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Body composition of Myanmar elderly people from home for the aged (Hninsigone), Yangon

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To find out body composition of Myanmar elderly people, the study was conducted on 154 (67 males and 87 females) apparently healthy elderly people, age ranged from 70 to 103 years at the home for the aged (Hninsigone), Yangon. Body composition was measured using skin-fold thickness. Body fat percent was calculated by equation described by Durnin and Rahamen (1967). Mean and SD of Body Mass Index (BMI) of elderly males and females were 19.18 ± 2.75 and 20.48 ± 4.03 respectively. 22.38 % of males and 19.54 % of females were found to have BMI less than 17, and 6.2 % of females had BMI more than 25. The older the age, the higher the reduction was observed in body fat percent, fat mass and fat free mass. Significant difference was evident in fat percent and fat mass of females and fat percent of males. However, elderly people with low BMI (BMI <17) had significantly lower body weight, fat percent, fat mass and fat free mass than those of their counterparts with normal BMI.

INTRODUCTION

In many Southeast Asian countries, continuous economic growth in recent decades has led to improved living condition for large proportion of the population. Partly this improvement has resulted in increased life expectancy and the proportion of elderly in the population has increased. Therefore, the health care of elderly people takes an important part in the national health program.

Changes in body composition such as increase in fatness especially in central region increase the risk of atherosclerosis, hypertension, hypercholesterolemia and insulin resistant diabetes mellitus and conversely, changes in body composition are secondary to many diseases such as acromegaly, postmenopausal osteoporosis. Paget's disease etc. [1] Furthermore, change in body composition is an indicator for the assessment of nutritional status. A Body Mass Index (BMI) of less than 18.5 has been proposed to indicate chronic energy malnutrition (CEM) in adults whereas those with BMI lower than 17 have added health risk and reduction in physical work capacity [2]. On the other hand, a BMI of more than 25 is regarded as obesity.

In elderly people, there are many controversies regarding changes in body composition. It is generally accepted that age-related changes in body composition such as loss of fat free mass with increase in total and central fatness occur in elderly people [3]. Reduction in fat free mass and increase in fat mass have considerable health have implication by contributing to frailty and functional impairment [4].

However, the two longitudinal studies of changes in FFM suggested lower rate of changes than observed in the cross-sectional studies [5, 6]. Furthermore, changes in body composition that are associated with increasing age may not be age related and the levels of physical activity are important in determining body fat accumulation [5]. In addition, the body composition (the mixture of FM and FFM on the frame) can differ by ethno-geographic situation e.g. for height-matched Asians and Caucasians, the latter have higher body mass indices but the former have more total body fat [1].

Since little information is available on the body composition of Myanmar elderly people, the present study is a preliminary one aimed at finding out the body composition of Myanmar elderly people.

MATERIALS AND METHODS

Subjects

The study was conducted on 154 (67 males and 87 females) apparently healthy elderly people, age ranged from 70 to 103 years at the home for the aged (Hninsigone), Yangon. None of the subjects was suffering from overt diseases and all were able to walk and dress unaided.

Anthropometric and body composition assessment

Body weight was measured with bathroom scale weighing machine, calibrated with standardized weight. Subjects were weighed barefoot with minimum clothing. Measurements were taken two hours after breakfast and the weight was recorded to the nearest 0.1 kg.

Standing height was measured to the nearest 0.1 cm using a stadiometer. Subjects stood barefoot on a flat horizontal surface, their heads held in the Frankfurt plane and with their heels, buttocks and shoulders touching the wall.

Body Mass Index (BMI) was calculated as weight/height^2 (kg/m^2)

Body composition was assessed through measurements of skin-fold thickness. Skin-fold thickness at sites of biceps, triceps, sub-scapular and supra iliac was measured on the left side of the body using a Harpenden caliper by a well-trained technician. Body fat percent was calculated by using the formula described by Durnin and Rahaman, 1967 [7].

Body fat % = (4.95/Y – 4.5) × 100
Y = 1.1610 – 0.0632 X in men
Y = 1.1581 – 0.0720 X in women.

(Y is body density and X is the log of the sum of skin-fold thickness at all four sites in mm)

Statistical analysis

Data were expressed as mean ± SD. Comparison were made using Student 't' test for unpaired samples (two tailed). Differences were considered significant if $p<0.05$.

RESULTS

Table 1 shows comparison of body composition of elderly people with that of middle-aged people [8]. Old-age people had lesser height, weight, and body fat percent, fat mass and fat free mass than the middle-aged people.

Table 2 shows body composition of elderly males at different ages. The older the age, the higher the reduction was observed in body fat percent, fat mass and fat free mass. Significant difference was evident in fat percent.

Table 3 shows body composition of elderly females at different ages. The changes were similar to those of the males but significant difference was evident in fat percent and fat mass.

Table 1. Comparison of body composition of elderly people with that of middle-aged people

Sex	No.	Age (yr.)	Height (cm.)	Weight (kg.)	Fat (%)	Fat mass (kg)	Fat free mass (kg)	Body Mass Index
Male	294	49.92 ± 6.06	162.35 ± 5.73	57.32 ± 12.24	14.18 ± 6.10	9.10 ± 5.90	48.25 ± 8.35	21.70 ± 4.18
	67	81.03 ± 5.05	157.64 ± 6.30	47.82 ± 8.05	18.93 ± 4.37	9.42 ± 3.50	38.70 ± 5.10	19.18 ± 2.75
Female	329	48.99 ± 5.65	151.48 ± 5.67	52.44 ± 12.39	27.77 ± 6.56	15.41 ± 7.11	37.02 ± 6.66	22.75 ± 4.74
	87	80.15 ± 5.55	145.52 ± 5.63	43.29 ± 8.63	29.80 ± 4.53	13.19 ± 4.31	30.10 ± 4.67	20.48 ± 4.03

Table 2. Body composition of elderly males at different ages

Age groups	All	70 - 79 yrs	80 – 89 yrs	90- above
No. of subjects	67	27	37	3
Height (cm)	157.64 ± 6.30	159.01 ± 6.36	156.62 ± 6.25	157.9 ± 3.15
Weight (kg)	47.82 ± 8.05	50.14 ± 6.89	46.45 ± 4.83	43.83 ± 3.70
Body Mass Index	19.18 ± 2.75	19.85 ± 2.66	18.83 ± 2.77	17.58 ± 1.49
Body Fat Percent	18.93 ± 4.37	20.51 ± 3.88	18.21 ± 4.33	15.27 ± 2.67
Fat Mass (kg)	9.42 ± 3.50	10.43 ± 3.11	8.89 ± 3.65	6.77 ± 1.54
Fat Free Mass (kg)	38.7 ± 5.10	39.71 ± 4.71	37.82 ± 5.40	37.07 ± 2.33

Table 3. Body composition of elderly females at different ages

Age groups	All	70 - 79 yrs	80 – 89 yrs	90- above
No. of subjects	87	39	46	2
Height (cm)	145.52 ± 5.63	147.51 ± 5.16	143.92 ± 5.54	143.65 ± 3.55
Weight (kg)	43.29 ± 8.63	45.52 ± 8.79	41.77 ± 8.10	34.75 ± 0.75
Body Mass Index	20.48 ± 4.03	20.97 ± 4.18	20.22 ± 3.88	16.89 ± 1.20
Body Fat Percent	29.80 ± 4.53	31.33 ± 3.90	28.81 ± 4.56	22.69 ± 0.54
Fat Mass (kg)	13.19 ± 4.31	14.35 ± 4.34	12.33 ± 4.17	7.88 ± 0.02
Fat Free Mass (kg)	30.10 ± 4.67	31.05 ± 5.03	29.44 ± 4.25	26.87 ± 0.77

Table 4. Incidence of elderly people with BMI <16. 16 – 16.9 and 17 – 18.4 in different age groups

Age (yr)	70 - 79	80 – 89	90 and above
BMI (Male)			
17 - 18.4	18.52%	21.62%	
16 -16.9	3.70%	10.81%	66.67%
<16	3.70%	18.92%	
BMI (Female)			
17 – 18.4	15.39%	13.04%	50%
16 – 16.9	7.69%	8.70%	
< 16	5.13%	15.20%	50%
> 25 - < 30	7.69%	6.52%	
> 30	5.13%	2.17%	

Table 5. Comparison of body composition of elderly from different ethnic groups

Ethnic groups	No. of subjects	Age (Yr)	Weight (kg)	Body fat (%)	Fat mass (kg)	Fat free mass (kg)
Male						
Caucasian(11)	15	65 – 72	75.40 ± 2.50	28.00 ± 1.50	21.50 ± 1.70	53.90 ± 1.30
Chinese (10)	64	70 – 74	55.61	29.31	16.30 ± 5.30	39.31 ± 5.83
Myanmar	67	71 – 92	47.82 ± 8.05	18.93 ± 4.37	9.42 ± 3.50	38.70 ± 5.10
Female						
Caucasian(12)	10	68 - 79	60.00 ± 7.22	21.70 ± 3.90	21.70 ± 3.90	38.30 ± 4.40
Chinese	95	70 - 74	49.86	34.61	17.26 ± 6.24	32.60 ± 4.67
Myanmar	87	70 - 103	43.29 ± 8.63	29.80 ± 4.53	13.19 ± 4.31	30.10 ± 4.67

Table 4 shows incidence of elderly people with BMI 17 to 18.4, 16 to 16.9, <16, >25 and >30 in different age groups. Some elderly women, not elderly men, had BMI >25 and >30.

Table 5 shows comparison of body composition of elderly from different ethnic groups. Although height, weight, fat mass and fat free mass were lower in Chinese and Myanmar elderly than those of Caucasians, body fat % was higher in Chinese and Myanmar elderly women than that of Caucasians.

DISCUSSION

It was found that Myanmar elderly people had lower body weight, height, and fat free mass but higher body fat percent when compared with those of middle-aged people. This finding was in agreement with the concept that age related changes in body composition were loss of fat free mass with increase in total and central fat. However, when the subjects were divided into three groups (i.e. 70–79 years, 80–89 years and Their 90 years & above) and compared their body weight, fat percent, fat mass and fat free mass, all reduced with increasing age.

BMI is an early measurable nutritional status indicator for adult and BMI of <8.5 has been proposed to indicate chronic energy malnutrition (CEM). In the present study, 41.79% had a BMI <18.5 and 22.38% had a BMI <17. These findings were a little higher than those found in Indonesian urban elderly where 33% had a BMI <18.5 and 15% had a BMI <17 [9]. Considering high prevalence of low BMI individuals, CEM may be a public health problem among elderly or alternatively, the BMI cut-off point to define CEM may not be valid for elderly in Myanmar. Woo *et al.* reported that the BMI of elderly Chinese was lower than that of other elderly with different ethnic backgrounds, namely Caucasian, Maori and Scandinavian. The fiftieth percentile of BMI values for the Chinese elderly fell on the twenty-fifth percentile BMI values for the Caucasian elderly in United Kingdom [10]. Therefore, many researchers recommended conducting further investigation of general applicability of the BMI classification for different populations.

Wang *et al.* reported that, despite lower BMI values, Asians had higher body fat percent than did Caucasians [6]. In the present study, Myanmar elderly women also had higher body fat percentage than Caucasians but Myanmar elderly men had lower body fat percentage.

When comparison was done between elderly with normal BMI and elderly with

BMI less than 18.5, body weight, body fat percent, fat mass and fat free mass of normal elderly were significantly greater than those of elderly with low BMI value.

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REFERENCES

1. Solomons N.W and Mazariegos M. Body composition and disease: is anything new to be learned? *Asia Pacific Journal of Clinical Nutrition* 1996; 5(4): 211–216.
2. James WPT, Ferro-Luzzi A and Waterlow JC. Definition of chronic energy deficiency in adults. *European Journal of Clinical Nutrition* 1988; 42: 969-981.
3. Evans WJ and Cyr-Campbell D. Nutrition, exercise and healthy ageing. *Journal of the American Dietetic Association* 1997; 97(6): 632–638.
4. Fukagawa NK, Bandini LG and Young JB. Effect of age on body composition and resting metabolic rate. *American Journal of Physiology* 1990; 259: E 233–E 238.
5. Murray LA, Reilly JJ, Choudhry M and Durnin JVGA. A longitudinal study of changes in body composition and basal metabolism in physically active elderly men. *European Journal of Applied Physiology* 1996; 72: 215–218.
6. Wang J, Thorton JC and Russel M. Asians have lower body mass index (BMI) but higher percent body fat than do whites: comparisons of anthropometric measurements. *American Journal of Clinical Nutrition* 1994; 60: 23–28.
7. Durnin JVGA and Rahaman MM. The assessment of the amount of fat in the human body from measurements of skin fold thickness. *British Journal of Nutrition* 1967; 21: 681–688.
8. Ye Tint Lwin, Zaw Myint, Myo Myo Mon, Aye Aye Win, *etal.* Prevalence of coronary heart disease risk persons in South Dagon Township, Yangon. *Myanmar Health Sciences Research Journal* 2003; 15 (1–3).
9. Iswarawanti DN, Schultink W, Rumawas JSP and Lukito W. Body composition and physical activity patterns of Indonesian elderly with low body mass index. *Asia Pacific Journal of Clinical Nutrition* 1996; 5(4): 222–225.
10. Woo J, Ho SC, Donnan SPB and Swaminathan R. Nutritional status of healthy, active, Chinese elderly. *British Journal of Nutrition* 1988; 60: 21–28.
11. Roberts SB, Young VR, Fuss P, Heyman MB, Fiatarone M, Dallal GE, Cortiella J and Evans WJ. What are the dietary energy needs of elderly adults? *International Journal of Obesity* 1992; 16: 969–976.
12. Reilly JJ, Lord A, Bunker VW, Prentice AM, Coward W, Thomas AJ and Briggs RS. Energy balance in healthy elderly women. *British Journal of Nutrition* 1993; 69: 21–27.

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Waist-hip ratio to identify the cardiovascular risk factors among people in the South Dagon Township, Yangon, Myanmar

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A cross-sectional community-based descriptive study was conducted in South Dagon Township, Myanmar during March, 2001. The objective of this study was to determine the frequency of some cardiovascular risk factors in people categorized by various levels of waist-hip ratio. A total of 294 men and 329 women aged 40-60 years were studied. A waist-hip ratio exceeding 0.94 in men and 0.91 in women correctly identified subjects with body mass index of ≥27.8kg/ m^2 and body fat percent of ≥20 in men and those of ≥27.3 and ≥30, respectively in women with sensitivities of ≥86% for men and ≥52% for women, and specificities of ≥64% and ≥49% respectively. Men and women with at least one cardiovascular risk factor (total cholesterol ≥250mg/dL, systolic blood pressure ≥160mmHg, diastolic blood pressure ≥95mmHg) were identified with sensitivities of 57% for both sexes and specificities of 70% and 53% respectively. Compared with those with lower waist-hip ratio levels, age and life style (physical activity, cigarette smoking) adjusted odds ratios for having at least one risk factor were 2.2 in men with a waist-hip ratio of 0.95-1.00 and 1.5 in women with a waist-hip ratio of 0.92-0.97. In men and women with larger waist-hip ratios, these age and life style adjusted odds ratios were 2.4 and 3.0 respectively. In conclusion, larger waist-hip ratio identifies people at South Dagon Township at increased cardiovascular risks especially in men.

INTRODUCTION

In Myanmar, ischaemic heart disease (IHD) is an important priority health problem identified in National Health Plan (1996-2001). Elimination or reduction of one or more risk factors of IHD may cause a corresponding decrease in the probability of contracting IHD.

Among the modifiable risk factors, obesity and elevated blood lipids are the important risk factors in association with IHD. Obesity is defined as a body mass index (BMI) in excess of 30kg/ m^2, with being overweight as having a BMI between 25 and 30. BMI values above 27.8 for men and 27.3 for women are associated with an increased incidence of high blood pressure, Diabetes Mellitus, and IHD [1]. However, BMI has limitations. The numerator of the BMI equation is affected by factors other than excess body fat, such as bone and muscle mass. Most people cannot readily calculate their index to establish their own risk or need for weight management.

Based on data from physically active young adults, it is probably desirable to consider as average a body fat content of 15% for men and about 25% for women. The determination of body fat percent calculated from measured skin fold thicknesses needs special instrument, technical skills and computations which general public cannot easily make. Moreover, the equations used to calculate body fat percent are "population specific": they are most accurate with subjects similar to those from whom the equations were derived.

Body fat distribution, independent of total body fat, alters the health risks of obesity. More specifically, ratios of waist- to- hip girth that exceed 0.80 for women and 0.95 for men are associated with an increased risk of coronary artery disease [2], hypercholesterolemia, hypertension, atherosclerosis and other illnesses [3].

The major metabolic cardiovascular risk factors (plasma lipids, high blood pressure, insulin resistance) all aggregate independently with both body mass index and waist - hip ratio and improve with weight loss [4, 5]. Weight loss and accompanying body fat reduction generally normalize cholesterol and triglyceride levels and have a beneficial effect on blood pressure and adult-onset diabetes.

In this study waist-hip ratio was used as a simple predictor of health risk from being overweight and its relationship with some cardiovascular risk factors was determined.

General objective

To determine cardiovascular risk factors in people in the South Dagon Township categorized by various levels of waist-hip ratio.

Specific objectives

1. To identify the waist-hip ratio levels of people aged forty to sixty years in South Dagon Township.
2. To find out the waist-hip ratio as a simple predictor of health risk from being overweight or having high body fat percent.
3. To determine the relationship between waist-hip ratio and cardiovascular risk factors.

MATERIALS AND METHODS

Study design

A cross-sectional community-based descriptive study.

Study population

Both male and female of 40 to 60 years old living in South Dagon Township.

Sample size determination and sampling procedure

In South Dagon Township, 12 wards were randomly selected for the study. From each ward 60 subjects of both sexes, 40 to 60 years old were selected by simple random sampling method. A total of 623 male and female were included in this study. Those taking drugs that can affect blood cholesterol level and those who are acutely ill were not included.

Data collection methods:

(1) Proper history taking was done according to the proforma.
(2) Body weight, body height, blood pressure, skin fold thicknesses were measured according to standard methods.
(3) Waist and hip circumferences were measured by a steel measuring tape. Waist and hip circumferences were operationally defined [6] with slight modification. Waist circumference was measured around the waist, over the abdomen where the girth is largest while standing relaxed, not pulling in the stomach. Hip circumference was measured around the hip, over the buttocks where the girth is largest.
(4) Fasting serum total cholesterol level was measured by using Cholesterol RTU test kit based on an enzymatic method [7].

RESULTS

Physical and metabolic characteristics of 294 men and 329 women are shown in table 1. Mean age, body mass index, waist-hip ratio were similar in men and women. Men had higher blood pressure and lower waist and hip circumferences, total serum cholesterol concentration and body fat percent.

Table 1. Physical and metabolic characteristics of 294 men and 329 women

Characteristics	Men		Women	
	Mean	SD	Mean	SD
Age (years)	49.9	6.1	49.0	5.6
Weight (kg)	57.3	12.2	52.4	12.4
Height (cm)	162.4	5.7	151.5	5.7
Body mass index (kg/m^2)	21.7	4.2	22.8	4.7
Waist circum-ference (cm)	82.2	12.1	85.1	10.8
Hip circum-ference (cm)	88.5	8.0	93.2	10.6
Waist-hip ratio	0.93	0.06	0.91	0.05
Total cholesterol (mg/dL)	206.9	47.1	224.3	51.8
Body fat percent	14.1	6.0	27.8	6.5
Systolic blood pressure(mmHg)	128	21	123	20
Diastolic blood pressure(mmHg)	88	13	84	12

Table 2 and Table 3 show prevalence, positive and negative predictions, and sensitivity and specificity of high cholesterol concentration (≥250 mg/dL)and hypertension (systolic pressure ≥160mmHg or diastolic pressure ≥95mmHg) in men and in women, respectively by different levels of waist-hip ratio. Sensitivity and specificity for identifying risk factors from waist-hip ratio (≥0.95 in men and ≥0.92 in women) were between 57% and 70% in men and 57% and 53% in women, respectively with positive 25% prediction varying between 25% and 38% in men and 21% and 32%, respectively in women for individual risk factors. Positive prediction increased to 53% in men and 43% in women who had one or more risk factors. Negative prediction was much higher, 73% varying between 73% and 92%.

In Table 4, odds ratio of men and women having high cholesterol concentration and hypertension in different categories of waist-hip ratio adjusted for age, cigarette smoking and physical activity by logistic regression are shown. Compared with those with lower waist-hip ratio levels, age and lifestyle adjusted odds ratios for having at least one cardiovascular risk factor were 2.2 in men with a waist-hip ratio of 0.95-1.00 and 1.5 (statistically not significant) in women with a waist-hip ratio of 0.92-0.97. In men and women with larger waist-hip ratios, these age and lifestyle adjusted odds ratios were 2.4 and 3.0 respectively.

Table 4. Odds ratio of high cholesterol concentration (≥250mg/dL) and hypertension (systolic pressure ≥160mmHg or diastolic pressure ≥95mmHg) in different categories of waist-hip ratio adjusted for age, cigarette smoking and physical activity in men and women

Waist-hip ratio	Odds Ratio		
	High total cholesterol	Hyper-tension	One or more risk factor
Men (n=294)			
<0.95	1.00	1.00	1.00
0.95-1.00	2.85	2.16	2.16
>1.00	5.77	2.43	2.43
Women (n=329)			
<0.92	1.00	1.00	1.00
0.92-0.97	1.16	1.54	1.54
>0.97	1.49	3.02	3.02

DISCUSSION

In South Dagon Township, mean waist-hip ratios in men and women are 0.93 and 0.91 respectively. Prospective studies suggest cut offs of waist-hip ratio, 0.95 in men and 0.80 in women as values above which health risk increases appreciably. In our study, 40% of the men (117 out of 294) (data not shown) had waist-hip ratios above this figure. For the women, the mean value of waist-hip ratio, 0.91 is very much higher than cut off value, 0.80; and 99.1% of women (326 out of 329) (data not shown) had waist-hip ratios above this figure. It means that waist-hip ratio cut off value, 0.80 could not be applied to the women in our study population.

With high sensitivity (95.24%) and specificity (64.47%) (data not shown), waist-hip ratio ≥0.95 in men identifies people with BMI ≥27.8kg/m^2 which is associated with an increased incidence of

Table 2. Prevalence, positive and negative predictions, and sensitivity and specificity of high cholesterol concentration (≥250mg/dL) and hypertension (systolic pressure ≥160mmHg or diastolic pressure ≥95mmHg) in 294 men by different levels of waist-hip ratio

Risk factor	Prevalence*	Percentage (95% confidence interval)			
		Positive prediction	Negative prediction	Sensitivity	Specificity
Waist-hip ratio (≥0.95)					
High total cholesterol	14.97	24.8 (17.5 to 33.8)	91.5 (86.2 to 95.0)	65.9 (50.0 to 79.1)	64.8 (58.5 to 70.6)
Hypertension	*26.53*	*37.6* (29.0 to 47.1)	*80.8* (74.1 to 86.2)	*56.4* (44.7 to 67.4)	*66.2* (59.4 to 72.4)
One or more risk factor	36.73	53.0 (43.6 to 62.2)	74.0 (66.8 to 80.2)	57.4 (47.5 to 66.8)	70.4 (63.2 to 76.8)
Waist-hip ratio (≥1.00)					
High total cholesterol	14.97	30.4 (18.2 to 45.9)	87.9 (83.0 to 91.6)	31.8 (19.1 to 47.7)	87.2 (82.3 to 91.0)
Hypertension	26.53	41.3 (27.3 to 56.7)	76.2 (70.3 to 81.3)	24.4 (15.7 to 35.6)	87.5 (82.2 to 91.5)
One or more risk factor	36.73	60.9 (45.4 to 74.5)	67.7 (61.5 to 73.4)	25.9 (18.2 to 35.4)	90.3 (84.9 to 94.0)

*Prevalence of risk factors in total population

Table 3. *Prevalence, positive and negative predictions, and sensitivity and specificity of high* cholesterol concentration (≥250 mg/dL) and hypertension (systolic pressure ≥160mmHg or diastolic pressure ≥95mmHg) in 329 women by different levels of waist-hip ratio

Risk factor	Prevalence*	Percentage (95% confidence interval)			
		Positive prediction	Negative prediction	Sensitivity	Specificity
Waist-hip ratio (≥0.92)					
High total cholesterol	29.18	31.5 (24.7 to 39.2)	73.3 (65.6 to 79.8)	55.2 (44.7 to 65.3)	50.6 (44.1 to 57.2)
Hypertension	17.63	21.4 (15.6 to 28.6)	86.3 (79.8 to 91.1)	62.1 (48.3 to 74.2)	51.3 (45.2 to 57.4)
One or more risk factor	38.60	42.9 *(35.3 to 50.7)*	65.8 *(57.9 to 73.0)*	56.7 *(47.6 to 65.4)*	52.5 *(45.4 to 59.5)*
Waist-hip ratio (≥0.97)					
High total cholesterol	29.18	40.9 (26.7 to 56.7)	72.6 (67.0 to 77.6)	18.8 (11.8 to 28.3)	88.8 (83.9 to 92.4)
Hypertension	17.63	25.0 (13.7 to 40.6)	83.5 (78.6 to 87.5)	19.0 (10.3 to 31.8)	87.8 (83.2 to 91.4)
One or more risk factor	38.60	50.0 (34.8 to 65.2)	63.2 (57.2 to 68.7)	17.3 (11.4 to 25.3)	89.1 (83.8 to 92.9)

*Prevalence of risk factors in total population

IHD, high blood pressure and Diabetes Mellitus [1]. Similarly, it identifies the people with high body fat percent (≥20%) with high sensitivity (85.71%) and specificity (72.73%) (data not shown). Therefore, waist-hip ratio exceeding 0.94 in men correctly identified subjects with body mass index of ≥27.8kg/ m^2 and body fat percent of ≥20 with sensitivities of ≥86% and specificities of ≥64%, respectively. Because waist-hip ratio cut off point, 0.80 could not be applied to the study women population, an arbitrary cut off point, 0.92 which is close to the mean value was used to identify those with high BMI (≥27.3kg/m^2) or high body fat percent

(≥30%). Even this cut off point could only identify women with sensitivities (51.85% and 61.11%, respectively) (data not shown) and specificities (49.09% and 56.76%, respectively) (data not shown). The smaller the cut off point value, the more increase sensitivity becomes while specificity is decreased, and the reverse is true for the larger cut off point. So the power to identify those with high body mass index or high body fat percent by various waist-hip ratio levels in women is weak in study population.

The study shows the close relation between waist-hip ratio and cardiovascular risk factors. The mean serum total cholesterol concentration in men, systolic and diastolic blood pressures of men and women increased significantly with waist-hip ratio (results not shown). In addition to that, waist-hip ratio significantly correlated similarly to body mass index and body fat percent with these cardiovascular risk factors (results not shown). Moreover, men and women with at least one cardiovascular risk factor (total cholesterol ≥250mg/dL, systolic blood pressure ≥160mmHg, diastolic blood pressure ≥95mmHg) were identified with sensitivities of 57 % for both sexes and specificities of 70% and 53%, respectively (Table 2 and 3). Finally, waist-hip ratio cut off measurement identified cardiovascular risk factors at one and a half times to twice the prevalence in the whole population at waist-hip ratio 0.95 in men and 0.92 in women, and two and a half to three times at waist-hip ratio 1.00 in men and 0.97 in women (Table 4). These results suggest that different levels based on waist-hip ratio may provide a valuable, simple method for alerting people in the South Dagon Township at increased risk of cardiovascular disease.

In conclusion, larger waist-hip ratio identified people at South Dagon Township at increased cardiovascular risks especially in men. Different levels of waist-hip ratio might be used to identify general population at high risk of chronic disease from high total serum cholesterol concentration and hypertension who might benefit from weight management.

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REFERENCES

1. Dulloo, A.G., Geissler, C.A., Horton, T., Collins, A., Miller, D.S. Normal caffeine consumption; influences on thermogenesis and daily energy expenditure in lean and post-obese human volunteer. *Am. J. Clin. Nutr.* 1989; 49:44.
2. Terry, R.B., Stefanick, M.L., Haskell, W.L., Wood, P.D. Contributions of regional adipose tissue depots to plasma lipoprotein concentrations in overweight men and women: possible protective effects of thigh fat. *Metabolism* 1991; 40:733,.
3. Despres, J-P., Moorjani, S., Lupien, P.G., Tremblay, A., Nocleau, A., Bouchard, C. Regional distribution of body fat, plasma lipoproteins, and cardiovascular disease. *Atherosclerosis* 1990; 10: 497.
4. Bjorntorp P. Classification of obese patients and complications related to the distribution of surplus fat. *Am. J. Clin. Nutr.* 1987 45 (suppl 5):1120.
5. Kanaley, J.A., Andersen-Reid, M.L., Oenning, L., Kottle, B.A., Jensen, M.D. Differential health benefits of weight loss in upper-body and lower-body obese women. *Am. J. Clin. Nutr.* 1993; 57:20.
6. Mcardle, W.D., Katch, F.I., Katch, V.L., editors. Obesity and weight control. In *"Exercise Physiology"*, Williams and Wilkins Press, 1996; p. 609.
7. Flegg, H.M. An investigation of the determination of serum cholesterol by an enzymatic method. *Ann. Clin. Biochem.* 1973; 10: 79.

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Cross neutralization of cobra (*N. kaouthia*) antivenom manufactured by Myanmar Pharmaceutical factory with spitting cobra (*N. mandalayensis*) venom

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In 1998 a new species of spitting cobra (*N. mandalayensis*) was identified in mid-land, Myanmar by J.B. Slowinski. Myanmar Pharmaceutical Factory manufactures mono specific cobra (*Naja kaouthia*) antivenom for treating cobra bite cases. Venom ophthalmia following spitting of spitting cobra has been reported earlier. The objective of the study is to determine possibility of use of cobra antivenom in treating spitting cobra bite cases. In order to elucidate this fact, cross protective study of lethal effect of spitting cobra venom by cobra antivenom was assessed in rodents. Immunodiffusion was carried out between cobra antivenom and spitting cobra venom. It was found that 120µl of cobra antivenom will neutralise 3 LD_{50} i.v. spitting cobra venom. The cobra antivenom with cobra and spitting cobra venoms recognizes a similar number of precipitin bands. The study highlighted that cobra antivenom could be used to treat spitting cobra bite cases.

INTRODUCTION

Snakebite is endemic in Myanmar. Russell's viper is responsible for 90% of the bites and followed by cobra (*Naja kaouthia*) 8% [1]. Cobra has a wide distribution in whole Myanmar except Chin, Kachin, Kayah and Shan states [1]. Venom ophthalmia following spitting of venom into eyes by spitting cobra (*Naja siamensis*) in mid-land was reported in 1997 [2], but its bite has not been reported. In later year, the reported spitting cobra was found out to be a new species of cobra and named as *Naja mandalayensis* by J.B. Slowinski [3]. Myanmar Pharmaceutical factory manufactures monospecific antivenom for treating cobra bites. Since there is no specific antivenom for spitting cobra bite, it is highly desirable to know that whether the cobra antivenom could be used in treating spitting cobra bite cases. The study attempts to verify the assumption.

MATERIALS AND METHODS

Spitting cobras (*Naja mandalayensis*) (n=15) (length>100cm) caught from Mandalay Division (Thazi Township) were milked and lyophilized. Cobra (*Naja kaouthia*) venom and enzyme refined lyophilized monospecific cobra (*Naja kaouthia*) antivenom were bought from Myanmar Pharmaceutical Factory. Agarose gel (FMC Bio Products (USA), Coomassic brillant blue R -250(Nakari chemicals Ltd), acetic acid, glacial (E Merck) and methanol (Wako pure chemical) were used.

METHODS

Immunodiffusion

Antigen antibody reaction was performed in 1.5% agarose gel plate using Ouchterlony method [4]. Cobra antivenom in the centre well was allowed to react with the cobra (*N. kaouthia*) (1mg/ml) and the spitting cobra (*N Mandalayensis*) (1mg/ml) venoms in surrounding wells at room temperature for 24hr. The plate was washed with physiological saline, stained with 0.025% w/v Coomassie brillant blue R-250 in methanol: water: acetic acid (50:45:5)

mixture, de-stained in water: acetic acid: methanol (87:8:5) mixture and dried.

Determination of median lethal dose (LD_{50iv})

Determination of median lethal dose (LD_{50iv}) of venom was carried out according to WHO recommended method [5].

In brief, it was determined by intravenous injection of 0.2ml of the variable concentrations of venom in physiological saline into tail vein of 18-20g male ICR mice. Six mice per dose were used. The LD_{50iv} of the venom was calculated by probit analysis [6] of death occurring within 24 h following injection of the venom.

Neutralisation of lethal activity of the venom by antivenom

Neutralisation of lethal activity of venom by antivenom was performed according to WHO recommended standard test of neutralising activity [5].

Briefly a fixed amount of venom was mixed with a variable dilution of antivenom, incubated at 37°C for 30 min. and injected intravenously into the laboratory animals. Deaths were recorded following 24 h after injection. The result was expressed as median effective neutralising dose (ED_{50iv}): the minimum amount of antivenom that will save 50% of the test animals in 24h after injection.

RESULTS

Determination of lethal activity of venom

LD_{50iv} of the cobra (*Naja kaouthia*) venom was 4.95 (3.54-6.73)µg/mouse (95% confidence limit) [7] and that of spitting cobra (*Naja mandalayensis*) was 56.1 (49.09-66.5) µg/ mouse.The results were means of three experiments.

Immunodiffusion

Two distinct precipitin bands were observed following reaction between the cobra antivenom and the cobra venom and three distinct cross-reacting precipitin bands between the former and the spitting cobra venom (Figure).

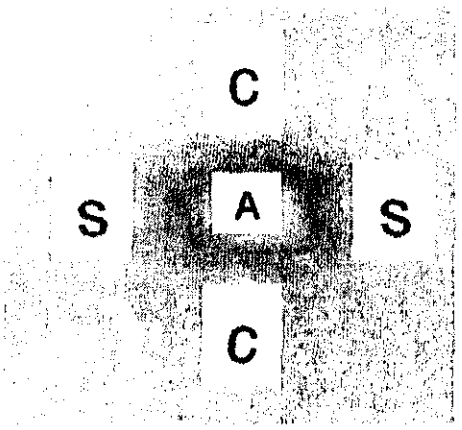
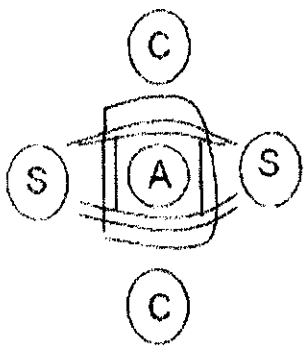


Fig. Precipitin reactions between spitting cobra, cobra venoms and cobra antivenom .



Diagramatic presentation of precipitin reactions
S= Spitting cobra (*N. mandalayensis*)
C= Cobra (*N. kaouthia*)
A= Cobra antivenom (*N. kaouthia*)

Neutralisation of lethal activity of the spitting cobra venom by the cobra antivenom

120 (127.7-130.6) µl (95% confidence limit) of the cobra antivenom was required to neutralise 3 LD_{50iv} of the spitting cobra venom whereas it required 11.07(2.87-21.37) µl to neutralise 3LD_{50iv} of the cobra (*Naja kaouthia*) venom.

DISCUSSION

Although venom ophthalmia following spitting of venom into eyes by spitting cobra (*Naja siamensis*) was reported in 1997 [2], its bite has not been reported. Since 700 spitting cobras caught in mid-land (Thazi

Township) were brought for sales to Myanmar Pharmaceutical Factory, Yangon in the reporting year [2], it is possible that its bite may have mistaken for cobra bite and treated accordingly with cobra antivenom. Detail study of the cobra bite cases from mid-land may reveal incidence of spitting cobra bite. The reported spitting cobras were found to belong to a new species of cobra and named by JB Slowinski as *Naja mandalayensis* [3].

The LD_{50iv} of Myanmar cobra (*Naja kaouthia*) is 4.95 µg/mouse and spitting cobra (*Naja mandalayensis*) 56.1µg/mouse whereas that of Thai cobra (*Naja kaouthia*) is 6.61µg/mouse and spitting cobra (*Naja siamensis*) 21.4µg/mouse [8]. Results indicate that spitting cobra venoms are less lethal than that of the cobras.

In cross neutralisation study, 10 times more Myanmar cobra antivenom is needed to neutralise the lethal effect of the spitting cobra (*Naja mandalayensis*) venom whereas about 3 times more Thai cobra antivenom is required to neutralise lethal effect of spitting cobra (*Naja siamensis*) venom [8].

The study highlights the cross reaction between spitting cobra (*Naja mandalayen sis*) venom and cobra (*Naja kaouthia*) anti-venom and cross protection of the lethal activity of spitting cobra venom by the cobra antivenom. The results are in consistent with those reported by Minton [9] about the presence of genus specificity in cobra antivenoms. This is the first report of cross protection provided by the cobra antivenom against the lethal activity of spitting cobra (*Naja mandalayensis*) venom.

It suggests that in the absence of mono specific antivenom for spitting cobra, cobra (*Naja kaouthia*) antivenom could be used for treating spitting cobra bite however, more antivenom will be needed to neutralise the lethal effect of the venom.

REFERENCES

1. Aye Aye Myint, Tun Pe and Tin Zar Maw. Epidemiology of snakebite and venomous snake survey in Myanmar. Seminar on Management of Snakebite and Research, December 11-12, 2001, Yangon.
2. Tun Pe, Than Htut, Aye Aye Myint, Khin Aung Cho, Maung Chit and Myo Tint Tun. Venom ophthalmia caused by spitting cobra (*Naja siamensis*) in Myanmar. Myanmar Health Sciences Research J. 2002; 9: 89-92.41
3. Slowinski, J.B. and Wuster, W. A new cobra (Elapidae:Naja) from Myanmar (Burma). Herpetologica 2001; 56(2): 257-270.
4. Ouchterlony, 'O' and Nilsson, L.A. Immunodiffusion and immunoelectrophoresis. In handbook of experimental Immunology. ed. DM Wier. Blackwell Scientific Publications, Oxford. 1978.
5. Theakston, R.D.G. and Reid, H.A. The development of simple standard assay procedures for charcterisation of snake venoms. Bulletin of WHO 1983; 61:949-956.
6. Finney, D.J. Probit analysis. Cambridge University Press, Cambridge. 1971.
7. Pizzi, M. Sampling variation of the fifty percent end point, determined by the Reed-Muench (Behrens) method. Human Biology 1950; 22: 151-190.
8. Khow, O., Pakmanee, N., Chanhome, L., Sriprapat, S., Omori-Satoh, T., and Sitprija, V. Cross-neutralisation of Thai cobra (*Naja kaouthia*) and spitting cobra (*Naja siamensis*) venoms by Thai cobra antivenoms. Toxicon 1977;11: 1649-1651.
9. Minton, Jr., S.A. Para specific protection by elapid and sea snake antivenoms. Toxicon 1967; 5: 47-55.

Study of snakebite cases referred to Yangon General Hospital

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A total of 266 snakebite cases (173 retrospective plus 93 prospective) referred to Yangon General Hospital from January 1999 to April 2001 were reviewed. Since clinical features, complications and outcome of two study groups were similar data were grouped and presented together. Forty seven percent of the referrals were from Yangon division. Majority 77% of the bites were due to Russell's viper (*D.r. siamensis*), 15% cobra (*N. kaouthia*), 7% unknown, 0.3% sea snake and 0.3% green pit viper. Majority (73%) of Russell's bites were referred for impending or established acute renal failure and 88% finally developed acute renal failure. Thirty one percent of them still had incoagulable blood on admission. Majority 70% of acute renal failure cases underwent peritoneal dialysis and 23% died whereas 54% of the remaining cases presented with shock and no peritoneal dialysis died. Fifty-one percent (20/39) of cobra bites were referred to intensive care unit, of these 30% (6/20) needed ventilatory support. 37% (7/19) of unknown bites were given one to four ampoules of either Russell's viper or cobra antivenom. One sea snakebite case referred for further management died in spite of conservative treatment. No specific antivenom was available for treatment of sea snake or green pit viper bites.

INTRODUCTION

Snakebite is one of the priority health problems in Myanmar. Geographical variation in Russell's viper (*Daboia russelii siamensis*) (RV) venom [1] and variation in clinical features of the Russell's viper bite cases admitted to township hospitals [2,3] had been reported. An earlier study on snakebite cases admitted to the Renal Medical Unit of the Yangon General Hospital in 1993-1994 was focused on causes of death following peritoneal dialysis in acute renal failure cases following Russell's viper bites [4]. Yangon General Hospital is known as a main referral centre for renal dialysis and ventilatory support for neurotoxic envenoming patients. It is likely that the clinical details of the snakebite cases referred to YGH will be different from those of township hospitals [2]. The main objective of this study is to determine the pattern of referral snakebite cases to YGH.

MATERIALS AND METHODS

Snakebite cases referred to YGH from January 1999 to July 2000 were reviewed retrospectively. For prospective study, snakebite cases admitted to the hospital from August 2000 to April 2001 were also studied. Clinical parameters of the cases were recorded in proforma. The clotting status was assessed at the time of admission and repeated at 6hr interval until clotted for cases presented with incoagulable blood. Charts with incomplete information were excluded from the study.

RESULTS

Total 266 snakebite cases (173 retrospective and 93 prospective) referred to Yangon General Hospital were studied. Since the clinical findings and final outcome of two study groups were similar, the data were pooled and presented together.

Majority 77% (n206) of the bites are due to Russell's viper (*D.r. siamensis*), 15% (n39) cobra (*N. kaouthia*), 7% (n19) unknown, 0.3% (n1) sea snake and 0.3% (n1) green pit viper. Majority 63% (124/198) of the victims are referred from Yangon Division, 18% (35/198) Bago Division, 12% (23/198) Magwe Division, 7% (15/198) Ayerawaddy Division and 0.5% (1/198) Mon State.

Russell's viper bite

Majority 73% (n150) of Russell's viper bites are referred for management of impending or established renal failure and 27% (n56) for further management (including 3 cases for shortage of ASV). Sixty percent (44/73) of Russell's viper bites occurred while working in the paddy field/farm and 75% (55/73) were bitten at foot, 12% (9/73) around the ankle, 7% (5/73) at leg and 6% (4/73) at hand. Majority 53% (n39) of the bites occurred during daytime (6am-6pm). Still 88% (64/73) of Russell's viper bites applied tourniquets, tattooing (n8), incision (n6), herbal medicine (n2) and suction (n3).

Referral Russell's viper bite cases arrived at YGH in 47 hrs (mean) (1 hr – 7 days) after the bite and received 1 – 10 ampoules of antivenom (13 amp in 1 case, no antivenom in 5 cases) at primary health centre and 2-10 ampoules of ASV were given on arrival. In spite of antivenom therapy, 31% (63/206) of Russell's viper bites still had incoagulable blood on admission. Clot restoration occurs 30 h (1 ½ h-7 days) after antivenom. Blood remained incoagulable up to the time of death (1-8 days) in 32% (20/63) systemic envenomed cases.

The clinical features of Russell's viper bites were shown in the table. Majority 88% (182/206) of the cases developed acute renal failure, of which 70% (128/182) underwent peritoneal dialysis and 14% (25/182) of acute renal failure patients recovered with conservative therapy. Peritoneal dialysis was not performed in 16% (29/182) of acute renal failure cases with complications died from a constellation of complications: shock, systemic bleeding, DIC, septicaemia and adult respiratory distress syndrome. As a result, 71% (147/206) of Russell's viper bites survived and 29% (59/206) died.

Table. Clinical features of Russell's viper bite case referred to Yangon General Hospital (Retrospective-65 and Pros-pective-73)

Local features	No.	%	Symptoms (Local-129, Systemic-138)	No.	%
Local pain at site	129	93	Epigastric pain	95	69
Local swelling	129	93	Vomiting	115	83
Tender lymph node	58	42	Loin pain	76	55
Necrosis/ blister/bruises	16	12	Systemic(138)		
Ulcer	9	7	Epistaxis	5	4
			Gum bleeding	9	7
			Haemoptysis	18	13
			Haematemesis	31	22
			Melena	43	31
			Haematuria	62	45
			Conjunctival haemorrhage	42	30
			Conjunctival edema	54	39
			Puffy face	56	39
			Fever	71	51
			Oliguria (<400ml/24hr)	115	83
			Proteinuria	104	75
			Shock	40	30
			Hypertension	29	21
			Encephalo-pathy	22	16
			Systemic bleeding	11	8
			Haemothorax	1	0.7
			Adult respiratory distress syndrome (ARDS)	9	7
			Convulsion	4	3

Cobra bite

Majority 74% (n29/35) of cobra bites were referred for management of neurotoxic symptoms, 15% (n6) for impending respiratory failure and 10% (n4) for further management. Four were bitten at the hand, 3 foot, 2 leg and 1 back of the trunk. Four were bitten while working or staying at home or in house compound. Most bites 60% (n6) occurred during daytime and 90% (9/10) applied tourniquet.

Cobra bite cases arrived at YGH in 6 h (2-42 hrs) and 85% (n33) of them received 1-4 amp of ASV and 8% (n3) 8 amp, 8% (n3) no ASV. Thirty eight percent (n15) were given 1 to 8 amp of ASV on admission. Clinical features include: 51% (n20) local painful swelling, 21% (n8) necrosis, cellulitis and ulcer, 56%(n22) drowsiness, 31% (n12) dyspnea, 18%(n6) shallow respiration, 15%(n6) cyanosis & respiratory failure, 15% (n6) dysphagia, 13% (n5) slurred speech, ptosis & heavy eyelids, 10% (n4) tachypnea, 8% (n3) blurred vision, 5% (n2) diplopia and 3% (n1) vomiting, unilateral lung collapse & shock. Fifty one percent (20/39) of cobra bites were referred to Intensive Care Unit and ventilatory support was needed in 30%(6/20). Majority 97% (38/39) of the bites survived except one died at the time of admission.

Sea snake bite

One sea snake bite was referred from Shwepyithar hospital for further management as an unknown bite with neuromuscular symptoms 18h after the bite. Eight amp of cobra ASV were given before referral. He developed local swelling, drowsiness, dyspnea, tachypnea, severe myalgia, vomiting and shock, and despite supportive therapy, died within one day after admission.

Green pit viper bite

One green pit viper bite was referred as an unknown bite with painful local swelling and prolonged clotting time and was admitted to the hospital within 3 hrs after bite. The patient had incoagulable blood until discharged (2 days) from the hospital. No antivenom was given to the patient.

Unknown bites

19 unknown bites were referred for further management and arrived at the hospital in 4 hrs after the bites. All had slight local swelling and fang mark. They did not develop systemic envenomation. 7 cases received 1-4 amp of either RV or cobra ASV before referral.

DISCUSSION

Study of referral snakebite cases to the YGH shows the majority of them came from Yangon division because of close distance to the referral site. Twelve percent of the referrals from Magwe division take 10-12 hrs to get to Yangon and it would be time saving and more economical if dialysis could be carried out in regional hospitals.

Russell's viper bite cases take the greatest proportion of the referrals. It was observed that early administration of antivenom failed to prevent development of later sequelae and death. Some fatal systemic cases initially treated with 1-2 ampoules of ASV developed severe sequelae and died. Early ASV given in small divided doses is not helpful in preventing development of renal failure and complication is also observed [4]. Twenty out of 63 systemic envenomed cases still had incoagulable blood up to 8 days or up to the time of death indicating that neutralising efficacy of the procoagulant of the venom by the antivenom needs to be reviewed. Local injection of ASV around the site of bite is observed in one case indicating that continued medical education is needed. Since the old traditional methods of first aid are still widely practised, extensive effective health education is needed.

In the earlier study on renal involvement in

Russell's viper bite in YGH, acute renal failure is attributable to total nephron failure (a combination of glomerular, tubulo-interstitial and vascular nephropathies) rather than due simply to acute tubular necrosis [5]. However, in the present study it could be due to a variety of causes of renal damage (pre renal or renal or both) with a mortality of 29% (59/206). Timely referral, geographical variation of venom and development of complications at the time of admission play an important role in determining the outcome of ARF. High fatality rate of referrals from Bago division (54%) (19/35) compared to Yangon division (42%) (28/66) could be attributed to high incidence of renal failure (21%) and venom variation [2].

Majority of cobra bite patients recovered with antivenom therapy and ventilatory support if they were referred in time. No specific antivenom is available for sea snakebite case and the patient died of multi organ failure despite supportive care. Sea snakebite could be saved if specific antivenom and dialysis could be provided. Unnecessary use of ASV was found in unknown snakebite patients.

REFERENCES

1. Tun Pe. Aye Aye Myint, Kyi May Htwe, Khin Aung Cho and Theingi (2000). Geographical variation of biological properties of Russell's viper (*Daboia russelii siamensis*) venom. Myanmar Health Research Congress abstract 2000, p.75.
2. Tun Pe, Aye Aye Myint, Sann Mya, Khin Aye Kyu, Kyaw Than, Aung Myint, Tint Lwin, Myint Soe and Min Than (2000). A study of Russell's viper (*Dabioa russelii siamensis*) bites from six snakebite endemic township hospitals. Myanmar Health Research Congress abstract 2000, p.74.
3. Myint Lwin, DA Warrell, RE Phillips, Tin Nu Swe, Tun Pe, Maung Maung Lay. Bites by Russell's viper (*D. russelii siamensis*) in Burma: Haemostatic, vascular and renal disturbances and response to treatment. *Lancet* 1985; ii: 1259-1264.
4. Sann Mya, Tun Pe, Aye Aye Myint, Nu Nu Aung, Khin Aye Kyu and Tin Oo. Russell's viper bite in Taungdwingyi hospital: Clinical features and response to antivenom. *Myanmar Health Sciences Research Journal* 1998; 10: 26-30.
5. Khin Hla Cho, Khin Mar Yee, Swe Swe Thet and Paing Soe. A study of 107 cases of viper bite in renal dialysis unit, YGH (1993-1994). 41st Myanmar Medical Conference, Jan 19th-23rd, 1995. Yangon.

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Activity of Traditional Medicine Formulations (TMF-6 & TMF-23) *on some pathogenic bacteria*

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The Myanmar Traditional Medicine Formulations (TMF-6 & TMF-23) which are mainly used in diarrhoea and dysentery by Myanmar practitioners were selected to determine the antibacterial properties. The ingredients (24 plants) present in it were selected singly and tested for their antibacterial activities. A total of 35 strains of bacteria (*Escherichia coli*= 11; *Staphylococcus aureus*=3; *Salmonella* species=7; *Shigella* species=4; *Vibrio cholerae*=7 and one species each of *Bacillus subtilis, Pseudomonas aeruginosa* and *Proteus morganii*) were chosen for testing. Agar disc diffusion was done for screening. It was demonstrated that TMF-06 extract was active on *Escherichia coli* (STLT) and *Vibrio cholerae* (Inaba); TMF-23 extract was active on *E. coli* (STLT), *Staphylococcus aureus, Shigella boydii, Shigella dysenteriae* and *Vibrio cholerae* (Ogawa). The extract of the mixture of two TMFs was also found to be active on *E. coli* (LT) and *Vibrio cholerae* (Inaba). Among the 23 plants tested, they were found to be active on one, two or more of the bacteria tested with different patterns.

INTRODUCTION

Plants and their products have been used in the treatment of infectious diseases for a very long time, even before the discovery of the microorganisms. Screening of Indian plants for biological activity was reported since 1968 [1] and recently in 1996 [2]. Various investigators also demonstrated the anti-bacterial activity of *Heracleum* species (sulanapha variety) [3], *Euclyptus maidenii* (yuclyp) [4]; *Allium ursinum* (kyetthun variety) [5]. Antibacterial activity of were Myanmar formulations were reported on limited bacteria in 1996 [6]. The LD_{50} of the two drugs was <50mg/body weight [7] and it was found to be safe for consumption. This paper deals with investigations of bacteria which were isolated from different infections. Simultaneously, the ingredients prepared from the traditional medicine formulations were extracted singly and tested separately to show the complete picture of the activity. These two medicines were used generally by many traditional practitioners for a long time and was used throughout the country for gastrointestinal disorders. They were prepared by the practitioners themselves or were available at Department of Traditional Medicine or as different brands from private shops. However, their potency has not been tested and proven.

MATERIALS AND METHODS

Traditional Medicine Formulations used for testing antibacterial activity

TMF 06 contains 11 ingredients: samonnet, Hsanwinn, pygyee pyar, htanot pyar, yan-zein, hsahlaw, sithsatpyar, mahpauk-hton, hsah kyatkhoe, khayuziizinn pyar and yauk thwahgone pyar.

TMF 26 contains 25 ingredients: thinbaw gyingyauk, ngayokkoung, peikchinn, samon

Table 1. Antibacterial activity of TMF 06 and its ingredients

Sr. No.	TMF/Botanical name	Myanmar	Active on
	TMF 06	Taingyin 06	*Escherichia coli* (LT) (Ec) *Staphylococcus aureus* (Sa) *Shigella boydii* (Sb) *Shigella dysenteriae* (Sd) *Shigella sonnei* (Ss) *Vibrio parahaemolyticus*(Vp)
1	*Nigella sativa* L.	samonnet	Ec, Sa, Sb, Ss, Sd, Vp
2	*Curcuma longa* L.	hsanwinn	Bs, Ec (LT), Sa, Sb, St, Vc
3	*Dolichos lablab* L.	pegyee pyar	(-)
4	*Borassus flabelliferL.*	htanot pyar	(-)

sabah, samonbyu, samonnyo, samon-phwe, samonni, kyetthunbyu, eikmwayt thee, pharlarngei, samonnyo, hsinthamanwei, peikchinn myit, kantgyokni, pan-oot, ziyar, karaway ywet, zardeikpho thee, layhnyinn, sularnaphar, satugah, theindaw, sheingo and hsaypale.

70% ethanolic extracts of plants and TMFs

All the tested materials were extracted by 70 means of 70% ethanol for 5-days at room temperature. After maceration, the solvent was removed under reduced pressure in a rotatory evaporator. The extract was placed in a dessicator till used. All the extracts were done in Department of Chemistry, Yangon University [8].

Bacterial strains tested for antibacterial activity

A total of 35 strains of bacteria (*Escherichia coli*=11; *Staphylococcus aureus*=3; *Salmonella* species=7; *Shigella* species=4; *Vibrio cholerae*=7 and one species each of *Bacillus subtilis, Pseudomonas aeruginosa* and *Proteus morganii*) were chosen for testing of the traditional medicine extracts.

Screening for antibacterial indigenous plant extracts by agar disc diffusion technique

Screening was done by the use of impregnated filter paper discs. The discs, 6 mm in diameter (Difco) were sterilized by autoclaving followed by dry heat at 60°C for one hour. It was the impregnated with concentrated extracts (1 to 2 mg/disc) and then allowed to dry at room temperature. A few colonies (3 to 10 organisms) to be tested were picked with a wire loop from the original culture plate and introduced into a test tube containing five millilitre of Mueller Hinton broth and followed by the sensitivity testing method of Bauer, Kirby, Sherris and Turck, 1966 [8].

RESULTS

Screening for antibacterial activity by agar disc diffusion technique

Antibacterial activity of TMF-06 and their ingredient plants is shown in Table 1. The TMF-06 was active on *E. coli, S. aureus, S. boydii, S. sonnei, S. dysenteriae* and *V. parahaemolyticus*. Also the plant samonnet (70% ethanolic) was found to be active on some organisms as TMF-06. However, the plant hsanwinn was found to be active on *B. subtilis, E. coli, S. aureus, S. typhi* and *V. cholerae*.

Antibacterial activity of TMF-23 and its ingredient plants is shown in Table 2.The TMF-23 was found to be active on *E. coli, S. aureus, S. boydii, S. dysenteriae* and *V. cholerae*. Peikchinn was found to be active on *S. typhi, S. stanley* and *S. boydii*. Samonbyu, samonnyo, samonphwe, samonni were found to be active on *E. coli, S. aureus, S. boydii, S. dysenteriae,*

Table 2. Antibacterial activity of TMF-23 and ingredients

Sr	Plants	Myanmar	Active on
	TMF-23	Taingyin 23	*Escherichia coli* (LT) (Ec) *Staphylococcus aureus* (Sa) *Shigella boydii* (Sb) *Shigella dysenteriae* (Sd) *Vibrio parahaemolyticus*(Vp)
1	*Zingiber officinale* Roscoe	gyin	(-)
2	*Piper nigrum* L.	ngayokkoung	(-)
3	*Piper longum* L..	peikchin thee	*S t, S. stanley*, Sb
4	*Foeniculum vulgare* Mill	samonsaba	Ec(STLT), Sa, Sb, Sd, Ps, Vc
5	*Trachyspermum ammi* L..	samonbyu	-ditto-
6	*Anethum sowa* Roxb.	samonnyo	-ditto-
7	*Foeniculum vulgare* Mill.	samonphwe	-ditto-
8	*Lepidium sativum* L.	samoni	-ditto-
9	*Allium sativum* L.	kyetthun byu	EC(STLT), Sa, Bs
10	*Embelia robusta* Roxb.	eikmwayt thee	Pm, Ec, St, Sa
11	*Elettaria cardamomum*(Roxb.) Maton	pharlarngei	(-)
12	*Anethum sowa* Roxb.	samonnyo	Sb, Ec
13	*Tinospora spp.*	*hsin thamanwei*	*Ec (LT), Sa*
14	*Piper longum L.*	peikchinn myit	Sa
15	*Plumbago rosea* L.	kangyokni	Ec, St, Sa, Bs, Sb, Vc
16	*Kaempferia spp.*	pan-oot	(-)
17	*Cumminum cyminum L.*	ziyar	Ec, Sb
18	*Cinnamomum spp.*	karaway ywet	Ec, Sa, Sb
19	*Myristica fragrans Houtt*	zardeikpho thee	Ec
20	Syzygium aromaticum L.	layhninn	Ec, Sa, Sb, Sd, Vc
21	unidentified	sularnaphar	Ec, Sa
22	unidentified (rhizome)	satugah	Ec, Sa, Vc
23	unidentified	hsaypale	(-)
24	Chemical origin Theindaw	*Natural sodium* chloride; rock salt	NT
25	*Ferula asafoetida* (latex)	sheingo	Sd, Vc

Bs = *Bacillus subtilis* Pm = *Proteus morganii*
Ps =*Pseudomonas pyocyanea* St = *Salmonella typhi*
S. stanley = *Salmonella stanley* Vc = *Vibrio cholerae*

P. pyocyanea and *V. cholerae*. Kyetthun byu was active on *E. coli, S. aureus,* and *B. subtilis*. Eikmwayt thee was active on *P. morganii, E. coli, S. typhi* and *S. aureus*. Hsinthamanwei was found to be active on *E. coli* and *S. aureus* and kangyokni was active on *E. coli, S. typhi, S. aureus, B. subtilis, S. boydii* and *V. cholerae*. Moreover, ziyar was active on *E. coli* and *S. boydii*; karaway was active on *E. coli, S. aureus,* and *S. boydii* ; zardeikpho on *E. coli*. Layhnin was active on *E. coli, S. aureus, S. boydii, S. dysenteriae* and *V. cholerae;* sulanaphar on *E. coli* and *S. aureus* and hsaypale was active on *E. coli, S. aureus* and *V. cholerae*. Lastly, sheingo was also found to be active on *S. dysenteriae* and *V. cholerae* in this study.

DISCUSSION

The search for antibacterial properties is worldwide. The constituents of plant compounds and their structural elucidation have been investigated in this modern era [9-14]. In this research, some biological data from the plants in Myanmar which are used for medicinal purposes have been obtained. *In vitro* study reveals that oil of kangyokni and kyetthunbyu showed more antibacterial

activity than the 70% ethanolic extracts. The active principlesa were mostly found in essential oil products and have been already shown [15]. Antidiarrhoeal activity of plants and traditional medicine formulation were also shown [16-18]. Antimicrobial activity of plants has been demonstrated in many countries [19-20]. The activity of garlic was shown [21] and effect on *Helicobacter pylori* was demonstrated [22]. Moreover, anti cough activity by *Psidium guajava* and plants used for urinary pathologies had been identified by other workers [23, 24]. Here. the plants which are commonly used as ingredients in Traditional medicines such as *Cuminum cyminum, Foeniculum vulgare, Piper nigrum* showed antibacterial activity regardless of the fact that they possessed variable zone sizes and therefore, variable potencies.

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REFERENCES

1. Dhar, M. L., Dhar, M. M., Dhawan, B. N., Mehrotra, B. N. & Ray, C. Screening of Indian plants for biologiocal activity: Part 1. *Indian Journal Experimental Biology,* 1968; 6: 232-247.
2. Aswal, B. S., Goel, A. K., Kulshrestha, D. K., Mehrotra, B. N. & Patnaik, G. K. Screening of Indian plants for biological activity: Part XV. *Indian Journal Experimental Biology,* 1996, 34: 444-467.
3. Glowniak, K., Wierzchowskea-Ranke, K., Dragan, T. & Zgorka, G. Content of furanocoumarins in fruits of several forms of *Heracleum sibiricum* growing in Gdansk Pomerania, Poland. *Planta Medica,* 1993; 59:Suppl., A 630-631.
4. Gundidza, M., Chinyangaya, F., & Mavi, S. Antimicrobial actiivity of the essential oil from *Eucalyptus maidenii. Planta Medica,* 1993; 59: A705-706.
5. Tynecka, Z., Szczesniak, Z. & Glowniak, K. The effect of various environmental condition on the antimicrobial activity of *Allium ursimum. Planta Medica,* 1993; 59: suppl., A701.
6. Mar Mar Nyein, Chit Maung & Mya Bwin. Investigation of antibacterial activity of three Tradition! Medicine Formulations. *Myanmar Health Science Research Journal;* 1996; 8: 20-24.
7. Report. Department Medical Research, Pharmacology Research Division. Standard-ization of Tradituonal Medicine Formulations in Myanmar, 1986. WHO/DMR.
8. Khin Myo Naung. The anti-arthritic activity and biochemical studies of plant materials in Myanmar Traditional Medicine Formulations (anti-streptococcal & anti-inflammatory properties (PhD dissertation, Chemistry Department 2003.
9. Bauer, A. W. W., Kirby, W. M. M., Sherris, J. C. & Turck, M. Antibiotic susceptibility testing by standardized disc method. *American Journal Clinical Pathology,* 1966; 45: 493-496.
10. Abraham, W. & Abraham, H. *Penicillin camemberti*: A new source of Brefeldin A. *Planta Medica,* 1992; *58* : 484.
11. Gorecki, P., Mscisz, A., Segiel-Kujawa, E. & Kedzia, B. Phytochemical, analytical, microbiological and pharmacological investigations of a Polish *Avena sativa* sort. *Planta Medica,* 1993; 59: suppl. A674.
12. Hafner, A. & Frahm, A. W. Biflavanoids from the heartwood of *Garcinia schomburgkiana* and their structural elucidation as Atriopsomers. *Planta Medica,* 1993; 59: A 604.
13. Horie, T., Awazu, S., Itakura, Y. & Fuwa, T. Identified diallyl polysulfides from an aged garlic extract which protects the membranes from lipid peroxidation. *Planta Medica,* 1992; *58*: 468-469.
14. Kreuter, M. H., Giger, E., Ramp, T., Zanier, C. & Honerlagen, H. Analysis of the terpenes of *Ginkgo biloba* by HPLC and GC/MS. *Planta Medica,* 1993; 59: Suppl., A633.
15. Mar Mar Nyein, Win Myint, Mu Mu Sein Myint, Mya Bwint & Tin Aye. Antibacterial properties of essential oils from six medicinal plants. *Myanmar Health Sciences Research Journal,* 1996, 8: 62-65.
16. Almeida, C. E., Karnikowski, M. G., Foleto, R. & Baldisserotto, B. Analysis of antidiarrhoeic effect of plants used in popular medicine.

Review Saude Publica; 1995; 29(6): 428-433.

17. Lutterodt, G. D. Inhibition of microlax-induced experimental diarrhoea with narcotic-like extracts of *Psidium guajava* rats in rats. *Journal Ethnopharmacology,* 1992; 37(2): 151-157.

18. Aye Than, Kulkarni, H. J., Wut-Hmone & Tha, S. J. Anti-diarrhoeal efficacy of some Burmese Medicine Formulations in experimental diarrhoeal. *International Journal Crude Drug Research,* 1989; 27: 195-200.

19. Rabe, T. & van-Staden, J. Antibacterial activity of South African plants used for medicinal purposes. *Journal Ethnopharmacology,* 1997; 56 (1): 81-87.

20. Caceres, A., Fletes, L., Aguilar, L., Ramirez, O., Figueroa, L., Taracena, A. M. & Samayoa, B. Plants used in Guatemala for the treatment of gastrointestinal disorders. 3. Confirmation of activity against enterobacteria of 16 plants. *Journal Ethnopharmacology,* 1993; 38(1): 31-38.

21. Ankri, S. & Mirelman, D. Antimicrobial properties of allicin from garlic. *Microbes and Infection,* 1999, *2*: 126-129.

22. Cellini, L., Di-Campli, E., Massulli, M., Di-Bartolomeo, S. & Allocati, N. Inhibition of *Helicobacter pylori* by garlic extract (*Allium sativum*). *FEMS Immunology Medical Microbiology,* 1996; 13:273-277.

23. Jaiarj, P., Khoohaswan, P., Wongkrajang, Y., Peungvicha, P., Suriyawong, P., Saraya, M. L. & Ruangsomboon, O. Anticough and antimicrobial activities of *Psidium guajava* Linn. leaf extract. *Journal Ethnopharmacology,* 1999, 67(2): 203-212.

24. Darias, V., Martin-Herrera, D., Abdala, S. & de la-Fuente, D. Plants used in urinary pathologies in the Canary islands. *Pharmaceutical Biology,* 2001; 39(3): 170-180.

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Bacteriological study of sputum smears positive follow-up pulmonary tuberculosis patients attending Tuberculosis Centre, Yangon Division

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This study was carried out in Tuberculosis Centre, Yangon Division from December 2001 to January 2003. Sputum smear microscopy and drug susceptibility pattern of seventy follow-up pulmonary tuberculosis patients (46 Category I patients and 24 Category II patients) still sputum smear positive after initial intensive phase of anti-tuberculosis treatment were studied to determine the possible bacteriological factors related to slow rate of sputum conversion and to detect drug resistant cases among them. The *results showed that heavy initial bacillary load was the most common cause* for slow rate of sputum conversion after initial phase. Multi-drug resistant tuberculosis cases were detected in 4.6% (2 cases) of Category I follow-up patients and 12.5% (3 cases) of Category II follow-up patients. Resistance to one drug were seen in 22.7% (10 cases) of Category I patients and 29.1% (7 cases) of Category II patients. Based on the results of our study it is suggested that performing of drug susceptibility testing on follow-up pulmonary tuberculosis patients still sputum smear positive at the end of initial intensive phase treatment could detect drug resistance in the early stage and could be ultimately one of the means of reducing MDR-TB country wide.

INTRODUCTION

Tuberculosis (TB) is a major health problem in most developing countries.Approximately one third of the world's population has been infected with *Mycobacterium tuberculosis* and there are six to eight million new cases of disease and two to three million deaths each year [1].

South East Asia Region (SEAR) accounts for nearly 40% of all tuberculosis cases. Nearly 3 million cases and 700,000 deaths occur every year in SEAR, and 90% of morbidity and 95% of mortality are from five high burden countries including Myanmar [2].

In Myanmar, recent estimates suggest that 1.5% of population becomes infected with *tuberculosis every year and about 85,000* people progress to develop disease annually. About half of these have infectious pulmonary tuberculosis and continue to spread the disease [3]. Multidrug resistant tuberculosis (MDR-TB) is a serious threat to *National TB Programme (NTP) in both* developed and developing countries. In 1994-95, primary initial MDR-TB rate was 1.25% among out-patients of Zone 1 Zonal Centre, Yangon and acquired MDR-TB rate among re-treatment cases of Aung San TB *Hospital was 23.7% [4].*

The World Health Organization (WHO) TB Programme has adopted the Directly

Observed Treatment Short Course (DOTS) strategy since 1994. It consists of five components including the administration of standardized regimens with first line drugs under direct observation at least in the intensive phase regardless of the patient's drug susceptibility pattern [5].

National TB Programme in Myanmar was established in 1966. Short course chemotherapy was introduced in 1994 and DOTS strategy was started in 1997. The NTP fully intermitted regimen has been used in all DOTS implementing townships since 1999 [6].

In Guidelines for National TB Programme, WHO stated that under programme conditions in countries with a high incidence of TB, routine monitoring by sputum culture is not feasible or recommended and patients with sputum smear positive pulmonary TB should be monitored by sputum smear examination. Sputum conversion is the process whereby initially smear positive patients become smear negative and it is also a good response to treatment.

Therefore, in order to monitor sputum conversion and response to treatment, it was recommended that new sputum smear positive pulmonary TB patients (Category I) must have follow-up sputum smear check at the end of initial phase (second month), then during the continuation phase (fifth month) and in the last month of treatment regimen (sixth month). In relapse and retreatment smear positive pulmonary TB patients (Category II), sputum smear examination is performed at the end of initial phase (third month), during the continuation phase (fifth month) and at the end of treatment (eighth month).

If a patient has delay in smear conversion at the end of initial phase, then one-month prolongation of initial phase treatment is recommended regardless of patient's drug susceptibility pattern and recheck sputum examination is done after one month prolongation of initial phase treatment. For Category II patients if this sputum recheck showed positive, culture and sensitivity testing must be performed. [7].

Therefore, this study was carried out on follow-up pulmonary TB patients still sputum smear positive after initial phase treatment to determine the bacteriological factors ie. sputum microscopy pattern and drug sensitivity pattern related to slow rate of sputum conversion with the aim of detecting drug resistant cases early in the treatment course.

MATERIALS AND METHODS

Study area and study period

This study was carried out at the Tuberculosis Centre, Yangon Division, Aung San, Yangon from December 2001 to January 2003.

Collection of specimen

Sputum samples of seventy (70) follow-up pulmonary TB patients (46 Category I patients and 24 Category II patients) still sputum positive after initial phase treatment were collected and sent to Bacteriology Research Division, Department of Medical Research (Lower Myanmar). Relevant background data was also recorded.

Smear microscopy, culture and sensitivity

Sputum samples were again examined by direct microscopy after Ziehl Neelsen staining to confirm the smear microscopy. The number of acid-fast bacilli seen on microscopy was recorded as recommended by WHO. (Table 1) Then they were inoculated onto 3% Ogawa media and incubated for 8 weeks at 37°C. Positive cultures were tested for sensitivity to streptomycin, isoniazid, rifampicin and ethambutol on drug containing 1% Ogawa media using absolute concentration method for 4-6 weeks at 37°C according to Minimum Essentials of Laboratory Procedure for the Tuberculosis Control published

Table 1. Reporting on AFB microscopy (WHO)

Number of bacilli seen	Results reported
None per 100 oil immersion fields	Negative
1-9 per 100 oil immersion fields	Scanty, report exact number
10-99 per 100 oil immersion fields	1+
1-10 per 100 immersion fields	2+
>10 per oil immersion fields	3+

Table 2. Smear Microscopy Results of Category I follow-up patients in relation to different drug susceptibility pattern

Drug susceptibility pattern	No. of cases	Smear grading		
		First visit	Follow-up after initial phase	Follow-up after one month prolongation of initial phase treatment
Sensitive to HRSE (32 cases)	30	$2^+, 3^+$	1^+	-
	2	2^+	2^+	-
Resistant to HRS & HR (2 cases)	2	2^+	2^+	+
Resistant to H (8 cases)	8	2^+	1^+	-
Resistant to E (2 cases)	1	2^+	1^+	-
	1	2^+	2^+	-
Not done (2 cases)	2	2^+	2^+	-

Table 3. Smear Microscopy Results of Category II follow-up patients in relation to different drug susceptibility pattern

Drug susceptibility pattern	No. of cases	Smear Grading		
		First visit	Follow-up after initial phase	Follow-up after one month prolongation of initial phase treatment
Sensitive to HRSE (14 cases)	12	$2^-, 3^+$	1^+	-
	2	$2^-, 3^+$	2^+	-
Resistant to HRSE (1 case)	1	2^+	2^+	2^+
Resistant to HRS (2 cases)	1	1^+	2^+	1^+
	1	2^+	1^-	1^-
Resistant to H (3 cases)	3	2^+	1^-	-
Resistant to E (2 cases)	2	2^-	2^-	-
Resistant to S (2 cases)	1	2^-	1^-	-
	1	2^-	1^+	1^-

by the Research Institute of Tuberculosis, Japan 1986 [8].

Checking by smear microscopy after one month

The sputum smear microscopy results of study population were again checked after one - month prolongation of initial phase treatment.

Analysis of data

Smear microscopy results of diagnostic examination (first visit), follow-up after initial phase and follow-up after one month prolongation of initial phase were compared and analysed in relation to background data and drug susceptibility pattern.

RESULTS

Sputum microscopy at follow-up after initial phase

All of the tested samples were also positive on re-examination. Among them 39 (84.8%) of Category I patients and 18 (75%) of Category II patients had grade 1^+ smear positive smears. Seven (15.2%) cases of category I patients and 6 (25%) of Category II had grading 2^+ positive smears.

Drug susceptibility testing of Mycobacterium tuberculosis by culture method

Among 46 Category I patients, positive culture for *Mycobacterium tuberculosis* was obtained from 44 patients (2 isolates were contaminated). Drug susceptibility results on 44 Category I patients and 24 Category II patients are shown in Figure 1 and 2. Tested anti-tuberculosis drugs were isoniazid (H), rifampicin (R), streptomycin (S) and ethambutol (E).

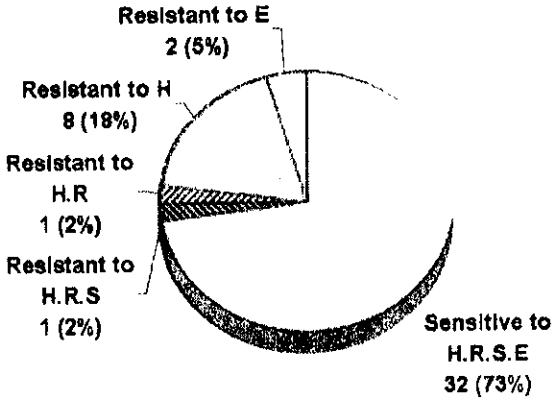

Fig.1. Drug susceptibility pattern of Category I follow-up patients

Sputum microscopy results in relation to different drug susceptibility pattern

Sputum microscopy results after the one-month prolongation of initial phase (i.e. third month in Category I patients and fourth month in Category II patients) were compared with those of diagnostic (first visit) and follow-up examination after initial phase treatment.

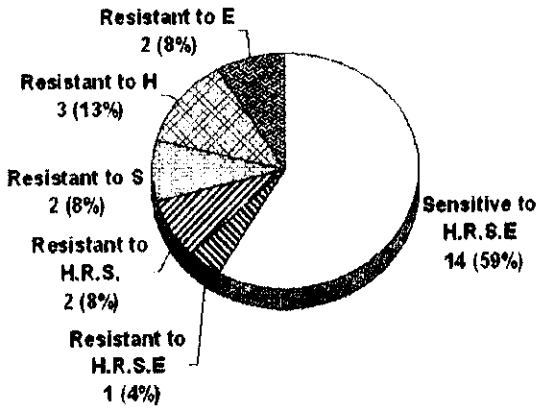

Fig.1. Drug susceptibility pattern of Category II follow-up patients

Table 2 and 3 show the smear microscopy results in relation to drug susceptibility pattern.

Analysis of sputum microscopy results in relation to drug resistant pattern and background data of follow-up patient

It was found that all patients in the study population were treated according to NTP fully intermittent regimen at TB Centre, Aung San or township health centers.

Out of 70 follow-up patients showing sputum positive on sputum re-check after initial phase treatment, 44 cases (95.6%) of Category I patients and all cases (100%) of Category II patients were found to have taken anti TB drugs regularly and correctly. Among Category I patients, 2 patients (4.4%) took the drugs in divided doses with meals but they achieved sputum conversion after completion of one month prolongation of initial phase treatment. They were also sensitive to all tested anti TB drugs. Five cases (20.9%) have extensive lung lesions and cavitations and they were resistant to one or two anti-TB drugs.

Among Category II cases, 2 cases (8.3%) of 2^+ smear positive follow-up patients resistant to 3 or 4 tested anti TB drugs had a history of massive haemoptysis and extensive pulmonary lesions but four cases

(16.7%) with cavitations and extensive lung lesions showed 1^+ or 2^+ positive smears in econd month follow-up and were sensitive to all anti TB drugs.

In both groups, all MDR-TB cases and one streptomycin resistant case were sputum positive on sputum re-check at one month after prolongation of initial phase treatment.

DISCUSSION

Tuberculosis continues to be a major health problem and is still one of the biggest killers in Myanmar. Sputum smear positive pulmonary TB patients are 4-20 times more infectious than smear negative patients and if untreated, they may infect 10-15 persons per year [9]. These are the group for whom bacteriological monitoring is essential, so they should be monitored by sputum smear examination. Culture of tubercle bacilli is necessary for carrying out sensitivity tests, which are of value in guiding retreatment of relapses and of patients in whom chemotherapy has failed and for epidemiological purposes to access the efficacy of TB control programme.

Data from TB Centre, Yangon Division in 2002 showed that out of 5544 registered new smear positive cases (Category I), 79% were smear negative on second month follow-up and 4.2% were converted to smear negative on third month follow-up. Those remaining smear positive cases at 3^{rd} month comprised 78 (1.4%).

In this study, among 70 follow-up patients still sputum positive after initial phase, 100% (46/46) of Category I follow-up patients and 95.8% (23/24) of Category II follow-up patients had initial bacillary load of 2^+ to 3^+ grading. However, after one month prolongation of initial phase treatment, 95.7% (44/46) of Category I patients and 83.3% (20/24) of Category II patients had smear conversion from positive to negative.

This indicated that heavy initial bacillary load may play an important role for slow rate of progress of sputum conversion after initial phase but tubercle bacilli were killed along with the treatment course as most of these cases had sputum conversion after one month.

Regarding the drug susceptibility pattern, 72.7% (32/44) of Category I and 58.3% (14/24) of Category II patients were sensitive to all tested four anti TB drugs (H, R, S, E). Multi-drug resistant TB MDR-TB (resistant to HRSE or HRS or HR) were seen in 4.6% (2/44 cases) of Category I patients and 12.5% (3/24 cases) of Category II patients. Resistance to one drug (H or E or S) was seen in 22.7% (10/44 cases) of Category I patients and 29.1% (7/24 cases) of Category II patients.

Drug resistance may also be one of the causes for positive smears after initial phase but it is a less frequent cause as only 5 cases of MDR-TB (2 cases of Category I and 3 cases of Category II) were observed among the study group.

Although drug resistance may be construed as a less frequent cause of slow rate of smear conversion, all MDR-TB and one streptomycin resistant case were shedding bacilli in the sputum after one month prolongation of initial phase treatment and these cases may be very infectious to the community at large.

As *Mycobacterium tuberculosis* is a slow growing bacterium, it takes at least 6 weeks for culture and another four weeks to get the drug susceptibility results. So by doing culture and drug susceptibility tests on those with positive smears on their follow-up after initial phase treatment, drug resistance could be identified earlier in the treatment course.

Drug susceptibility tests are laborious and need expertise and adherence to standard procedures in accordance with the reference laboratory. However, to spare labour and cost, drug susceptibility tests could be done

only on those with positive smears after one month prolongation of initial phase treatment.

In this study all the smear positive follow-up patients were taking anti TB treatment under NTP-Fully Intermittent Regimen through DOTS and almost all patients (95.6% of Category I patients and 100% of Category II patients) were found to be taking the drugs regularly and correctly. Only two cases (4.4%) of Category I patients were taking the drugs in divided dosage after meals. However, they were sensitive to all tested anti-TB drugs and gained sputum conversion after one month as they received thorough supervision of initial phase treatment afterwards.

Our finding highlights the fact that extensive pulmonary lesion was related to slow rate of sputum conversion after initial phase as tuberculous cavity lesion harbours millions of bacilli. Sputum microscopy may show positive although the patient's condition is improving because he is shedding dead bacilli. But it may also be associated with drug resistance as 5 cases of Category I patients and 2 cases of Category II patients with extensive pulmonary lesion were resistant to one or more anti-TB drugs.

WHO stated that the usual most frequent factor for delay in smear conversion is that the initial phase treatment was poorly supervised and the patient adherence was poor [7]. However, in our study, almost all the patients were thoroughly supervised and taking the drugs regularly and correctly under NTP fully intermittent regimen, so this factor did not play an important role for them. As this study mainly emphasized on bacteriological factors, the social factors, clinical picture and other relevant past history of these patients could not be analysed in detail.

Therefore, it was concluded that the most frequent cause for delay sputum conversion of follow-up patients of this study might be due to heavy initial bacillary load. The less frequent causes might be the fact that the patients may have extensive pulmonary lesion and cavitations and the patient may have drug resistant tubercle bacilli that does not respond to first line anti-TB treatment.

Our study also highlighted the occurrence of MDR-TB among smear positive follow-up patients as 4.6% in Category I patients and 12.5% in Category II patients. During 1994-1995 MDR-TB rate was 1.25% among isolates from 400 patients with new sputum positive pulmonary TB attending Union Tuberculosis Institute and acquired MDR-TB rate among retreatment cases of Aung San TB Hospital was 23.7% [10,4]. In 2000, it was reported that 23.3% of isolates from new pulmonary TB patients were resistant to at least one anti-TB drug and MDR-TB rate was 2.0% among isolates from 51 patients attending Zone I TB Centre [11].

This finding shows that there is a relatively high frequency of initial drug resistance among our patients. It may be due to undisclosed past exposure to anti-TB drugs and our study population also focused on sputum positive follow-up patients and the study site represented the major drainage of TB cases in Yangon. Carriage of drug resistant bacilli was more obvious in Category II patients than in Category I patients as expected. In a study carried out at Srinagarind Hospital, Thailand in 2000 pointed out that 2.4% of patients were infected with MDR-TB [12].

Our study also suggested that culture and drug sensitivity should be considered in patients with positive smears after initial phase provided facilities are available or if not they should be thoroughly monitored whether they get sputum conversion after one month prolongation of initial phase treatment, as those shedding bacilli in the sputum after one month have greater chance of drug resistant infection.

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REFERENCES

1. Drobniewski FA & Wilson SM (1998). The rapid diagnosis of isoniazid and rifampicin resistance of *Mycobacterium tuberculosis* – a molecular story. *J. Med. Microbiology*, 47: 189-196.
2. TB in SEAR (1999). The time to act is now. WHO Regional Office for South East Asia, New Delhi.
3. Aye Tun (2001). National Tuberculosis Control Programme in Myanmar in Symposium on An Update on Re-emerging Tuberculosis, Microbiology Society, MMA, p. 23.
4. Than Lwin, Khin Aye Win, Khin Lay Nyi & Zaw Oo Swe (2000). A study of forty three cases taking treatment for multi-drug resistant tuberculosis at Aung San Tuberculosis Hospital. *Myanmar Medical Journal*, 44(3): 135-139.
5. World Health Organization, Global Tuberculosis Programme (1997). Treatment of tuberculosis. Guidelines for National Programme, 2nd edition. WHO/GTB/97-220.
6. National Tuberculosis Program, Annual Report, 2002.
7. World Health Organization (2002). Treatment of Tuberculosis. Guidelines for National Programme, 3rd edition, WHO/CDS/TB/2003: 313.
8. Minimum Essential of Laboratory Procedure for Tuberculosis Control, Published by Research Institute of Tuberculosis, Japan (1986).
9. WHO, Regional Office for South East Asia, New Delhi (1999). Speakers Notes by Dr. Uton Muchtar Rafei, Regional Director, TB SEAR in a comprehensive set of overhead transparencies on effective diagnosis, treatment and control of tuberculosis.
10. Ti Ti, Aye Htun, San Hla Mu *et al.* (1995). A random sample study of initial drug resistance among tuberculosis cases in Yangon, Myanmar. *Proceedings of the Myanmar Health Research Congress.*
11. Sabai Phyu, Ti Ti, Jureen, R., Thandar Hmun, Hlaing Myint, Aye Htun, Grewal H. & Bjorvatn B. (2003). Drug-resistant *Mycobacterium tuberculosis* among New Tuberculosis Patients, Yangon, Myanmar. *Emerging Infectious Diseases*, 9(2): 274-76.
12. Reechaipichitkul, W. (2002). Multidrug-resistant tuberculosis at Srinagarind Hospital, Khon Kaen, Thailand. *Southeast Asian J. Trop. Med. Public Health*, 33(3): 570-574.

Rubella-specific Immunoglobulin-G status among schoolgirls in Pyinmana, Central Myanmar

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Rubella is a common cause of childhood rash and fever. In Myanmar, only a few studies have been done on rubella infection in the past 30 years, and the surveillance system for congenital rubella syndrome (CRS) in Yangon has recently been established. Anti-rubella antibody levels were already identified in Myanmar among the infants, children and the pregnant women but not in schoolgirls. Therefore, this operational research was carried out to explore the rubella-specific Immunoglobulin-G (IgG) status among schoolgirls at two ages, between 11-12 years and between 15-16 years. A total of 100 schoolgirls attending the Basic Education High School, Pyinmana, 50 girls at age 11-12 years and 50 girls at age 15-16 years, were chosen by simple random sampling. After obtaining written informed consent, 5 ml of blood was withdrawn from each subject and the sera were tested for rubella IgG using Rubenostika ® IgG II Microelisa System. Forty-two girls (84%) at 11-12 years age group and 41 girls (82%) at 15-16 years age group had rubella IgG. This finding could be used as a crude indicator for rubella susceptibility among adolescent schoolgirls, for a representative rural setting in Central Myanmar, which in turn can be utilized as a base-line data by the health authorities in selecting appropriate vaccine strategy to control rubella infection and CRS in Myanmar.

INTRODUCTION

Rubella is a common cause of childhood rash and fever: its public health importance relates to the teratogenic effect of primary rubella infection in pregnant women [1,2].

After infection in the first trimester, there is an approximately 50% risk of spontaneous abortion [3].

Congenital rubella syndrome (CRS) manifestations in surviving infants may be transient (e.g. purpura), may include permanent structural manifestations (e.g. deafness, congenital heart disease, cataracts) or late-emerging conditions (e.g. diabetes mellitus) [4].

CRS may be diagnosed by its classic triad of clinical signs: cataract, heart disease and deafness [5]. However, many infants only have one of these manifestations, or may present earlier with neonatal signs: laboratory confirmation of the disease is therefore recommended.

In infants with CRS, rubella-specific IgM can be detected in nearly 100% at age 0-5 months; about 60% at age 6-12 months; and 40% at age 12-18 months. IgM is rarely detected after 18 months [6]. Its detection usually indicates prenatal rather than postnatal infection [4].

The persistence of rubella-specific IgG beyond 6 months (the age when maternally derived IgG would usually have waned) can be detected in 95% of infants with CRS [7]. However, the presence of IgG in a child over 6 months of age may indicate either prenatal or postnatal infection.

In Myanmar, only a few studies have been done on rubella infection in the past 30 years [8,9], and the surveillance system for CRS in Yangon has recently been established [10]. Measles-mumps-rubella (MMR) vaccine is now available in the private sector, but rubella is not included in the Expanded Programme on Immunization (EPI) in Myanmar.

Although rubella infection is not a priority health problem in Myanmar, it is high time to estimate the burden of the disease due to CRS. This area of gap in knowledge is recently filled up by the WHO-funded study on CRS surveillance in Yangon, covering a 25 month-period from 1December 2000 to 31 December 2002. This study estimates the annual incidence of CRS in Central Yangon to be 0.5 suspected CRS cases per 1000 live births and 0.1 confirmed CRS cases per 1000 live births [11].

In 1976-1978, Kyaw Wynn carried out a study on rubella to fulfill the Diploma in Pathology. The first part of his dissertation entitled "Rubella antibody survey in Burmese pregnant women" consisted of a rubella serosurvey on serum specimens obtained from 100 women attending antenatal clinics at Central Women's Hospital, Rangoon. The Haemagglutination-Inhibition (HI) method was used, with a cut-off value of 1:8 serum dilution. Twenty-five women were tested for each age group, 15-19, 20-24, 25-34 and 35-45. The HI antibody positive rates were 92%, 92%, 100% and 100%, respectively, for these age groups [9]. This study showed that 100% of pregnant women above the age of 25 years are immune to rubella infection.

Rubella vaccine is usually given at early childhood and/or early reproductive age. The most rapid method for preventing CRS is to provide rubella vaccine to women of childbearing age (e.g. postpartum women and/or schoolgirls).

In the WHO South-East Asia Region, two countries have incorporated rubella vaccine in their national programmes. Thailand is now using a dose of MMR vaccine at age 15 months. Sri Lanka, which suffered a very large outbreak of rubella with several hundred CRS cases in 1994, has added a dose of rubella vaccine for schoolgirls.

On this background, this study has been designed to explore the rubella-specific IgG positive rate among schoolgirls at two ages, between 11-12 years and between 15-16 years. Aims and Objectives of the study was to identify the rubella-specific IgG status among adolescent schoolgirls in Pyinmana area as a representative rural setting in Central Myanmar. In fact, this study is the maiden research of the Department of Medical Research (Central Myanmar) located in Pyinmana.

MATERIALS AND METHODS

Study design

Community-based, cross-sectional descriptive and exploratory study

Subjects of the study

Total of 100 subjects, 50 middle-school girls at age 11-12 years and 50 high-school girls at age 15-16 years.

Inclusion criteria

- apparently healthy school girls
- age 11-12 years and 15-16 years
- those who gave their written informed consent to participate in the study

Exclusion criteria

- those who were febrile at the time of blood collection
- those with a known history of bleeding disorders

Methods

During the month of August, 2003, a total of 100 schoolgirls attending No. (2), Basic

Education High School, Oo-Yin-Su, Pyinmana, consisting of two groups, 50 girls at age 11-12 years and 50 girls at age 15-16 years, were chosen by simple random sampling. They had to meet the inclusion criteria as well as free from exclusion criteria. The nature of the study was explained clearly to the subjects and written informed consent was taken prior to the blood collection.

After obtaining informed consent, 5 ml of blood was withdrawn from each subject using disposable syringes and needles and vacutainer tubes. Sera were then separated, and stored in a -80°C deep freezer until further procedures. Sera were tested by ELISA using a commercially available IgG test kit (Rubenostika® IgG II Microelisa system, Biomerieux bv, The Netherlands), according to the manufacturer's instructions.

RESULTS

Fig.1 shows the percentage of rubella IgG positivity among schoolgirls in Pyinmana, in two groups. Forty-two out of 50 girls (84%) at 11-12 years age group and 41 out of 50 girls (82%) at 15-16 years age group showed a positive IgG for rubella infection.

All schoolgirls at 11-12 years age group belonged to the sixth standard of the school representing the middle schoolgirls whereas those at 15-16 years age group belonged to ninth and tenth standards of the same school representing the high school girls.

With regards to the birth place, the majority of the girls at 11-12 years age group (46 out of 50) and those at 15-16 years age group (36 out of 50) were born in Pyinmana township, indicating that most of the girls are native girls of the Pyinmana region.

Fig.2 shows the places of delivery of two study groups of schoolgirls in Pyinmana. About 88% of schoolgirls at 11-12 years age group and 68% of schoolgirls at 15-16 years age group were delivered at home. On the other hand, 12% and 22% respectively, of schoolgirls of the above mentioned two age groups were delivered at health facilities (either hospitals or clinics).

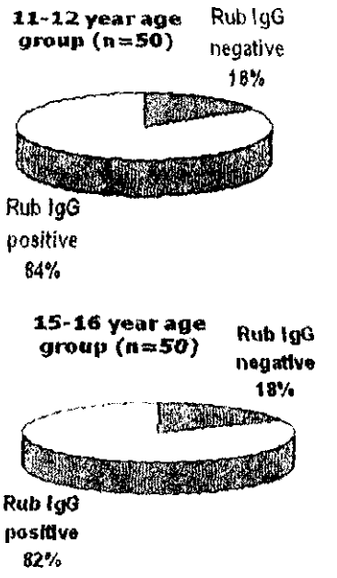

Fig.1. Pie diagram showing the percentage of Rubella IgG positives among schoolgirls in Pyinmana, at two particular age groups

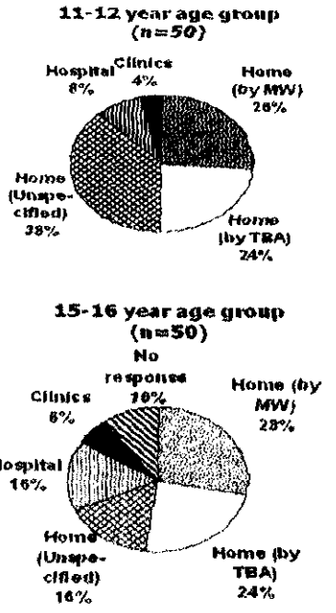

Fig. 2. Pie diagram showing the places of delivery among two study groups of schoolgirls in Pyinmana

Table 1 shows the past history of rash illness, family history of congenital defects and vaccination history among two study groups of schoolgirls in Pyinmana. Only a

Table 1. Past history of rash illness, family history of congenital defects and vaccination history among two study groups of schoolgirls in Pyinmana

	11-12 years age group (n=50)			15-16 years age group (n=50)		
	Yes	No	No response	Yes	No	No response
Past history of rash illness	28%	72%	-	24%	76%	-
Family history of congenital defects	-	100%	-	4%	96%	-
Vaccination history	88%	6%	6%	94%	4%	2%

quarter of the subjects gave past history of rash illness. In general, family history of congenital defects was not given except by 2 subjects in the 15-16 year age group. Vaccination coverage (including measles vaccine) was high in both study groups (88% and 94%, respectively).

All subjects in 11-12 years age group were at pre-pubertal age as no history of menarche was reported among them. In contrast, all subjects except two in the 15-16 year age group were at their pubertal age.

DISCUSSION

This study highlighted the immune status, particularly rubella IgG status, of the adolescent schoolgirls attending at the Basic Education High School in Pyinmana. The results revealed that rubella-specific IgG positive rate of schoolgirls aged 11-12 years and 15-16 years were 84% and 82%, respectively. In other words, 16% to 18% of the adolescent schoolgirls were susceptible to rubella infection in this area. This finding could be used as crude indicator for rubella susceptibility among adolescent schoolgirls at a representative rural setting in Central Myanmar, which in turn will be utilized by the health administrators in selecting appropriate vaccine strategy, if there is a real need to combat the rubella infection and CRS in Myanmar.

The present study is the first of its kind in Myanmar, to explore the rubella IgG profile among adolescent schoolgirls. Only a single study has been conducted 25 years ago to identify the rubella antibody status of the women of childbearing age, using the haemagglutination-inhibition (HI) assay. The HI antibody positive rate for 15-19 years age group in that particular study was 92% [9]. Given an account of the data resulted from above-mentioned studies into consideration, one could roughly estimate that 10% to 20% of the target populations (women of childbearing age and schoolgirls) under the age of 20 in Myanmar would be susceptible to rubella infection. This study also indicates that EPI vaccine coverage in Pyinmana area was quite high (over 80%) although no one has received rubella vaccine due to its unavailability.

Reliable statistics on CRS are rare in developing countries, but the incidence rate of CRS in developed and developing countries before the introduction of rubella vaccine appeared to vary during endemic periods from 0.1-0.2 per 1000 live births. Epidemic rates varied from 1-4 per 1000 live births without marked difference between industrialized and developing countries.

The burden of CRS is estimated that more than 100,000 cases occur each year in developing countries alone. Caring for CRS cases is costly because of the permanent disabilities caused by this condition. WHO recommended the regular serological screening for rubella antibodies among representative samples of young women as a sensitive tool to monitor the risk for CRS in a population.

The primary purpose of rubella vaccination is to prevent the occurrence of congenital

rubella infection including CRS. Two approaches are recommended: (a) prevention of CRS only, through immunization of adolescent girls and/or women of childbearing age; or (b) elimination of rubella as well as CRS through universal vaccination of infants and young children (with/without mass campaign), surveillance and assuring immunity in women of childbearing age [12].

Decisions on which approach is taken should be based on the level of susceptibility in women of childbearing age, the burden of disease due to CRS, strength of the basic immunization programme as indicated by routine measles coverage, infrastructure and resources for child and adult immunization programmes, assurance of injection safety, and other disease priorities.

Nowadays, children in Myanmar have been receiving 7 vaccines through the EPI programme, namely diphtheria, pertussis, tetanus, BCG, polio, measles and more recently hepatitis B. In fact, recently estimated annual incidence of CRS in Central Yangon, 0.1 confirmed CRS cases per 1000 live births, is more likely to be endemic pattern.

Based upon the current available data, introduction of rubella vaccine into the existing EPI programme in Myanmar is not an urgent need. However, regular serological screening for rubella antibodies among representative population of young women needs to be carried out to monitor the disease trend.

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REFERENCES

1. Cutts F.T., Robertson S.E., Diaz-Ortega J.L., Samuel R. Control of rubella and congenital rubella syndrome (CRS) in developing countries, Part I: burden of disease from CRS. *Bulletin of the World Health Organization* 1997; 75: 55-68.
2. Gregg N.M. Congenital cataract following German measles in the mother. *Transactions of the Ophthalmological Society of Australia* 1941; 3: 35-46.
3. Siegel M., Fuerst H.T., Peress N.S. Fetal mortality in maternal rubella results of a prospective study from 1957 to 1964. *American Journal of Obstetrics and Gynaecology* 1966; 96: 247-253.
4. Cooper L.Z. The history and medical consequences of rubella. *Reviews of Infectious Diseases* 1985; 7(Suppl. 1): S2-S10.
5. Plotkin S.A. Rubella vaccine. In: Plotkin SA, Mortimer EA, eds. Vaccines, 2nd edt. London, WB Saunders, 1994.
6. Chantler S., Evans C.J., Mortimer P.P. *et al.* A comparison of antibody capture radio and enzyme immunoassays with immuno-fluorescence for detecting IgM antibody in infants with congenital rubella. *Journal of Virological Methods* 1982; 4: 305-313.
7. Plotkin S.A. *et al.* Congenital rubella syndrome in late infancy. *Journal of the American Medical Association* 1967; 200(6): 435-441.
8. Ming C.K. *et al.* Serologic survey for certain childhood viral infections in Rangoon in 1971. *Journal of Tropical Medicine and Hygiene* 1974; 77: 260-266.
9. Kyaw Wynn. Rubella antibody survey in Burmese pregnant women. Dissertation submitted for the Diploma in Pathology, Institute of Medicine (1), Rangoon, 1978.
10. Kyaw Zin Thant *et al.* Initiation of congenital rubella syndrome (CRS) surveillance network in Yangon, Myanmar. *Abstracts of the Myanmar Health Research Congress*, January, 2003, p. 32.
11. Kyaw Zin Thant *et al.* Unpublished data, Manuscript under preparation.
12. WHO, Geneva. Rubella vaccines: WHO position paper. *Weekly Epidemiological Record* 2000; 75(20): 161-169.

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Bacterial pathogens isolated from acute diarrhoea cases of children at Yangon Childrens' Hospital

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Rectal swab samples were collected in Cary Blair transport media from 313 cases (male=179; female= 134) of children (less than nine years old) who were admitted to Yangon Children's Hospital during 1999 to 2003. They were processed by standard conventional bacteriological methods. The enteric pathogens isolated were enteropathogenic *Escherichia coli (EPEC)* (23.64%); Shigella spp. (3.5%); Vibrio cholerae (8.31%), and Salmonella typhi (0.32%). Total pathogen isolation rate was as follows: 1999 (20.59%); 2001 (35.79%); 2002 (21.82%) and in 2003 (60%). In other terms EPEC isolation rate increased from 16.18% in 1999; 17.89% in 2001; 10.91% in 2002 and 41.05% in 2003. Vibrio cholerae was not isolated in 1999 but increased beginning from 2000 (7.37%); 2001 (3.64%) to 2003 (17.89%). Antibiotic susceptibility pattern of EPEC has shown that they were resistant to ampicillin, amikacin and tetracycline. Also 66.7% and 93.75% of Vibrio cholerae were resistant to ampicillin in 2001 and in 2003 repectively. Similarly, 50% and 75% of V. cholerae were resistant to tetracycline in 2001 and 2003 respectively.

INTRODUCTION

Diarrhoeal diseases are still a major cause of morbidity and mortality among children in developing countries. In Kenya, epidemiological study in children revealed that bacterial diarrhoea was found in 239 (27.7%) of 862 tested cases comprising EPEC, ETEC and EHEC strains, isolated from 119 cases (13.8%), Salmonella spp. (63 cases, 7.3%) and Shigella spp. (56 cases. 6.5%) and this finding suggests that the main routes of infection may be contaminated drinking water and faecal oral transmission of enteric pathogens [1]. Epidemic diarrhoea caused by enteroaggregative E. coli was reported from south India [2]. Bacteriological quality of weaning food and drinking water given to children of market women in Nigeria had shown that bacterial contamination increases significantly with storage time, and was except for the water samples, significantly higher in foods given to children left at home. Reheated leftover foods also had significantly higher bacterial load than the freshly-cooked food. Coliform count varied significantly with source of drinking water. Poor hygiene standard (inferred from bacterial contamination) was generally observed among mothers weaning <or=2-year-old children, while they were engaged in trading activities in the market, thus exposing their children to high risk of diarrhoea [3]. In Western nations, pathogenic biotypes are sporadically encountered in foodborne gastroenteritis, cholera, dysentery, and chronic ulcerative colitis syndromes are recognized. Escherichia coli has been associated on the average with 2 % of the annual food outbreaks and 5% of total cases. In contrast with Salmonella and

Shigella, significance can be assessed only by fulfillment of Koch's postulates. They reported that 2% of isolates from cheeses involved were toxigenic; 14% were invasive [5]. Thus, this research was conducted to determine the changing pattern of causative pathogens of diarrhoea and antibiotic susceptibility pattern in this region.

MATERIALS AND METHODS

Sample collection

Rectal swab samples from 313 cases of children with diarrhoea who were admitted to Yangon Childrens' Hospital during 1999 to 2003 were collected in Cary Blair transport media and transported to Bacteriology Research Division, Department of Medical Research (Lower Myanmar). The subjects comprised of 179 males and 134 females whose ages ranged from two months to nine years. The samples were collected as follows:

1999: August to December = 68 cases (male = 39; female = 29)
2001: June to September = 95 cases (male = 54; female = 41)
2002: February to September = 55 cases (male = 34; female = 21)
2003: May to September = 95 cases (male = 52; female = 43)

Bacteriological examination

Primary isolation of bacterial pathogens was done by streaking the stool samples onto MacConkey agar (MA), Salmonella-Shigella (SS) agar, Thiosulphate Citrate Bile salt Sucrose (TCBS) agar, and incubating at 37°C overnight. Secondary isolation was done by using Selenite F enrichment at 42°C for 24-48 hours and alkaline peptone water at 37°C for six hours for growth of Salmonella-Shigella and Vibrios respectively. The suspected colonies from selective media were picked, and Gram stained and biochemical tests, catalase production, and oxidase reaction were tested and further confirmed by serology [6].

Serological identification of bacteria

A slide agglutination test was done by reacting with specific "O", "K" and "H" antisera. Antisera used were from Denka Seiken Co.Ltd.,Japan.

Antibiotic susceptibility testing

It was done by the method of Kirby-Bauer (1966). Mueller Hinton agar and broth were used. The zone sizes were measured and interpretation was drawn from the chart given by the disc products [7].

RESULTS

Isolation of bacterial pathogens

Table 1 shows the isolated bacterial pathogens from different studies during the period of 1999 to 2003. The isolation rate was 20.59% in 1999, 34.74% in 2001, 21.82% in 2002, and 60% in 2003.

Pathogens isolated from different age groups
As shown in Table 2, the pathogens isolated were EPEC, Shigella boydii, Shigella dysenteriae, Vibrio cholerae, O1 and O139, Salmonella typhi, Plesiomonas shigelloides and Aeromonas hydrophilia. It also showed the distribution of different pathogens in those periods. Vibrio cholerae was not isolated in the year 1999.

Distribution of enteropathogenic Escherichia coli during 1999-2003

Table 3 shows the distribution of EPEC in different age groups during 1999 to 2003. It was observed that isolation of EPEC was 13.24%, 17.89%, 10.91% and 41.05% in 1999, 2001, 2002 and 2003 respectively. It was found that the isolation rate was more in the age group of 6 months to 3 years.

Table 1. Isolation of bacterial pathogens during 1999 to 2003.

Bacterial species	1999 (n=68)		2001 (n=95)		2002 (n=55)		2003 (n=95)		all group
	M	F	M	F	M	F	M	F	
Klebsiella aerogenes	1	0	0	0	0	0	0	0	1
EPEC	5	6	11	7	2	4	22	17	74(23.64)
Shigellae	1	1	4	1	1	2	1	0	11(3.51)
Plesiomonas shigelloides	0	0	2	0	0	0	0	0	2(0.64)
Aeromonas hydrophilia	0	0	2	0	0	0	0	0	2(0.64)
Vibrio cholerae O1	0	0	4	1	1	1	6	3	16(5.11)
Vibrio cholerae O139	0	0	1	1	0	0	2	6	10(3.20)
Salmonella typhi	0	0	0	0	0	1	0	0	1(0.32)
Total number of isolates	7	7	24	10	4	8	31	26	117(37.38)
Tested cases	39	29	54	41	34	21	52	43	313
Percentages (each sex)	17.95	24.14	44.44	24.39	11.76	38.1	59.62	60.67	
Percentages (both sexes)	20.59		35.79		21.82		60.00		37.38

Specimens collected in 1999: August to December 2001: June to September
2002: February to September 2003: May to September

Table 2. Pathogens isolated from different age groups

Age months	1999-2000 n=68	2001 n=95	2002 n=55	2003 n=95
<6 -6	EPEC (1) *K. aerogenes* (1)	EPEC (2) *A. hydrophila* (1) *P. shigelloides*(1) *S. sonnei* (1) *V. cholerae* O1(1)	EPEC (1)	EPEC (4) *V. cholerae* O1(2)
6-12	EPEC (6)	EPEC (7) *P. shigelloides* (1) *S. dysenteriae* (1) *S. sonnei* (1) *V. cholerae* O139 (2)	EPEC (2) *S. flexneri* (2) *V. cholerae* O1 (1)	EPEC (12) *S. dysenteriae* (1) *V. cholerae* O1 (1) *V. cholerae* O139(1)
12-24	EPEC (3) *S. boydii* (1)	EPEC (8) *A. hydrophilia* (1) *V. cholerae* O1 (1)	EPEC (2) *S. flexneri* (1) *S. typhi*(1)	EPEC (14) *V. cholerae* O1 (2) *V. cholerae*O139 (5)
24-36	nil	*S. dysenteriae*(1) *S. sonnei* (1) *V. cholerae*O1 (1)	EPEC (1)	EPEC (7) *V. cholerae* O1 (3)
36-48	nil	*V. cholerae* O1 (1)	*V. cholerae* O1 (1)	EPEC (2) *V. cholerae* O1 (1) *V. cholerae*O139 (1)
48-60	*S. boydii* (1)	*V. cholerae* O1(1)	nil	nil
>60	EPEC (1)	nil	nil	*V. cholerae* O139(1)
All age group	EPEC (11) *Klebsiella* (1) *S. boydii* (2)	EPEC (17) *A. hydrophilia* (2) *P. shigelloides* (2) *S. dysenteriae* (2) *S. sonnei* (3) *V. cholerae* O1 (5) *V. cholerae* O139(2)	EPEC (6) *S. flexneri* (3) *S. typhi* (1) *V. cholerae* O1 (2)	EPEC (39) *S. dysenteriae* (1) *V. cholerae*O1 (9) *V. cholerae*O139(8)
% isolation	14 (20 59%)	33 (34.74%)	12 (21.82%)	57 (60.00%)

Table 3. Distribution of EPEC during 1999-2003

Age group (months)	1999		2001		2002		2003	
	Male	Female	Male	Female	Male	Female	Male	Female
<6 -6	1/8	0/1	1/8	1/7	0/3	1/4	3/7	1/2
6-12	1/15	5/16	4/20	3/17	1/15	1/10	5/14	7/13
12-24	2/9	1/5	6/18	2/13	1/10	1/4	9/19	5/17
24-36	0/7	0/3	0/5	0/3	0/2	1/1	3/6	4/7
36-48	0	0/1	0	0/1	0/3	0/1	2/5	0/1
48-60	0	0/2	0/1	0	0	0	0/1	0
>60	0	1/1	0/2	0	0/1	0/1	0	0/3
All age group (percent)	4/39 (10.26)	7/29 (24.14)	11/54 (20.37)	6/41 (14.63)	2/34 (5.88)	4/21 (19.05)	22/52 (42.31)	17/43 (39.53)
Both sexes	11/68 (16.18%)		17/95 (17.89%)		6/55 (10.91%)		39/95 (41.05%)	

Distribution of bacterial pathogens in different areas of Yangon (2003)

As shown in Table 4, pathogen isolation ranged from 63.3% to 100% in different areas. From area I (Dagon, Kyauktada & Lanmadaw) all 6-cases admitted to YCH had stool samples from which all had pathogens including 2-cases of *V. clolerae* O139. From area II (Pazundaung & Mingalartaungnyunt) 10 cases out of 15 cases tested (66.67%) had pathogens isolated from their stool including 3-cases of *V. cholerae* O1 and one case of *V cholerae* O139. From area III (Kamayut, Kyimyin-daing, Mayangone & Yankin, out of 10 cases tested, 7-cases were found to be infected with pathogens; including [3] cases of *V. cholerae* O1. From Dallah, Dawpon, Seikkyi and Tharketa, 14 cases out of 23 cases had pathogenic isolates, 2-cases each with *V. cholerae* O1 and O139. From Dagon, Hlaingtharyar, Insein, Shwepyithar, Twante and Thanhlin area, 16 out of 18 cases were infected with pathogens (88.89%) of which one case of *V. cholerae* O1 and 3-cases were *V. cholerae* O139.

Antibiotic susceptibility pattern of pathogens

Table 5 shows that from 39 isolates of EPEC, 92.31% were resistant to ampicillin, amikacin, streptomycin and tetracycline; 76.92% resistant to carbenicillin; 74.36% to trimethoprim/ sulfamethoxazole and 56.41% to chloramphenicol. Comparison of the resistance pattern between *V. cholerae,* EPEC and *Shigella* specie is shown in Table 5. The resistant pattern of pathogens from 2001 to 2003 is also shown. It was found that the resistant pattern of EPEC changed from 10% in 2001 to 97.44% in 2003 with amikacin; 10% in 2001 to 94.87% in 2003 with norfloxacin and 60% in 2001 to 94.57% in 2003 with tetracycline.

DISCUSSION

Enteropathogenic *E. coli* (EPEC) is a common cause of enteritis with colonization of organisms in the duodenum and ileum. Haemorrhagic colitis associated with a rare *Escherichia coli* strain O157:H7 manifesting illness characterized by severe crampy abdominal pain, initially watery followed by grossly bloody diarrhoea, and little or no fever was recognised from two outbreaks in Oregon and Michigan in 1982. They found that it was associated with hamburger meat eaten at restaurants. The attack rate for persons eating sandwiches was estimated to be about 1 case per 1000 sandwiches; 1.8 cases per 1000 for hambergers in those areas. Though the mechanism was not yet known, perhaps by the production of previously unrecognised enterotoxins, it was strongly suggested, but

Table 4. Bacterial pathogens isolated from downtown and outskirts of Yangon (n=95)

Sr. No.	Townships	Isolated pathogens		
		Male	Female	Total
1	Dagon Kyauktada, Lanmadaw	3/3 (100%) O44K74 O119K69 *V. cholerae* O139	3/3 (100%) O125K70 O8K25+*Sh.dysentriae* *V. cholerae* O139	6/6 (100.00%)
2	Pazundaung, Mingala- taungnyunt	6/7 (85.71%) O78K80 O142K+ O144Kx2 *V. cholerae* O1(3)	4/8 (50.0%) O6K15 O148K+ O125K70+O27K+ *V. cholerae* O139	10/15 (66.67%)
3	Kamayut Kyimindaing Mayangone Yankin	6/6 (66.67%) O1K51 O55K59 O111K58 O27K+ + *V. cholerae* O1 *V. cholerae* O1 (2)	1/4 (25.00%) O148K+	7/10 (70.00%)
4	Dala Dawpon Seikkyi Tharkata	8/11 (72.73%) O55K59 O78K80 O78K80+*V. cholerae*O139 O86K62 O128K67 O142K+ *V. cholerae* O1 *V. cholerae* O139	6/12 (50.00%) O86K61 O119K69 O128K67(2) O159K+ *V. cholerae* O1	14/23 (63.63%)
5	Dagon(south) Hlaingtharyar Insein Shwepyithar Tontae Thanhlin	6/7 (85.71%) O26K60 O112K60 O143Kx1 *V. cholerae* O1 *V. cholerae* O139(2)	10/11 (90.91%) O1K51 (2) O8K40 O27K+ O55K59 O86K61 O119K69 O8K25+O159K+ O55K59+O114K90 *V. cholerae* O139	16/18 (88.89%)
6	Other townships	0/18	1/5 O25K+	1/23
	Total	29/52 (55.76%)	24/43 (55.81%)	54/95 (56.84%)

not proven, at that time that it caused the illness, through contaminated meat before cooking or by unknown host susceptibility factors [8]. Study of water sources and environmental transmission of multiple resistant enteric bacteria in rural Bangladesh showed that contamination of water within the household and the wide spread distribution of resistant coliforms in the environment, contributed to the high prevalence of multiple resistant enteric flora in the community [9]. EPEC was isolated as 18.21% of acute diarrhoeic children [10] and 16.1% from dysenteric children in 1996 [11]. Though similar EPEC isolation rates of 16.18% in 1999 and 17.89% in 2001 were obtained; it seemed to increase in the year 2003 (60.00%). *Salmonella typhi* was isolated from one case only in 2002. Though *Vibrio cholerae* was not isolated in 1999, it was isolated from 2001 onwards. The distribution pattern of EPEC and *Vibrio*

Table 5. Resistance pattern of pathogens isolated during 2001 to 2003

Antibiotics (mcg/disc)	EPEC			*Vibrio cholerae*			Shigellae	
	2001 n=10	2002 n=4	2003 n=39	2001 n=6	2002 n=2	2003 n=16	2001 n=4	2002 n=2
Ampicillin, OXOID, Am-10	9	4	36 (92.31)	4	1	15 (93.75)	3	1
Amikacin, BBL, AN-10	1	4	38 (97.44)	1	1	2 (12.50)	1	2
ChloramphenicolBBL, C-30	4	2	23 (58.97)	2	1	6 (37.50)	3	2
Carbenicillin, BBL, CB-100	7	3	30 (76.92)	4	1	9 (56.25)	2	1
Cefalothin,BBL, CF-30	6	3	19 (48.72)	2	0	6 (37.50)	2	1
Gentamicin, BBL, GM-10	1	3	17 (43.59)	1	0	5 (31.25)	1	0
Neomycin, BBL, N-30	3	3	21 (53.85)	0	0	6 (37.50)	1	0
Nalidixic acid, BBL, NA-30	0	NT	15 (38.46)	1	0	6 (37.50)	0	0
Norfloxacin, NOR-10	10	4	37 (94.87)	1	0	3 (18.75)	1	0
Streptomycin, BBL, S-10	10	4	37 (94.87)	4	0	10 (62.50)	3	2
Trimethoprim/ Sulfa-methoxazole, BBL, SXT	6	1	30 (76.92)	4	1	8 (50.00)	1	0
Tetracycline, EIKEN, Te-30	6	3	37 (94.57)	3	2	12 (75.00)	3	2

Figures in parenthesis denote percentages

cholerae were mainly in the children who were from Pazundaung, Mingalataung-nyunt, Dala, Dawpon, Seikkyi, Tharketa, Hlaingtharyar and Shwepyithar areas. The resistant pattern to amikacin also increased from 1.67% in 1996 [10] to 92.31% in 2003 in this study. Similarly, with cephalothin it increased from 9.84% in 1996 [10] to 46.15% in 2003. Thus, it is essential to study the epidemiology, clinical spectrum, and pathogenesis of gastrointestinal illnesses and the reservoir of these agents which are still poorly understood so that gaps that still exist can be elucidated and clarified.

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REFERENCES

1. Saidi, S. M., Iijima, Y., Sang, W. K., Mwangudza, A. K., Oundo, J. O., Taga, K., Aihara, M., Nagayama, K., Yamamoto, H., Waiyaki, P. G. & Honda, T. Epidemiological study on infectious diarrhoeal diseases in children in a coastal rural area of Kenya. *Microbiology Immunology*, 1997; 41(10): 773-778.

2. Pai, M., Kang, G., Ramakrishna, B. S., Venkataraman, A. & Muliyil, J. An epidemic of diarrhoea in south India caused by enteroaggregative *Escherichia coli*. *Indian Journal of Medical Research,* 1997; 106: 7-12.

3. Iroegbu, C. U., Ene-Obong, H. N., Uwaegbute, A. C. & Amazigo, U. V. Bacteriological quality of weaning food and drinking water given to children of market women in Nigeria: impli cations for control of diarrhoea. *Journal Health Population Nutrition,* 2000, 18(3): 157-162.

4. Ashraf, S. M. & Yunus, M. Waterborne diseases of bacterial origin in relation to quality of water in a suburb of Uttar Pradesh. *Biomedical Environmental Science,* 1997; 10(4): 442-450.

5. Mehlman, I. J., Fishbein, M., Gorbach, S. L., Sanders, A. C., Eide, E. L., & Olson, J. C. J. Pathogenicity of *Escherichia coli* recovered from food. *Journal Association Off. Anal. Chemistry;* 1976; 59(1): 67-80.

6. WHO. Manual of diagnostic laboratory procedures for acute enteric infections. Simplified methods. Geneva: World Health Organization. 1981.

7. Hart, C. A., Batt, R. M. & Saunders, J. R. Diarrhoea caused by *Escherichia coli*. *Annals Tropical Paediatrics,* 1993; 12(2): 93-97.

8. Riley, L. W., Remis, R. S., Helgerson, S. D., McGee, H. B., Wells, J. G., Davis, B. R., Herbert, R. J., Olcott, E. S., Johnson, L. M., Hargrtett, N. T., Blake, P. A., & Cohen, M. L. Haemorrhagic colitis: Associated with a rare *Escherichia coli* serotype. http://www. Mcspotlight.org/media/reports/e-coli-us.htmlp.1-6

9. Shears, P., Hussein, M. A., Chowdhury, A. H., & Mamun, K. Z. Water sources and environmental transmission of multiply resistant enteric bacteria in rural Bangladesh. *Annals of the Tropical Medicine Parasitology;* 1995; 89(3): 297-303.

10. Mar Mar Nyein, Khin Myat Tun, Nyomie Kyaw, Thuzar Myint, Moh Moh Win, Wah Wah Aung & Than Nu Shwe. Enteropathogenic *Escherichia coli* (EPEC) from acute diarrhoeic children with *in vitro* antibiotic susceptibility. *The Myanmar Health Sciences Research Journal,* 1999; 11(1-3): 14-17.

11. Mar Mar Nyein, & Khin Myat Tun. Antimicrobial susceptibility testing of *Shigella* species and enteropathogenic *Escherichia coli* (EPEC) isolated from dysenteric cases of children in Yangon Children's Hospital during 1996. *The Myanmar Health Sciences Research Journal,* 2000; *12*(1-3): 25-29.

Study of snakebite cases admitted to Yangon General Hospital

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A total of 461 snakebite cases (312 retrospective plus 149 prospective) admitted to Yangon General Hospital from January 1999 to April 2001 were studied. Both groups had similar epidemiological and clinical parameters, data were pooled and presented together. Russell's viper bite constitutes 14% (n64) , cobra 5% (n 22), sea snake 0.2% (n 1), unknown 66% (n 302) and green pit viper16% (n 72). Thirty eight percent (24/64) of Russell's viper bites developed renal failure, 21% (5/24) underwent peritoneal dialysis and 80% (4/5) recovered. Forty two percent (10/24) of the cases with acute renal failure and shock died. Only 52% (33/64) of Russell's viper bites had incoagulable blood on admission and 2 to 14 ampoules of antivenom were given. Clot restoration took 2 ¼ hr to 4 days. Eighteen percent (4/22) of the cobra bites needed ventilatory support and all recovered. Forty four percent (32/72) of green pit viper bites had incoagulable blood on admission and 10% (7/72) were given 1 to 7 ampoules of Russell's viper antivenom. Four percent (12/302) of unknown bites were given 1 to 4 ampoules of either Russell's viper or cobra antivenom. No specific antivenom was available for sea snakebite case and the patient expired despite conservative therapy.

INTRODUCTION

Snakebite is an occupational hazard of our farmers. It usually occurs in the paddy fields and patients are transported to the nearest health station for treatment. A proportion of snakebite cases were either referred or admitted to Yangon General Hospital (YGH) for further management. It is not known that the pattern of snakebite cases admitted to YGH is different from that of district hospitals [1]. Snakebite still rates at high rank among causes of admission to YGH. Geographical variation of the biological properties of Russell's viper venom is well documented [2]. This study concerns with study of clinical details and outcome of snakebite cases admitted to YGH during 1999 Jan to 2001 April.

MATERIALS AND METHODS

This study included both retrospective (1999 Jan to 2000 July) and prospective (2000 Aug to 2001 April) snakebite cases admitted to YGH. Since the patients' clinical parameters and outcome of the two groups were similar, data were pooled and presented together. For retrospective study, the patients'old medical records were reviewed. Clinical details of the prospective cases were recorded in standard proformas. Clotting test was performed on admission and repeated 6 hourly for 24h in patients presented with clottable blood and 6h in patients with incoagulable blood until normal clotting is restored. 2-4 ampoules of monospecific antivenom were given to Russell's viper and cobra bite cases.

RESULTS

A total of 461 snakebite patients (312 retrospective & 149 prospective) were studied. Fourteen percent (n64) of the bites were due to Russell's viper (*Daboia russelii siamensis*) (RV), 4% (n22) cobra (*N. kaouthia*), 0.2% (n1) sea snake, 16% (n72) green pit viper and 66% (n302) unknown bites.

Russell's viper bites

30% (n19) of RV bites were from Twentae township, 16% (n10) Dala, 14% (n9) Hlaingtharyar, 8% (n5) Kyimyindaing, 5% (n3) Hmawbi, 3% (n2) Khanaungto, Tharkayta, Hlegu & South Dagon, and 1.5% (n1) Htantabin, Kyauktan, Kawhmu, Hlaing, Kunchangon, Zalon (Ayerwaddy Division), Yangon (Zoo), Mingalartaungnyunt, Thingankyun and Botahtaung.

Table 1. Clinical details of Russell's viper bite cases

(44 retrospective + 20 prospective		%
Time of bite : Day (6am-6pm): Night (6pm-6am)	21:43	33:67
Activity when bitten : working: walking:staying at home (prospective)	9:4:7	45:20:15
Place of bite : paddy field: house compound : work place: on the road (prospective)	6:5:5:4	30:25:25:20
Site of bite : upper limb: lower limb	13:51	20:80
First aid: tourniquet	19	95
immobilization	16	80
suction	4	20
incision	4	20
herbal medicine	1	5
tattoo	2	10
local injection of anti-venom around site of bite	2	3

Clinical details of Russell's viper bite cases are shown in table (1) and (2). Of 64 bites, 64% (n41) were systemic, 30% (n19) local and 6% (n4) no envenoming. Two to four ampoules of antivenom were given to all (except one) and 2-12 amps were given at admission. Two systemic envenoming cases treated with 2 amp of antivenom initially and followed by 4 amps in divided doses died of complications. Subcutaneous injection of antivenom around site of bite was found in 2 cases.

Table 2. Clinical details of 60 envenomed Russell's viper bite cases

Local features		%	Symptoms (local-19 & systemic-41)		%
Local pain at site	57	95	Loin pain	18	30
Local swelling	57	95	Epigastric pain	12	20
Tender lymph node	20	33	Vomiting	16	27
Local blister	3	5	Systemic (41)		
Necrosis	2	3	Gum bleeding	1	2
Bruise	1	2	Haemtoptysis	2	3
Blackening	9	15	Haematemesis	10	17
			Melena	10	17
			Haematuria	13	22
			Conjunctival haemorrhage	6	10
			Conjunctival edema	8	13
			Puffy face	10	17
			fever	19	32
			Oliguria <400ml/24hr	24	40
			Proteinuria	41	68
			Shock	11	18
			Hypertension	7	12

Clot restoration took 27.7 h (2¼h-5 days) and in 5 fatal cases blood is incoagulable upto the time of death (2-4 days). Twenty four (38%) patients subsequently developed acute renal failure (ARF): 5 (21%) underwent peritoneal dialysis, 19 treated conservatively, of which 7 (37%) recovered Eighty. percent RV bite patients recovered including 11 patients with ARF.Thirteen (20%) of the systemic envenomed cases with complications died of shock, systemic bleeding and acute renal failure (ARF).

Cobra bite

Cobra bite cases were admitted to YGH in 6h (½ -74 h) after the bite. Majority 56% (5/9) were bitten during daytime and 82% (18/22) applied first aid before admission. Most 58% (11/19) were bitten in the lower limb and 42% (8/19) in the upper limb. Eighteen percent

(n4) of the bites were from Tharkayta, 14% (n3) Hlaingtharyar, 14% (n3) Twentae and the rest from other Townships of Yangon division. Majority 59% (n13) of cobra bites had drowsiness, 50% (n11) ptosis, 45% (n10) local swelling, 27% (n6) respiratory depression, 18% (n4) dyspnoea, 9% (n2) slurred speech & tachypnea, 5% (n1) blurred vision, tender local lymph node, cyanosis, confusion, respiratory arrest and shock respectively. One to 10 ampoules of anti-venom were given to all patients. Thirty six percent (n8) were referred to intensive care unit and 18% (n4) required ventilatory support and all recovered.

Sea snakebite

One sea snakebite patient bitten in Insein Township was admitted to YGH in 7½ h after the bite. He was bitten at hand and presented with painful local swelling secondary to wound incision and later complicated with local cellulitis, dyspnea, dysphagia, paraparesis, myoglobinuria, renal failure, respiratory muscle paralysis and respiratory failure. Despite ventilatory support, the patient died.

Green pit viper bite

Green pit viper bites accounts for 16% (72/461) of the bites and 64% (n46) were bitten in Bahan Township and 10% (n7) in Kamaryut Township. Forty four percent (n32) had incoagulable blood on admission, 89% painful local swelling and 10% blister, bruise, necrosis and cellulitis. All were admitted to the hospital within 4 hrs after the bite. Most 63% (n45) bites occur in lower limb and 25% (n18) in upper limb. Majority 67% applied tourniquet and 10% (n2) received 2-7 amp of Russell's viper antivenom.

Unknown bites

Majority 66% (302/461) of the bites were unknown bites. Apart from slight local swelling and pain, no serious sequelae occurred. Four percent (n12) of the bites received 1-4 amp of either Russell's viper or cobra antivenom. All recovered without any complication.

DISCUSSION

The pattern of snakebite cases admitted to YGH is different from that of referral study of the same hospital. Majority of the bites are unknown bites (66%) and green pit viper bite constitutes 16% of the bites. The possible reasons for high admission to the hospital include YGH has facilities for renal dialysis and ventilatory support.

Russell's viper bite is most common in Tontay town ship. Since snakebite patients are still using traditional first aid, extensive health education is needed. For systemic envenoming patients, initial 2 amp of ASV is not enough to prevent development of serious complications. At least 4 amp of ASV should be prescribed initially in systemic envenomed patients (3). Efficacy and doses of RV antivenom should be reviewed since clot restoration took 27.7 h in this study.

It is also noted that Russell's vipers from Yangon division are quite effective in envenoming the victims since 64% of the bites resulted in systemic envenoming compared to 61% in Myinmu [1], 44% in Tharyawaddy [4] and 34% in Taungdwingyi [5]. Spontaneous bleeding such as haemoptysis, haematemesis, melena and haematuria were less common compared to Danuphyu study [6]. About one third of RV bite cases developed acute renal failure and the incidence was higher than other studies [1].

Green pit viper bite presented with incoagulable blood and local swelling could misdiagnose as Russell's viper bite. Unnecessary use of antivenom is also noted in green pit viper and unknown bites.

REFERENCES

1. Tun Pe, Aye Aye Myint, Sann Mya, Khin Aye Kyu, Kyaw Than, Aung Myint, Tint Lwin, Myint Soe and Min Than. A study of Russell's viper (*Dabioa russelii siamensis*) bites from six snakebite endemic township hospitals. Myanmar Health Research Congress 2000 abstract p.74.

2. Tun Pe, Aye Aye Myint, Kyi May Htwe, Khin Aung Cho and Theingi. Geographical variation of biological properties of Russell's viper (*Daboia russelii siamensis*) venom. *Myanmar Health Sciences Research Journal* 2001; 13:56-56.

3. Tun Pe, Aye Aye Myint, Khin Aye Kyu and Sann Mya (2001). Evaluation of prehospital antivenom in management and outcome of Russell's viper (*Daboia russelii siamensis*) bites cases admitted to Taungdwingyi hospital. *Myanmar Health Sciences Research Journal* 2003 ; 50: 1-5.

4. Myint Lwin, DA Warrell, RE Phillips, Tin Nu Swe, Tun Pe, Maung Maung Lay. Bites by Russell's viper (*D.russelii siamensis*) in Burma: Haemostatic, vascular and renal disturbances and response to treatment. *Lancet* 1985; ii: 1259-1264.

5. Sann Mya, Tun Pe, Aye Aye Myint, Nu Nu Aung, Khin Aye Kyu and Tin Oo. Russell's viper bite in Taungdwingyi hospital: Clinical features and response to antivenom. *Myanmar Health Sciences Research Journal* 1998; 10: 26-30.

6. Kyaw Than, Tun Pe, Aye Aye Myint and Nu Nu Aung. Clinical features and response to antivenom of Russell's viper bite cases of Danuphyu, Ayerwaddy division. *Myanmar Health Science Research Journal* 1997; 9:93-96.

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An educational intervention for improving knowledge, attitude and practice of mothers on indoor air pollution and acute respiratory infections

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A community-based intervention study was conducted in North Okkalapa Township during July 2002 to September 2003 with the aim of assessing the effectiveness of intervention to improve maternal knowledge, attitude and practice (KAP) on indoor air pollution and acute respiratory infections (ARI). Intervention included health education of mothers through the use of Information, Education and Communication (IEC) materials. A total of 669 mothers, 331 from the intervention and 338 from the control areas, participated in the study. At post intervention assessment conducted 6 months after intervention, maternal knowledge on cause of ARI and attitude towards indoor air pollution and ill health were significantly improved in the intervention area. Their practice on use of scent stick in the living room also diminished compared to control area. Our results indicate that with relatively inexpensive methods and simple interventions, KAP of mothers on indoor air pollution and ARI can be improved.

INTRODUCTION

Acute lower respiratory infection (ARI) is the single most important cause of mortality in children aged under 5 years, accounting for around 2 million deaths annually in this age group [1]. The severity and fatality of ARI is much greater in the developing nations and amongst socially and economically deprived groups in the developed countries [2].

Agents of respiratory diseases are mainly transmitted through the air. Crowding, domestic smoke and inadequate ventilation are significant risk factors for ARI [3]. Approximately half the world population and up to 90% of rural households in developing countries still rely on unprocessed biomass fuels in the form of wood, dung and crop residues [4]. As a result there are high levels of indoor air pollution, to which women, especially those responsible for cooking, and their young children, are most heavily exposed. Various studies in developing countries have reported on the association between exposure to indoor air pollution and acute lower respiratory infections [3, 5, 6, 7]. It is also responsible for upper respiratory infections and middle ear infections [8].

Such consequences can be controlled only if the prevailing knowledge, attitude and practice (KAP) of the community could be improved. So this study was conducted with the following objectives:

1. To access the effectiveness of an educational intervention for improving KAP of mothers on indoor air pollution and ARI ;

2. To reinforce the avoidance of practices enhancing indoor air pollution in the study area.

MATERIALS AND METHODS

Study area and population

A community-based interventional study was carried out in North Okkalapa Township, a peri-urban township of Yangon during July 2002 to September 2003. Two wards with similar geographic and socio-economic conditions were selected, one as a test (intervention) and the other as a control area. The location of the control area was about two miles away from intervention area so as to eliminate the contamination effect of health education.

All households with at least one under-five child were enumerated from each ward. Only one family was randomly selected if the household consisted of more than one family. The respondent was the mother or caretaker of under-five children and a total of 669 participants, 331 from intervention and 338 from control area, were recruited for the baseline study. Some families migrated out during the study period. Thus, 223 mothers from the intervention area and 254 from the control area were available for follow up at post intervention assessment.

Methodology

Before the field survey, training on systematic filling up of the proforma was given to interviewers. After having informed consent, data was collected by face to face interview using pre-tested structured questionnaire to obtain base line data on KAP of mothers on indoor air pollution and ARI in both areas.

Thereafter, three sessions of Focus Group Discussions (FGD) were conducted on mothers of the intervention area for the development and choice of Information, Education and Communication (IEC) material. Thirty-one mothers of under-five children participated in these sessions. Their age range was 19-50 years and the majority (19) fell within (26-35) year age group. More than half of respondents (18) were primary school level. Only 3 mothers attended a university/ college. Regarding their occupation, majority (21) were dependent and few were unskilled labour. Choice of IEC material, its format, content and distribution were discussed during FGD sessions. All respondents participated in the discussions actively and shared the ideas, experiences and suggestions. The facts discussed individually and collectively by the respondents were counted down in details. Based on their opinion, wall posters and pamphlets were chosen as IEC materials for health education. Illustrated wall posters containing messages to highlight the danger of indoor air pollution were placed at strategic locations in the market place and other parts of the intervention area. Pamphlets containing messages on causes and prevention of ARI with special emphasis on avoidance of indoor air pollution were also distributed to the households. In the control area, no special interventions were instituted except for the routine measures for ARI treatment and control like child immunisation.

Beginning 6 months after initiation of intervention, post intervention assessment was started in both areas. The same questionnaire used in base line data collection was administered to mothers of under-five children to record their KAP regarding indoor air pollution and ARI.

Statistical methods

Data analysis was performed with SPSS Version 10.0 software. Statistical comparisons of categorial variables were made with use of chi-square statistics. Differences were considered significant if $p<0.05$.

Ethical consideration

This study was approved by the Medical Ethics Committee of the Department of

Medical Research.

RESULTS

Comparability of the intervention and control areas in the baseline period

Table 1. Baseline socio-demographic variables of the intervention and control areas

Variables	Intervention area n=331	Control area n=338	p-value
Age groups of mothers			
≤25 years	70(21.1%)	69(20.3%)	>0.1
26-35 years	169(51.1%)	180(53.3%)	
36-45 years	62(18.7%)	60(17.8%)	
≥46 years	39(9.1%)	29(8.6%)	
Education of mothers			
No formal education	9(2.7%)	9(2.7%)	>0.05
Primary school	53(16.0%)	66(19.5%)	
Middle school	120(36.3%)	112(33.1%)	
High school	100(30.4%)	109(32.2%)	
College	49(14.8%)	42(12.4%)	
Occupation of mothers			
Own business	8(2.4%)	6(1.8%)	>0.05
Unskilled labour	47(14.2%)	39(11.5%)	
Government employee	18(5.4%)	19(5.6%)	
Employee at private business	12(3.6%)	7(2.1%)	
Dependent	246(74.3%)	267(79.0%)	
Family income per month (Kyats)			
≤10,000	82(24.9%)	85(25.1%)	>0.1
11,000-20,000	133(40.4%)	150(44.4%)	
≥21,000	114(34.7%)	103(30.5%)	
Number (%) of houses constructed with bamboo	89(27.1%)	49(14.5%)	<0.01
Median number of room per house (interquartile range)	2(1-3)	2(2-3)	
Median number of window per house (interquartile range)	3(1-5)	3(1-4)	
Median number of persons in the household *(interquartile range)*	6(5-9)	7(5-9)	

Table 1 shows the comparative demographic and socioeconomic profiles of the 331 intervention families and 338 control families in the baseline period. They are comparable with respect to important characteristics such as age of the mothers, education, occupation and family income. The only difference was in the type of house construction. Maternal knowledge on indoor air pollution and ARI was also similar (Table 2).

Table 2. Knowledge of mothers on indoor air pollution and ARI at baseline period

Knowledge	Intervention area n=331	Control area n=338	p-value
Knows what ARI is	261 (78.9%)	274 (81.3%)	>0.1
Knows cause of ARI	241 (73.0%)	254 (75.6%)	>0.1
Knows relationship of smoking and respiratory infections	291 (87.9%)	291 (87.9%)	>0.5
Knows relationship of passive smoking and ARI	270 (81.6%)	291 (87.1%)	>0.1

Table 3. Maternal practices enhancing indoor air pollution at baseline period

Practice	Intervention area n=331	Control area n=338	p-value
Cooking place			
In the living room	134(40.5%)	155(45.9%)	>0.05
Kitchen	138(41.7%)	132(39.1%)	
outside the house	59(18.8%)	51(15.1%)	
Type of fuel for cooking			
No smoke forming*	15(4.5%)	26(7.7%)	>0.05
Smoke forming**	316(95.5%)	312(92.3%)	
Use of scent stick	253(75.3%)	211(63.7%)	<0.001
Use of mosquito coil	277(82.4%)	236(71.3%)	<0.01
Use of fume to drive out mosquitoes	163((50.6%)	160(48.8%)	>0.1

*No smoke forming = Electric/gas
**Smoke forming = Wool/coal/kerosene

Regarding their attitudes. 279 (84.3%) respondents from intervention and 299 (89.5%) from control areas agreed that

indoor air pollution can cause ill health (p = >0.1). Moreover, 290 (87.6%) and 295 (88.1%) from intervention and control areas respectively agreed indoor air pollution and ARI were preventable (p = >0.5). The differences were not statistically significant between the two areas.

Majorities of the maternal practices were also identical except the use of scent stick and mosquito coils in their living room or bed room that were significantly higher in the intervention area (Table 3).

Comparison of knowledge, attitude and practice of mothers after the intervention

Table 4 compares the maternal knowledge in the study areas after educational intervention. Knowledge on cause of ARI was significantly higher in the intervention area.

Table 4. Knowledge of mothers on Indoor air pollution and ARI at post intervention assessment

Knowledge	Interven-tion area n=223	Control area n=254	p-value
Knows what ARI is	154 (69.1%)	174 (68.5%)	>0.5
Knows cause of ARI	182 (81.6%)	184 (72.4%)	<0.05
Knows relationship of smoking and respiratory infections	210 (94.2%)	232 (91.3%)	>0.1
Knows relationship of passive smoking and ARI	186 (83.4%)	215 (84.6%)	>0.1

When acquired about their attitudes, 205 (92.3%) mothers in the intervention area agreed that indoor air pollution could cause ill health compared to 181 (85.0%) in the control area. The difference was statistically significant (p=<0.01). But no significant difference was found as 203 (91.1%) respondents in the former and 228 (89.8%) in the latter area agreed that indoor air pollution and ARI were preventable (p= >0.1).

Regarding the maternal practices, the use of scent stick in the living room was significantly less in the test area than in the control area at post intervention assessment. Other practices enhancing indoor air pollution did not differ significantly in both areas (Table 5).

Table 5. Maternal practices enhancing indoor air pollution at post intervention assessment

Practice	Intervention area n=223	Control area n=254	p-value
Cooking place			
In the living room	74(33.5%)	84(32.9%)	>0.1
Kitchen	96(42.7%)	122(47.8%)	
Outside the house	53(23.9%)	48(19.2%)	
*Type of fuel for cooking**			
No smoke forming	47(21.2%)	73(28.6%)	>0.05
Smoke forming	175(78.8%)	181(71.4%)	
Use of scent stick	134(60.4%)	186(72.9%)	<0.01
Use of mosquito coil	144(64.9%)	178(69.8%)	>0.1
Use of fume drive out mosquitoes	136(61.3%)	149(59.1%)	>0.1

*Same as defined under Table 3

DISCUSSION

After the health education, maternal knowledge on cause of ARI was found to be higher in the intervention area as was their attitude towards indoor air pollution and ill health. In addition, practice of mothers on use of scent stick in their living room was significantly less compared to the control area.

Since the trial used a concurrent control, to access whether the differences were real and due to the intervention two study areas should be comparable at the baseline. Although the maternal practices on use of scent stick and mosquito coils were different between intervention and control area at the baseline period, they were found to be higher in the intervention area. Thus, the less use of scent stick in this area after intervention may reflect the real improvement attributable to

effectiveness of intervention. The use of mosquito coils in the bed room was decreased relatively to baseline in both groups but the difference was not significant at post intervention assessment.

While no specific attempt was made to monitor for "spillover" of the educational message from intervention to control communities, the distance between the two areas (about 2 miles) separating the communities made such an occurrence unlikely. Moreover, such contamination would have lessened the measured impact of the intervention and would have constituted a major concern only if the study had failed to find an effect.

Our results suggest that simple health educational intervention with relatively inexpensive methods can improve the KAP of mothers on indoor air pollution and ARI.

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REFERENCES

1. Graham, N. The epidemiology of acute respiratory infections in children and adults: a global perspective. *Epidemiol. Rev.* 1990; 12: 149-78.
2. Douglas, R., Kerbey-Eaton, E. Acute respiratory infections in childhood. *Proc. Int. Workshop,* Sydney, 1984.
3. Armstrong, J.R. & Campbell, H. Indoor air pollution exposure and lower respiratory infections in young Gambian children. *Int. J. Epidemiol.* 1991; 20: 424-29.
4. World Resources Institute, UNEP, UNDP, World Bank. World resources: a guide to the global environment. Oxford, Oxford University Press, 1998.
5. Collings, D.A., Sithole, S.D. & Martin, K.S. Indoor woodsmoke pollution causing lower respiratory disease in children. *Tropical Doctor* 1999; 20: 151-55.
6. Campbell, H., Armstrong, J.R. & Byass, P. Indoor air pollution in developing countries and acute respiratory infections in children. *Lancet* 1989; i: 1012.
7. Smith, K *et. al.* Indoor air pollution in developing countries and acute respiratory infections in children. *Thorax* 2000; 55: 518-32.
8. Daigler, G.E., Markello, S.J. & Cummings, K.M. The effects of Indoor air pollutants on otitis media and asthma in children. *Laryngoscope* 1991; 101: 293-96.

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A study on abortion in South Okkalapa

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As maternal morbidity and mortality following induced abortions are still high in hospital-based-studies in Myanmar (Win Win Mya; 2000 and Krsasu; 1992) [4-5], the knowledge, attitude and practice concerning abortion should be explored among the community. The general objective of this study is to identify the problem of abortion in South Okkalapa Township in the Yangon City. This study is a cross-sectional community-based descriptive study using both quantitative and qualitative data collection techniques. The study population comprised 572 currently married women aged 15 to 49 years residing in South Okkalapa Township. The eligible women were recruited during household surveys during May to October 2002. The project medical officer and interviewers were trained for data collection and face-to-face interviews. More than three quarters (77.7 %) of the study sample were aged 30 years and above, one third (35.8%)were educated up to the middle school level and more than seventy percent (73.4) were dependent housewives. The majority were Buddhists (93.5%). More than half (55.4%) of the husbands of the respondents were high school or university graduates and nearly half (48.8%) of them were either small or large scale business owners. Income was between 10,001 to 50,000 Kyats per month for nearly two thirds of the families. Eighty percent belonged to the parity one to three group. A history of abortion was given by 125 (21.9%), of whom 28 (4.8%) were repeat aborters. Only 19 women (3.3%) admitted having induced abortion. When specific abortion rates were analyzed, an increasing trend was observed by age of respondent and duration of marriage. When odds ratios were estimated for the selected variables, the older age group (30 year and above) and the longer the duration of marriage (10 years and above) were found to have high risk of abortion.

INTRODUCTION

Worldwide, 180 to 200 million pregnancies occurred each year. Among them, 75 million pregnancies were unintended and more than a half million pregnant women died each year and more than twenty million had reproductive morbidity following pregnancy. Of among these 75 million unintended pregnant women, 50 million underwent induced abortion and twenty million had unsafe abortion [1].

Maternal mortality ratio for Myanmar in 1999

was estimated at 2.55 per thousand live births and urban – rural difference is apparent; 1.78 for urban and 2.81 for rural respectively [2]. The maternal mortality is quoted as 1 and 1.23 per 1000 live births for the year 1994-1995 in urban and rural areas [3].

Abortion is one of the leading causes of the high rates of maternal mortality in Myanmar. The causes of maternal mortality according to a 18 hospital study in Myanmar in 1989-90 had revealed that abortion contributes 38.34% [4]. Abortion still contributes significantly to maternal mortality in North Okkalapa General Hospital, during 1992 to 1998 (a seven year period study), septic abortion comprises 54.17% of direct obstetric deaths [5].

Abortion causes not only maternal mortality but also morbidity and this was shown in reproductive morbidity survey conducted in rural and urban Pyay and Kalaw in 1999 [6].

There has been only one community-based epidemiological study of abortion in Myanmar. In this study of 943 currently married women residing in North Okkalapa, 58% reported at least one abortion, of which 20% were reported to have been induced [7].

Determinants or factors that explain why women resort to abortion and identification of the high risk patients who chooses abortion despite its illegality and the risks of mortality and morbidity have emerged as important issues in reproductive health [8].

Although many unintended pregnancies are carried to term, subgroups of women with the greatest occurrence of unintended pregnancy that choose to abort can be identified. These women may form a target group who is in need of improved reproductive health services.

Thus a community-based study on abortion in a peri-urban area like South Okkalapa is both timely and essential.

General objective

The general objective is to identify the problem of abortion in South Okkalapa Township, Yangon Division, Myanmar.

Specific objectives

1. To identify the selected socio-demo graphic and reproductive characteristics of women who have abortion.
2. To find out the types and number of abortion in the study population.
3. To identify the risk factors for abortion.
4. To determine the sequelae of induced abortion.

MATERIALS AND METHODS

Study design

It is a community based cross- sectional descriptive study. It was conducted by trained interviewers with questionnaire method.

Study area and population

South Okkalapa township is situated 12.87 kilometers from downtown Yangon and 1900.72 acres wide. It is quite close to Yankin, Thingangyun, North Okkalapa and Dagon Satellite Townships. The total population were 162992 and women of childbearing aged between 15-49 years were 79644, which was nearly 50% of the population. There are 13 wards in the township with the mixture of low, middle and high social classes. The South Okkalapa Women's and Children's Hospital, is situated in No. 10 ward. In 2001, abortion-delivery ratio was 1:4 with the actual number of 730 and 2833 respectively. Abortion and its complications contributed more than half of the total admissions to gynecological wards and induced abortion comprised 5% to 29.2% of these abortions according to South Okkalapa Women's and Children's Hospital data, 2001.

Sample size and sampling procedure

The study population comprises 572 currently married women aged 15-49 year. The study area comprises 13 electoral units of which 5 clusters were chosen to obtain the desired sample size by means of random sampling. The eligible women were recruited during household surveys conducted at the selected electoral units with mixed social classes; low, middle and high respectively.

RESULTS AND DISCUSSION

The coded questionnaires were entered by using EPI-INFO software and data analysis was performed by SPSS software version 10.00.

Duration of study

Study period was from 1st May 2002 to 31st October 2002.

Findings and Discussion

More than three quarter (77.7%) of the study sample were aged 30 years and above. One third were educated up to the middle school level and nearly half (47.8%) were high school and university graduates. Less than one percent did not have formal education which was much less than in the North Okkalapa community-based study in which 16.04 percent had either monastic education or had attended 3 R classes and could read and write [7]. Seventy three percent were housewives. The majority (93.5 percent) were Buddhists.

The husbands of the respondents belonged to a higher education level. More than half (55.4%) of the husbands of the respondents were high school or university graduates. Almost all of them, except six were gainfully employed in the public or private sector or obtained their livelihood by doing odd jobs. Nearly two-thirds had an income ranging in between 10,001-50,000 Kyats per month.

Some 32.3 percent had married before the age of 20 years. This 32.3 percent (age of marriage) is much less than 54.26 percent found in the North Okkalapa study [7]. Also in a study on birth spacing practices in twenty townships, 51.79 percent of women were married below the age of 19 years [10].

The modal duration of marriage was 10-14 years in one-fifth of the study population, 20 percent each had been married for 5-9 years, 15-19 years and 5-9 years respectively. Only 16 percent had been married for less than four years.

Four hundred and sixty women (80.4%) belonged to the parity 1-3 group whereas 10 percent were parity 4-6 group and nearly 9 percent have not conceived yet.

Table 1. Type and number of abortion of the study population

Variables	Frequency N=572	Percentage
Type of abortion		
Spontaneous	106	18.5
Induced	19	3.4
Number of abortions		
Once	97	17.0
Twice	22	3.8
3 times	3	0.5
4 times	3	0.5
Never	447	78.1

According to Table 1, a history of abortion is given by 21.9 percent of the study sample which is slightly higher than 14 percent of the sample in the birth spacing study mentioned above [10]. This figure appears comparably low to 57 percent of abortion in the North Okkalapa study [7]. However, abortion is known to be notoriously high in hospital-based studies [11, 12].

A history of induced abortion was obtained only in 3.4 percent of women in our study which is only half (6.3%) of the above mentioned community-based study in North Okkalapa. Hospital studies indicate that 20

to 25 percent of all abortion admissions are induced [11, 12]. In South Okkalapa Women's and Children's Hospital, induced abortion ranged from 5 to 29.2% of abortions admissions with average of 21.1%.

Table 2. Specific abortion rate among currently married women, aged 15-49 years by socio-demographic and reproductive characteristics

Variables	N	Abortions	Rate	Significance
Age group (in years)				
<25	52	3	5.9	
25-29	76	6	7.9	p =0.000***
30 & +	444	116	26.1	
Duration of marriage (in years)				
1-4	91	5	5.5	
5-9	128	21	16.4	p <
10+	353	99	28.0	0.001***
Contraceptive users				
Ever	468	93	19.9	p = 0.02**
Never	104	32	30.8	

**Significant at P = 0.05
***Significant at P = 0.001

Specific abortion rates are presented in Table 2. Histories of abortion were more common in those women of an older age group and longer duration of marriage, revealing significantly increasing trend. This trend was also found in the North Okkalapa community-based study but no statistically significant differences were observed among those with 5 year age group of age at first marriage, low to higher level of educational attainment of respondents, and those with low or high per head income.

When crude odds ratio were estimated in Table 3, women aged between 25-29 years and women over 30 years had risk of abortion 1.4 times and 5.6 times higher than those aged less than 25 years. Those who were married for 5-9 years and more than 10 years had risk of abortion 3.4 times and 6.7 times higher than those married for 1-4 years.

However, after logistic regression was performed to determine adjusted odds ratio of having risk of abortion, those women who were married for 5-9 years had 2.9 times and those whose marriage was more than 10 years had 3.4 times higher than those married for 1-4 years.

Abortion was considered having immediate, intermediate and remote medical and social sequelae. For immediate sequelae, 2 out of 19 patients (10.5 percent) who had induced abortion were required blood transfusion (Table 4). One third of women with history of induced abortion needed to borrow money (31.6%).

Among the intermediate sequelae of abortion, pelvic pain was complained by 6 out of 19 (31.6 %). Thirteen out of 19 induced Thirteen abortion patients (68.5 percent) need bed rest and away from work for more than 10 days.

Table 3. Crude odds ratio and adjusted odds ratio of logistic regression on risk of having abortions of currently married women, aged 15-49 years

Variables	History of abortion		Crude odds ratio	95% CI	Adjusted odds ratio	95% CI
	Yes	No				
Age(in years)						
25	3	49	1.00		1.00	
25-29	6	70	1.37	0.32-5.74	0.97	0.27-3.44
30 and above	116	328	5.64	1.72-18.44	2.29	0.72-7.22
Duration of marriage (in years)						
1-4	5	86	1.00		1.00	
5-9	21	107	3.37	1.22-9.31	2.88	1.12-7.38
10+	99	254	6.70	2.64-16.99	3.44	1.31-9.01

Table 4. Types of sequelae of abortion among induced abortion

Sequelae	No.	Percent (N = 19)
Immediate		
Medical : Blood transfusion	2	10.5
Social : Borrowed money	6	31.6
Contraceptive use following abortion	14	73.7
Intermediate		
Medical : Pelvic pain following abortion	6	31.6
Social : Bed rest for more than 10 days	13	68.5
Away from work for more than 10 days	13	68.5
Remote		
Medical: Next pregnancy	8	42.1
Outcome of next pregnancy		
- Normal delivery	6	31.6
- Another abortion	1	5.3
- Ectopic pregnancy	1	5.3

Regarding the remote sequelae of abortion, 8 out of 19 women who had induced abortion got pregnant again (42.1 percent) but the others did not. The outcome of next pregnancy were; 6 had normal delivery, 1 had abortion and 1 ended with ectopic pregnancy.

CONCLUSION

The event, usually unsafe abortions primarily stems from unwanted and unplanned or untimely pregnancies especially in peri-urban communities including South Okkalapa. Despite experiencing complications, 4.8% of the study population were repeat aborters. This fact should be taken into account in formulating strategie concerned with abortio reduction. The promotion of a high level of awareness in relation to dangers of abortion under unsafe conditions is a necessity for information, education and communication (IEC) campaigns. It is of great importance to conduct comprehensive research in fertility regulation behaviour after induced abortion.

Recommendations

1. According to the present study, knowledge and practice on reproductive health and fertility regulation should be promoted for all women of reproductive age.
2. All women of reproductive age and the community should be provided with information on the dangers of septic induced abortion.
3. Training on post abortion care should be introduced among basic health personnel (e.g. midwifery-trained-personnels).

REFERENCES

1. Social Science Research Initiative on Quality of care in Reproductive Health, WHO, 2000.
2. National Mortality Survey. Central Statistical. Organization, Ministry of National Planning and Economic Development, Yangon, Myanmar, 2000.
3. Country Profile on Reproductive Health, Myanmar by Department of Health, Maternal and child Health Section, 1998.
4. Krasu, Mary; An overview of maternal morbidity in Myanmar. Proceeding of a seminar on Maternal Morbidity, Yangon, Obstetric and Gynaecological Section. Myanmar Medical Association, 1992.
5. Win-Win-Mya (2000). An audit on Maternal Mortality in North Okkalapa General Hospital over seven years between 1992-1998. A paper presented at 46th Myanmar Medical Association Annual Congress, Yangon, Myanmar.
6. Perceptions of Reproductive Morbidity among Women, Men, and Service Providers in Pyay and Kalaw Townships in Myanmar, UNFPA, Myanmar 1999. (2001).
7. Ba-Thike, K *et al.* (1995). Abortion in North Okkalapa. Report WHO-HRP (1995). Progress in Human Reproduction Research (1993) Understanding Abortion 25:1
8. Adamson.P. (ed). The Progress of Nations: 1996, New York: UNICEF, 1996.
9. Bo Kywe and Maung Maung Lin (1993). Birth spacing practices in Twenty Townships, Department of Health, Yangon, Myanmar
10. Ba Thike, Katherine; Aye Aung, Khin Thet Wai and Myint Maung Maung (1992). Abortion at North Okkalapa General Hospital. Abstracts of papers. Myanmar Medical Research Congress.
11. Khin San Wai (1984). Septic abortion at the Mandalay General Hospital. M. Med. Sc. dissertation.

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SHORT REPORT

Disseminating messages on leprosy

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Leprosy continues to afflict a large number of people in the past years. However, it is now possible to eliminate it as a public health problem. The affected people not only face physical impairments but also suffer psychosocial repercussions due to the community's attitude. The prevalence of leprosy has been reduced globally by 85% since 1985. It is estimated that about 2.5 million people affected by leprosy need to be detected and treated during the period 2000-2005. In Myanmar, preventing the occurrence of disabilities by early diagnosis, treatment, improved management of cases, and changing the negative image of leprosy are the important strategies. These are implemented through capacity building of basic health staff, leprosy vertical staff, voluntary health workers and members of Myanmar Maternal and Child Welfare Association (MMCWA) by flushing out hidden, unreported cases. MMCWA is a strong association and reaches down to the grass roots level in 321 townships. MCWA members were trained to take part in an innovative approach of disseminating leprosy related key messages to the community [1,2,3].

They had to give the key information: the early sign of leprosy and the place where anti-leprosy drugs are got free. The communication methods to be used in the disseminating process are: (1) individual talk (2) small group discussion (3) mass talk [3].

The study was aimed to explore the disseminating messages on leprosy through MCWA communicators in Bago (West) Division. Specific objectives were to assess the leprosy knowledge of MCWA communicators, to find out the dissemination process of leprosy related knowledge by the MCWA communicators to the community, and to elicit the problems encountered in their dissemination process.

A cross-sectional study was conducted for the post-intervention assessment of leprosy related knowledge and performances of MCWA communicators in Pyay, Gyobingauk, and Tharyarwaddy townships. Multistage sampling method was used to choose the townships and villages. Altogether 56 subjects were interviewed by using the predesigned semi-structured questionnaires. We had mainly addressed to the MCWA communicators who had attended the training course on dissemina- tion of leprosy related knowledge at the district and township level, and MCWA communicators to whom the multiplier training had been provided at the village level. Purposive sampling was used to select the MCWA communicators in the chosen areas. The findings were analyzed using matrix analysis method.

Most of the subjects were 40 to 61 years of age (60.7%), married (62.5%), and had 6 to 11 years of schooling. Only 10.7 % had had second degree. All of them knew the

early sign of leprosy was a patch, which is painless, senseless to heat and touch. Only 82 % of them could tell that it was non itchy. We need to consider that they might impart wrong information to the community. Regarding the colour of the patch, 93% of them could give the correct answer that the patch was pale. Among them, 87 % knew that leprosy was caused by one of the infectious agent, and it could be transmitted from one person to another. They all definitely knew that leprosy was curable, and anti-leprosy drugs were available free from any health centre apart from leprosy campaign (86%). Cent per cent attained high scores in knowledge assessment. All of them correctly knew the characteristics of a patch, an early sign of leprosy, and the complete cure of leprosy with anti-leprosy drugs. So we could predict that they might give that relevant message to the public.

Nineteen respondents (34%) had shared their knowledge through mass talk by the arrangement of the township authorities. Among those, 13 members gave mass talk only once, and one member could provide 6 times during 6 months. Twenty-two (39%) communicators had imparted leprosy-related messages to the community as a group talk within the past 6 months. The number of talks ranged from 1 to 12 times. Of which, 12 MCWA members were found to give group talk two times. Only 3 had delivered their knowledge through group talk more than 5 times. It was found that, group talk (two way discussion) was the most preferable method they used to spread the message to the community. The reason was that it was relatively easier to gather the audience than mass talk. They performed focus group discussions integrated with other diseases, e.g. AIDS prevention, DHF prevention, family planning methods, nutrition programme etc. because FGD was less time consuming and more interesting. Individual talk was the most feasible way done by all interviewees as they could talk anywhere at any time.

About 70% encountered no problems while distributing leprosy-related messages. Operational problems, such as organizing the audience for group talks, were the common problems.

The expression made by the some respondents were:

It was hard to organize the people even with the reinforcement of the administrative authorities. And also, it was also difficult to persuade the person with a patch for consultation. Some patients didn't believe that it was curable. Some people were afraid of looking at the pamphlets. The patients taking MDT should be organized to give some talks to the community that they themselves were completely cured. It was necessary to continue repeated training of the MCWA communicators and supervise upon their performances. Frequent health talks were needed and should be led by the Doctors or Basic Health staff with the cooperation of MCWA members. MCWA communicators should be the educators as well as supervisors in regularity of treatment. A patient should be an organizer or educator in his/her respective community.

REFERENCES

1. WHO. A guide to eliminating leprosy as a public health problem. Geneva, 1995.
2. Kyaw Lwin *et al.* Strategies and main activities *of global and Myanmar Leprosy Elimination* Programme. Leprosy Research Seminar. Department of Health. August 2000. Yangon.
3. Plan of Action for dissemination of leprosy related knowledge to housewives through MMCWA, 2000.

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