vapour. It is also a necessity that regular monitoring of urinary mercury excretion of the exposed workers should be done 2 monthly in accordance with the half life of mercury 6 weeks, for the early detection of occupational hazard. Because mercury is spontaneously excreted by the kidney, workers can be sent back to Chlorine Plant when their urinary mercury levels came down below the upper limit of normal again. Clerical staff (nonexposed) of the said factory had mean value of urinary mercury excretion below the upper limit of normal but yet it was significantly higher than those of technician students, probably because mercury vapour from the Chlorine Plant might disperse to surrounding areas and thus they might also be working in the site where mercury vapour in the workroom air was higher than normal condition. Unfortunately, we had not measured mercury vapour concentration in their workroom. There is also a possibility that industrial wastes from the mill might dispose to the Sittaung river and thus water might get polluted and they would be having mercury from food chain or they might be having mercury other than industrial source like indigenous medicines containing mercury.

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The effect of antimalarials on the development of Plasmodium falciparum trophozoites

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The effect of different antimalarials (Artemether, Quinine, Chloroquine, Amodiaquine and Sulphadoxine/Pyrimethamine) on the in vivo development of asexual parasites during the treatment of falciparum malaria was studied on 29 patients. Maturation of trophozoites from tiny to large ring forms were noted on blood films taken every 6 hourly. The shortest clearance time of tiny forms and fastest parasite clearance rate was detected in the artemether treated group than other antimalarials. The parasite clearance time also does not depend on the disappearance time of tiny ring forms, though it does on small and large forms. The drug resistant cases showed longer duration of clearance time of small and large forms in both the sulphadoxine/pyrimethamine and artemether treated groups. The possible early interpretation of resistant cases and application of the method for the documentation of the action of the antimalarial was discussed.

INTRODUCTION

The antimalarials have their specific actions on different stages of parasites. Since, asexual parasitic stages of the parasites are the main forms which cause the pathological processes in man, it would be much beneficial to know the effect of drugs on which specific stage of asexual or ring forms (trophozoite) the particular drug is acting. Preliminary work has already been carried out by Jing-Bo-Jiang et al. (1), with Mefloquine and Qinghaosu.

This study was undertaken to scrutinize the effect of five different antimalarials on the in vivo development of asexual parasite In the treatment of falciparum malaria.

PATIENTS AND METHODS

The study was conducted in Tharyarwady Civil Hospital, Bago Division, Myanmar (80 miles north of Yangon). Malaria inpatients of both sexes above 12 years of age with a positive Plasmodium falciparum blood film with more than 5000/cu mm of parasites who had not taken any anti-malarials prior 14 days, having no other associated serious diseases were included in the trial. The history of antimalarial treatment was checked by the presence of chloroquine, quinine and sulphonamides in the urine by using WHO standard methods.

All patients were kept in the hospital for 7 days and were follow-up weekly up to day 28. Thick and thin blood smears

were taken from the finger tips every 6 hourly from day 0 until 4 consecutive smears were negative. The time at which the first negative smear was taken as the parasite clearance time.

Out of 29 patients tested in this study, group 1 and 2 had 7 subjects each and the rest of the groups had 5 subjects each. They were randomly allocated to 5 therapeutic regimens.

- Group (1): Intramuscular injection of Artemether 200 mg on day 0 and 100 mg 12 hourly for another 4 doses, the total dosage being 600 mg.
- Group (2): Oral quinine sulphate 10 mg/kg every 8 hourly for 7 days.
- Group (3): Sulphadoxine 1500 mg and pyrimethamine 75 mg (3 tablets of Fansidar) was given orally as a single dose.
- Group (4): Chloroquine phosphate 10 mg/kg was given on day 0 and day 1 and 5 mg/kg on day 2 to make a total of 25 mg/kg.
- Group (5): Amodiaquine 10 mg/kg was given on day 0 and day 1 and 5 mg/kg on day 2 to make a total of 25 mg/kg.

Maturation of the tiny trophozoites through the small ring forms to large ring forms were counted in thick film. Differentiation of the stages of ring forms as tiny, small and large was done according to Jing-Bo-Jiang *et al.* (1). The assessment of response to treatment was based on (a) asexual parasite clearance time and (b) percentage of different stages of asexual ring forms at various time interval after treatment.

RESULTS AND DISCUSSION

Out of five different antimalarials tested artemether cleared the parasite within 36 hours after drug administra-

tion whereas chloroquine took up to 156 hours. The parasite clearance time of other three drugs were found to be intermediate between artemether and chloroquine.

The initial mean percentage parasitaemia level of the different forms of the asexual stages are similar in all the groups with the tiny forms below 16%, the small forms 65-82% and the large forms 5-27%. The clearance time of tiny forms in Artemether treated group was the shortest, being 6 hour, quinine treated group took the longest clearance time of 66 hours and the other drugs took 12-18 hours only (Figure 1). In all the groups the initial parasitaemia level of small forms was invariably high (range 65.8% to 82.88%), though the large forms varied from 5.62 to 27.4%.

In Artemether group, the quicker rate of parasite clearance and greater inhibition of parasite development was detected. Abrupt fall in number of small and large forms of parasites was seen. These were disappeared at 42 hours after commencement of treatment. Similar pattern of clearance of small and large forms was noted in quinine treated group but at a slower pace, showing that the effect on the inhibition of parasite development was not as great as Artemether. However, sulphadoxine-pyrimethamine did not have any effect on small and large forms up to 36 hours though abrupt disappearance of these forms were seen at 42 hours. Probably the drug has no effect on the developmental stages of ring forms at early hours of treatment.

The longest duration of parasite clearance time 132-156 hours seen in amodiaquine and chloroquine treated group, which might be due to the presence of resistant (R_1) cases among them. The quickest parasite clearance and greatest inhibition of parasite development of the effect of artemether had already been noted by others (Jing-Bo-Jiang *et al.*, (1) and Li *et al.*, (2). All the drugs showed definite action on tiny forms

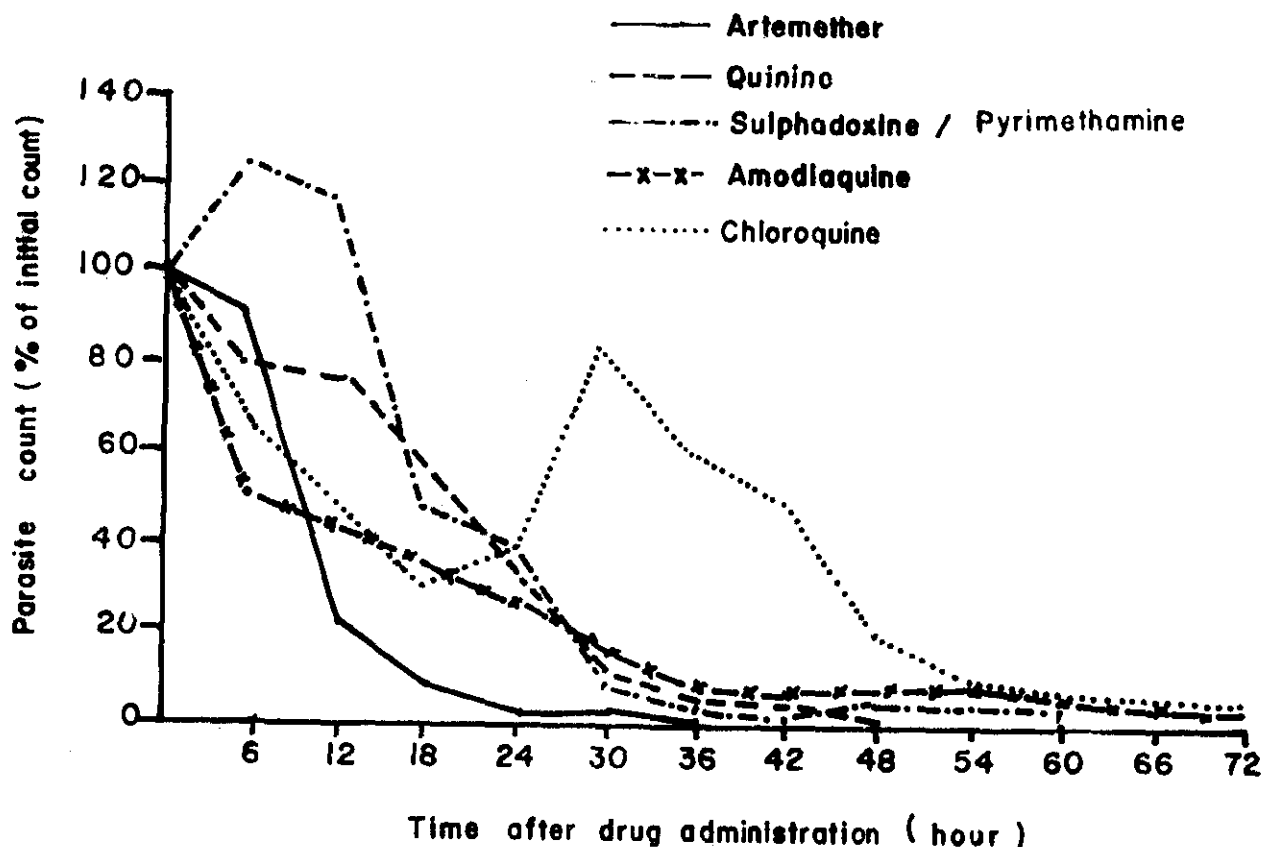


Figure 1. The effect of the drugs on the rate of the parasite clearance.

regardless of the drugs being schizonticide or antimetabolites (Table 1).

The parasite clearance time does not seem to depend on the disappearance time of the tiny ring form. This could clearly be seen in the chloroquine and quinine treated groups where parasite clearance time were 156 hours and 90 hours though the tiny ring form clearance time were 12 hours and 66 hours respectively.

The clearance times of small and large ring forms show no significant difference in all the drug treated cases. The parasite clearance time was found to depend entirely on the disappearance of small and large forms. Quinine and artemether have definite action on the

ring forms, which was shown by their inhibitory action on the developmental stages of asexual parasites. Chloroquine and amodiaquine also have similar action on tiny ring forms but have a slower action on small and large ring forms. After 90 hours of treatment, the drugs do not seem to have any suppressive effect on small and large forms which might be due to the resistant parasites or insufficient serum level of drugs after 90 hours.

Sulphadoxine/pyrimethamine has a different mode of action. Though the drug action was noted on the tiny rings, it had no effect on small rings and the large forms up to 18 hours.

This study may be useful as an adjunct

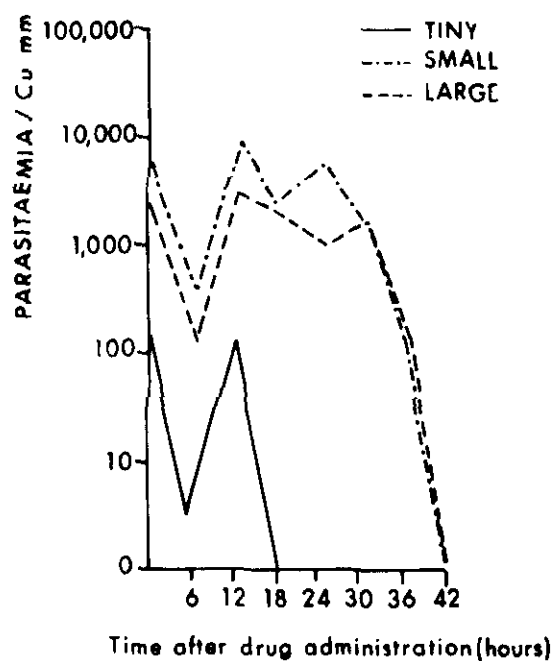


Fig: 2(a). Sulfadoxine - Pyrimethamine
(Resistant cases) N = 2

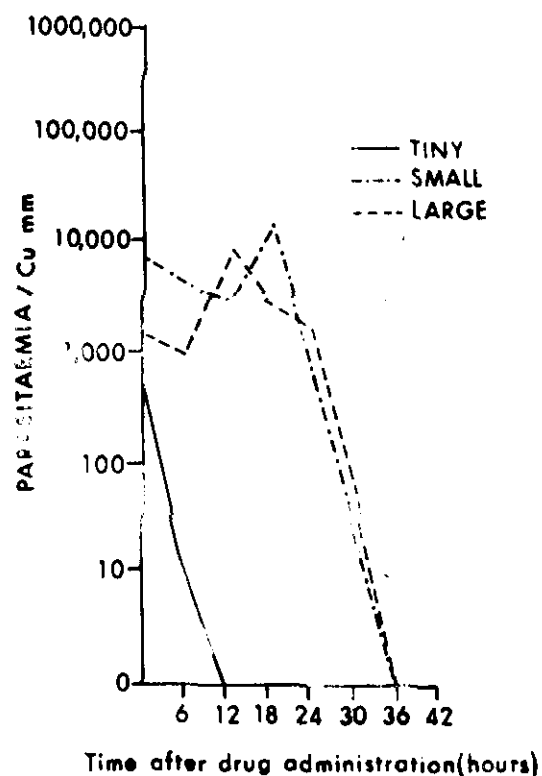


Fig: 2(b). Sulfadoxine - Pyrimethamine
(Sensitive cases) N = 3

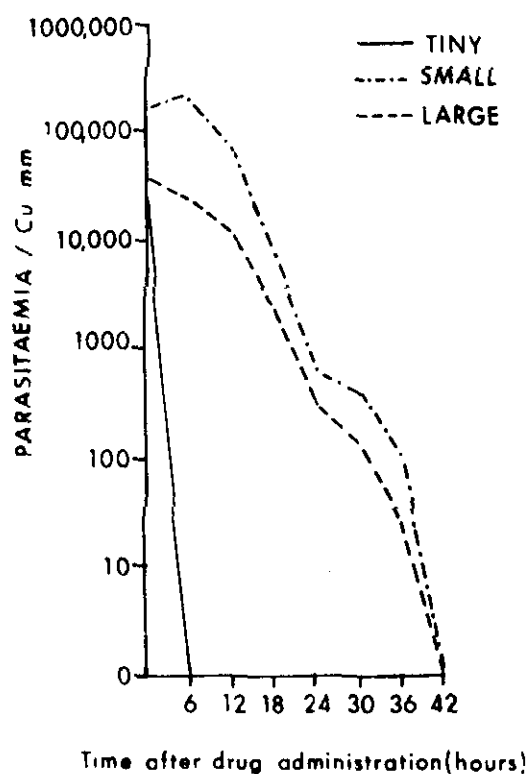


Fig: 3(a). Artemether (Resistant cases) N = 5

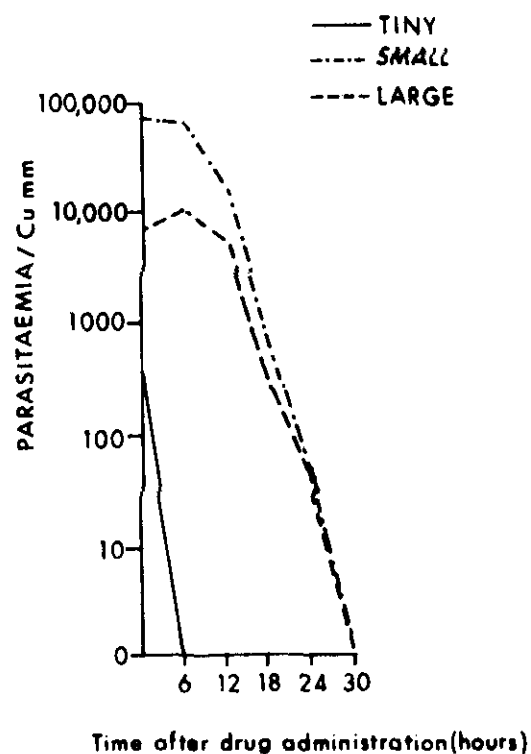


Fig: 3(b). Artemether (Sensitive cases) N = 4

Table 1. Percentage distribution of different stages of parasites after drug treatment

Time since drug(h)	QUININE			ARTEMETHER			AMODIAQUINE			CHLOROQUINE			SULPHADOXINE/ PYRIMETHAMINE		
	Tiny	Small	Large	Tiny	Small	Large	Tiny	Small	Large	Tiny	Small	Large	Tiny	Small	Large
0	15.63	78.75	5.62	8.75	82.88	8.8	6.8	65.8	27.4	5.6	79.2	15.2	7.6	73.8	18.6
6	8.75	70.0	21.25		87.63	13.6	1.6	78.2	20.2	0.8	76.6	24.6	8.4	65.6	26.0
12	6.88	59.5	33.62		81.38	18.6	1.2	74.2	24.6		72.2	27.8	0.6	45.8	53.6
18	0.88	59.75	39.37		74.3	25.8		71.8	28.2		71.0	29.0		39.0	61.0
24	1.38	62.5	36.12		56.1	31.4		79.0	21.0		79.0	21.0		58.5	41.5
30	2.25	64.87	33.0		72.67	27.33		77.4	22.6		70.5	29.5		62.0	38.33
36	0.13	52.0	47.87		82.0	18.0		78.6	21.4		81.0	19.0		44.0	56.00
42	0	49.5	50.5					83.2	16.8		77.25	22.75			
48	0	54.14	45.86					81.2	17.9		78.75	21.25			
54	0.43	57.71	41.86					81.2	18.8		74.25	25.75			
60	5.67	49.33	45.0					78.8	21.2		80.0	20.0			
66		56.67	43.33					74.8	25.3		81.0	19.0			
72		53.8	46.2					74.5	25.5		80.66	19.33			
78		57.33	42.67					87.0	13.0		69.5	30.5			
84		55.0	45.0					87.0	13.0		82.0	18.0			
90								90.0	10.0		85.0	15.0			
96								50.0	50.0		79.5	20.5			
102								80.0	20.0		64.0	36.0			
108								100.0	0		79.0	21.0			
114								100.0	0		79.5	20.5			
120								80.0	20.0		73.0	27.0			
126											49.0	51.0			
132											76.0	24.0			
138											30.0	70.0			
144											40.0	60.0			
150											60.0	40.0			
156															

to conventional methods for the exploration of the action of an antimalarial. But to be able to draw definite conclusions, it is suggested that the study should be extended.

The study also showed that drug resistant (R_1) cases have longer duration of clearance time of small and large forms in both the Sulphadoxine/Pyrimethamine and artemether treated groups (Figure 2 & 3). This may form a good basis to study the possible early interpretation of resistant cases, especially R_{11} and R_{111} , which were not included in our study.

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Utilization of hospital pharmacists in Yangon Division

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A cross-sectional study was conducted in 13 hospitals in Yangon Division to explore the current situation with regard to the utilization of hospital pharmacists. In this study, the most commonly performed activities of hospital pharmacists were identified; the relationship between their perceptions of what they have learned and the frequency of performance of some selected activities analysed; and the attitudes of hospital pharmacists and other health team members on the role of pharmacists measured. The study confirmed the situation that hospital pharmacists were being utilized mainly for drug store management. They were not being used appropriately for what they had been trained. Hospital managers and other close associates of hospital pharmacists in hospitals did not know the proper role of hospital pharmacists.

INTRODUCTION

The cost of training a pharmacist is estimated at Kyat 12,927(1). With the same amount of money, 0.6 doctor, 2 nurses or 3.8 midwives can be trained (1). In Myanmar, the role of pharmacists in hospital services is somewhat vague and they seem to be misfits and are not recognised as professionals (2). There is no career ladder for the pharmacists under the Ministry of Health. The attrition rate is 1% per year (personal communication with the Department of Health). Expensively trained pharmacists should not be wasted. In Myanmar, a rational policy on essential drugs is soon to be adopted and this necessitates the inclusion of providing a rational pharmacist manpower policy in the context of a general policy on health services and manpower development. In order to support policy

analysis on training and utilization of hospital pharmacists, the current situation with regard to the utilization of hospital pharmacists needed to be explored and a management research study became a necessity.

MATERIALS AND METHODS

Study design and methodology:

The study aims to collect information on current practices of hospital pharmacists. It was also designed to probe into the attitudes of pharmacists and their superiors, internal peers (nurses) and subordinates (compounders) as regards the role of pharmacists in hospitals. The methods/instruments used included: a diary to be recorded by hospital pharmacists for 10 working days; self-administered questionnaires to record (i) a list of the most

frequently performed activities and the frequency of performance for each activity; (ii) perceived learning profile/frequency of performance in the actual work on selected activities; and (iii) attitudes of hospital pharmacists and their close associates in hospitals (medical officers, nurses, compounders).

Study population:

Nineteen pharmacists which comprised the total population of the hospitals in Yangon Division participated in the study. For each participating pharmacist two doctors (Medical Superintendent and a medical officer responsible for drug store management), two nurses and two compounders were also selected for the study. Among the nurses, the most senior ones who were in-charge of the drug sub-stores in medical wards were chosen. Altogether 13 Medical Superintendents, 24 medical officers, 37 nurses and 31 compounders participated.

Analysis:

The diaries were analysed to find out the number of hours spent for each kind of activity. Out of 19 pharmacists in the study, only 17 participated in recording the diaries. For the lists identified by pharmacists as the frequently performed activities, scoring was given to each activity and after consolidation a prioritized list of activities was obtained. All the 19 pharmacists participated in identifying the components of this list. Cross tabulations were made between variables of perceived learning profile and frequency of performance. The results were prepared in a 3 x 3 table. Attitudinal measures were analysed on two accounts: (1) recognition of pharmacists as professionals in the field of drug supply management and (2) opinion on whether hospital pharmacists were being correctly used. Job satisfaction of pharmacists was also measured.

RESULTS

Performance by type of activity

From the analysis of the pharmacists diaries, it was found that 59.6% of the time was spent on productive activities and 40.4% of the time was spent on non-productive activities. Out of the time spent on productive activities, 44.3% of the time was spent on drug store management activities (See Table 1). From the scoring of the activities in the lists of activities identified by pharmacists, the highest score was found to be in the drug store management activities (See Table 2).

Table 1. Time spent on each activity

type of activity	% of time spent
Productive activities	59.6
Drug store management activities*	44.3
Procuring drugs from Central Medical Store Department (CMSD)	7.8
Cleanliness of the drug store/ placing bottles properly	2.7
Preparation of solutions, sterile products/autoclaving	2.2
Attending meetings	1.1
Registering prescriptions issued by Physicians	0.9
Checking expiry dates/labelling	0.6
Non-productive activities (including free time)	40.4

*The activities include writing/checking drug indents, supplying drugs to hospital wards and stock entry/checking ground balance.

Perception of learning and frequency of performance:

42.48% of responses fell into the category: "taught well, learnt well/ never performed" (See Table 3). This finding was statistically significant at $p < 0.05$.

Table 2. Common activities as perceived by pharmacists

Type of activity	Score
Drug store management activities*	175
Preparation of solutions, sterile products/autoclaving	48
Cleanliness of the drug store/placing bottles properly	17
Checking expiry dates/labelling	5
Registering prescriptions issued by physicians	3
Supervision of pharmacists and pharmacy assistants	3
Providing information to patients on dosage and regimens	3
Training of compounder/volunteer workers	3

*The activities include writing/checking drug indents, supplying drugs to hospital wards and stock entry/checking ground balance.

Table 3. Responses made on perception of learning and frequency of performance on selected activities

Performance	Preception		
	Taught well, learnt well	Taught little, learnt little	Not taught
Frequently performed	12.40%	2.64%	2.87%
Occassion-ally performed	9.76%	5.86%	1.26%
Never performed	42.48%	15.96%	6.77%

$$\chi^2_4 = 19.448$$

$$N = 861$$

$$P < 0.05$$

Recognition of pharmacists as professionals:

Table 4 shows that about 65% of doctors and nurses gave the response that they recognized pharmacists as professionals.

However, with regard to the opinion of doctors on whether nurses viewed pharmacists as professionals and vice versa, it was a different story. Only 24% of doctors thought that nurses recognized pharmacists as professionals and only 30% of nurses thought that doctors accepted pharmacists as professionals (Table 5). In the same

Table 4. Perception on pharmacists as professionals

Respondent	Positive* responses (%)
Pharmacists (N = 19)	89.47
Doctors (N = 37)	64.85
Nurses (N = 37)	64.86
Compounders (N = 31)	83.87

*Positive responses refer to responses of respondent agreeing that pharmacists are professionals in drug supply management.

Table 5. Opinion on other's perception

Respondents	Positive opinion* on	
	Doctors	Nurses
Pharmacists (N = 19)	42.10%	31.57%
Doctors (N = 37)	-	24.32%
Nurses (N = 37)	29.72%	-
Compounders (N = 31)	22.58%	-

*Positive opinion refers to the opinion of respondents on whether doctors/nurses recognize pharmacists as professionals in drug supply management.

table it can be observed that from the pharmacists point of view, only 42% of them felt that doctors recognized them as professionals and only 32% felt that nurses did the same. In other words,

the majority of pharmacists did not feel that their role in hospitals was well recognized by doctors and nurses. When doctors, nurses and compounders were asked whether pharmacists had chances of performing to the full potential of their training only 19% of nurses and 27% of compounders agreed that pharmacists were not given adequate chances to perform to the full potential of their professional knowledge and skills. This seemed to indicate that the majority of these two categories of health workers do not really know the kind of functions pharmacists had been trained for.

Job satisfaction:

In this study all the pharmacists taking part responded that they were not in a situation where they could perform to the full potential of what they had been trained. 89.47% felt that they were not being correctly used in their work. 57.90% responded that they had no satisfaction with the job. However, 78.94% responded that they would remain as pharmacists in the health service sector. There was no statistically significant relationship between the duration of service and job satisfaction.

DISCUSSION

Pharmacists are expensively trained health professionals. However, their main function in hospitals at the present moment is drug store management, a function which could be delegated to low-cost health workers like compounders*. Compounders, as a matter of fact, are assigned this function in all hospitals in Myanmar where there are no pharmacists. The study revealed that most of the hospital managers and medical care providers were not aware of the role of hospital pharmacists.

The basis for the institutional pharmacist's contribution to health care is a thorough knowledge of drugs and their action. To bring this expertise to bear in the most cost-effective manner, the institutional pharmacist must interact and cooperate closely with all other health professionals practicing in the institution and he must assist the patient and the patient's family to cope with the problems of illness (3). This kind of function is totally lacking for Myanmar pharmacists.

To ensure that those who are trained to provide health care services are used to the best effect in the health system, proper health manpower management is important. Otherwise, expensively trained health personnel would be wasted. A manpower management system provides mechanisms for the employment, retention, support and development of health personnel (4). Job description, career structures, promotion procedure, supervision and continuing education are some of the key elements of health manpower management (5). For Myanmar pharmacists, there is no operational job description and career structures are lacking.

It is now time to consider how to promote clinical pharmacy as a hospital discipline to, inter alia, ensure rational use of drugs and reducing costs; and how to define the role of hospital pharmacists so that they could play an active part in patient care by making their expertise available to other disciplines and departments (6). Some of the functions of a hospital pharmacist can be delegated to a compounder or a new category of health worker in between a pharmacist and a compounder.

(*) The minimum education level of a compounder was 8th grade, the duration of training received was 12 months and the pay scale was K.625/- 25/- 725/-. The educational qualification for selection was unchanged to 10th grade in 1987 though other things remained unchanged.

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Clinical significance of fibrinogen/fibrin degradation products (FDP) in falciparum malaria

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The relationship between the levels of FDP in the serum, parasite count and the severity of the clinical manifestations were studied in 89 patients with falciparum malaria. Serum FDP levels were found to be related to the level of asexual parasite count as well as to the severity of the clinical manifestations of falciparum malaria. It is thus suggested that the measurement of serum FDP can be used to identify high risk group of falciparum malaria cases.

INTRODUCTION

Disseminated intravascular coagulation (DIC) had been reported by many authors to explain various disorders of haemostasis in severe falciparum malaria. It was considered to be important in the pathogenesis of some clinical manifestations, especially cerebral malaria and acute pulmonary oedema (1-6). This was disputed by some investigators (7-9). But it is irrefutable that disorders of haemostasis in falciparum malaria exist, namely Thrombocytopenia and increased fibrinogen/fibrin degradation products (FDP). The present study was undertaken not to argue whether there is DIC or not, but to assess the relationship between serum FDP levels and the severity of the disease in falciparum malaria.

PATIENTS AND METHODS

Eighty-nine semi-immune patients (69 males and 20 females), aged (12 to 68) years were studied in the Tharyawady Civil Hospital, 80 miles north of Yangon. They were admitted to the hospital. Thick and thin blood films were taken

and stained with Giemsa stain. Parasite count was expressed as percentage of red blood cell infected with asexual parasites.

Clinical status of the patients were recorded according to the following categories.

- Cat. I Patients with no complications
- Cat. II Patients with complications such as high fever, hyperparasitaemia (more than 5% of RBCs infected) severe anaemia, high blood urea, or jaundice.
- Cat III Patients with impaired level of consciousness or coma.

Thirty-six specimens of blood collected from blood donors were also included in the study as controls.

FDP was determined by latex agglutination test kits (Wellcome Reagents Ltd.) on first 30 sample of patients. As the results were encouraging the full study was done by staphylococcal clumping test (Sigma Chemical Co.) which is considered to be the most sensitive of all the established techniques (10).

Other biochemical tests such as blood platelet count and blood urea were also done on all patients.

RESULTS

Out of 89 patients, 28 belonged to category I, 43 belonged to category II and 18 belonged to category III.

Among controls the mean FDP level was 1.12 ug/ml. Among malaria patients the level of FDP ranges from 1.6 to 104.8 ug/ml. The mean FDP level was 11.6, 24.8 and 41.9 ug/ml respectively in different categories of patients. The correlation between the level of FDP and clinical severity of the disease is highly significant (See table 1 for details).

Table 1. Mean level of FDP in different clinical status of malaria

Clinical status	No. of patients studied	Mean FDP level & SD (microgram/ml)
Control	36	1.12 ($\pm$ 0.87)
Category I	28	11.16 ($\pm$ 6.53)
Category II	43	24.02 ($\pm$ 29.45)
Category III	18	41.95 ($\pm$ 46.58)

The mean FDP level was also raised in relation to the level of malaria parasites in blood. The correlation between the level of FDP and the level of parasites in blood is also significant (See table 2 for details).

Blood platelet count was low in all the patients (range 6,500 - 113,500), but there was only one patient with retinal haemorrhage. She was pregnant, brought in unconscious and jaundiced.

The level of FDP though raised was not persistently high in all patients with raised blood urea, low PCV, jaundice or with cerebral symptoms.

Table 2. Mean level of FDP in different level of Parasitaemia

Level of parasitaemia (% of RBCs parasitized)	No. of patients studied	Mean FDP level & SD (microgram/ml)
Control	36	1.12 ($\pm$ 0.87)
0.1%	13	8.37 ($\pm$ 3.07)
0.1% - 2%	27	14.37 ($\pm$ 13.26)
2% - 4%	14	21.03 ($\pm$ 27.03)
4% - 10%	14	50.51 ($\pm$ 54.89)
>10%	11	37.96 ($\pm$ 35.63)

$$r = 0.2917$$

DISCUSSION

It is a well known fact that there is *no direct correlation between the level of malaria parasites in the blood and the clinical status of the patients*. In our experience at Tharyawady in 1985, 11.6% of patients with complications (Category II) and 10% of patients with cerebral symptoms (Category III) had *low level of parasites in blood (less than 1% of RBCs parasitized)*. Hence it is certain that we can not put full reliance on the level of parasitaemia to use as a diagnostic criteria for predicting the severity of the disease. In this study there is correlation between the level of malaria parasites and the level of FDP. FDP is also strongly correlated to the clinical status of the patients. Raised level of FDP had also been reported in patients with cerebral malaria (Jaroovwesama (3), Reid & Nkrumah (2)). Hence it is proposed that FDP may be used in defining patients with high risk. The exact quantitation of FDP needs expertise and is time consuming, but simple semiquantitative tests such as latex agglutination test may be helpful in the field.

Although FDP is increased in the

serum of severe falciparum malaria patients, it was not high as those with DIC (disseminated intravascular coagulation) due to other causes such as snake bite. The malaria patients are also not associated with gross signs and symptoms of haemorrhage. In our experience at Tharyawady during 1985 malaria season there were 216 patients with malaria admitted to the hospital. Of those there were only two patients with retinal haemorrhage, two patients with epistaxis, and one patient with gastrointestinal haemorrhage.

In our series the elevation of FDP is not found in all patients with complicated malaria. Moderate degree of elevation of FDP level was been reported in various other conditions such as cirrhosis of liver, normal pregnancy and pregnancy with complications (Sigma Bulletin 10). Hence the elevation of FDP in malaria patients may be the result of the general disease process and not specifically to malaria infection.

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Short Report

Toilet paper and paper towel use after defaecation and hand contamination

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In our previous study (1), we have shown that hands of mothers using water after defaecation were more contaminated than those using paper other than toilet paper. However, we were unable to compare the degree of hand contamination between toilet paper and water users. We, therefore, conducted a study to show the degree of hand contamination resulting from the use of water and toilet paper after defaecation.

In January and February 1989 an unblind cross-over trial was carried out on 10 female volunteers in their reproductive years from one of the townships in Yangon, Myanmar. The subjects were asked to use 8 layers of "Scottie" 2 ply print toilet tissue (Scott Paper Co, USA), water (whichever water they use normally) and 4 times folded 1 layer of "Taiper" paper towels (A Japanese Paper Co) in that order with 3-7 days break in between. The details of hand swab sample collection and hand decontamination were as described elsewhere (1).

The median faecal coliform (FC) isolation from hands after defaecation when using toilet paper, water and paper towels were 0, 1.5×10^2 and 0 colony forming units per ml (cfu/ml) respectively. Similarly, their ranges were $(0-4.6 \times 10^4)$, $(0-1.1 \times 10^7)$ and 0 respectively. Little or no hand contamination occurred when toilet paper or paper towels were used. FC count of 4.6×10^4 cfu/ml during the toilet paper

use was contributed by a subject who mistakenly used 2 layers instead of 8 layers as instructed. The differences in FC isolation between the 3 cleaning methods were statistically significant ($\chi^2=195.2$, $df=9$, $p<0.001$) by Friedman two way analysis of variance by ranks (2). As before (1), proper hand washing with soap significantly reduced FC isolation (Table 1).

Table 1. Hand contamination according to different methods of anal cleaning, before/after defaecation and after hand washing, Yangon, 1989

Cleaning method	Faecal coliforms (cfu/ml) ^a		
	Before defaecation	After defaecation ^b	After hand washing
Toilet paper (Scottie)			
Median	0	0	0
Range	$(0-2.4 \times 10^4)$	$(0-4.6 \times 10^4)$	(0-75)
Water			
Median	0	1.5×10^2	0
Range	(0-43)	$(0-1.1 \times 10^7)$	(0-15)
Paper towel (Taiper)			
Median	0	0	0
Range	(0-43)	0	0

^a cfu = colony forming units

^b Differences statistically significant ($\chi^2_r = 195.2$; $p < 0.001$)

These data suggest that toilet paper as well as paper towels are as effective as paper other than toilet paper in preventing faecal contamination of hands during defaecation. However, it is of particular interest to note that there is a danger of soiling through soft tissues if sufficient layers are not used. This may occur especially when the stools are liquid or semi-liquid. For this reason and also from the data, it seems that in using soft toilet tissues sufficient layers should be used to effectively reduce faeces-finger contact.

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