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**Quality of antenatal care at outpatient department of Mandalay General Hospital:
time utilization and satisfaction among users**

**Than Tun Sein, **Khin Mi Mi Lwin, **Krasu, M., *Le Le Win,
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The study was a hospital-based cross-sectional survey using recording and interviewing techniques. Average waiting time (in minutes) before seeing registration clerk, nurses, laboratory staff and medical doctors, for all first visit and follow-up visit patients, were 10, 5, 8 and 31 respectively. Average time in contact (in minutes) with registration clerk, nurses, laboratory staff and medical doctors, for all patients, were 2, 2, 11 and 3 respectively. Among first visit patients, only 21% were told of their body weights, 21% were told of their blood pressures, 66% were told of their urine examination results, and 64% were told of their baby's clinical conditions. Similar figures for follow-up patients were 29%, 26%, 83% and 80% respectively at different service points. The types of service offered and the training and performance of the service providers can be concluded as far from being adequate.

INTRODUCTION

The aim of antenatal care (ANC) should be to guide and support prospective parents, and pregnant women should be treated accordingly. Much of the benefit of regular ANC checkups would be undermined if the way services delivered at an ANC clinic is poorly organized. Long waiting times before appointments are a source of much frustration, anger and worry [1]. This can influence a woman's decision to continue attending ANC clinics. According to the European Organization for Quality Control (EOQC), quality is "the totality of features of a product or service that bears on its ability to satisfy given needs" [2]. The definition is referring to quality as the merit or excellence of a thing or activity. It is being referred to as something that can be felt than measured. Roemer and Montoya-Aguilar referred to quality of health care as the degree to which the resources for health care or the services

included in health care correspond to specified standards [3]. Application of those standards could be expected to give desired results. In general notion, quality can be regarded as the merit or excellence of the system in all its aspects and this involves the resources, the activities, the management, and the outcomes of health care [4].

The model of "structure, process, and outcome" is to be applied whether to assess the quality of medical (clinical) care given to an individual patient or to assess the quality of health (public health) care provided to a population [3,5]. Structure includes tools and resources that providers of health care have at their disposal and of the physical and organizational settings in which they work. Process refers to the set of activities that interact within and between health care providers and patients/ community. Outcome is a change in a patient's/community's current

and future health status that can be attributed to the medical/health care being provided.

Studies in the past have shown that smooth patient flow is a basic requirement for providing effective health care with limited medical resources [6]. Long patient waiting times and the inefficient use of professional staff time can substantially limit the cost-effectiveness of a clinic's programmes [7]. Inefficient clinic practices that force patients to wait for long periods of time can cause patient dissatisfaction with the clinic and result in a low rate of patient return. A method of analyzing patient flow in the average clinic could provide a basis for improving clinic efficiency, not only from the viewpoint of the provider, but also from the often-neglected perspective of the patient.

The general objective of the study was to assess the quality of antenatal care (ANC) services being provided at outpatient department (OPD) of Mandalay General Hospital (MGH) through time utilization and satisfaction among the users.

MATERIALS AND METHODS

The study was a hospital-based cross-sectional survey using recording and interviewing techniques. ANC clinic of MGH opens from 8:00 am till 12:00 noon on every Monday, Wednesday and Friday. There are two senior nurses, assisted by about 15 student nurses, and 5-8 medical doctors providing ANC services at the OPD. VDRL test is performed at STD department next door to the OPD. There is no appointment system. New and old pregnant mothers coming to the OPD of MGH for antenatal care during a one-month period in March in 1998 were included in the study.

When a pregnant mother arrives at the OPD, she has to fill a registration form and ANC

record at the registration point. Then, her blood pressure and body weight are taken by a nurse, usually a student nurse. There is no proper flow system as regards which measurement should be taken first. Next, blood samples of new pregnant (first visit) mothers are taken for VDRL test. Urine for albumin is also tested for these first visit mothers. Finally, patients are examined by medical doctors in five separate rooms. High-risk mothers needing special investigations such as ultrasonography are referred to the responsible units of MGH and appropriately managed.

Arrival times of each patient at the entry of the OPD, registration table, service points of nurses, laboratory staff and medical doctors, and the exit of the OPD were recorded. Each patient was interviewed at the exit. A time recording form was given to each patient at the entry point and was used for all the subsequent time recordings. Time recording at each service point was performed by trained enumerators. Interview, using a pre-tested structured questionnaire, was also performed by trained enumerators. Although new patients were interviewed again in their second visits during the study period, old patients were interviewed once. A total of 601 patients were included in the study. The whole process of data collection was supervised by the investigators at MGH.

RESULTS

Table 1 shows patient care at ANC clinic of MGH. It can be noted from this table that average waiting time (in minutes) before seeing registration clerk, nurses, laboratory staff and medical doctors, for all patients, were 10.25, 5.41, 7.63 and 30.54 respectively. When first visit patients and follow-up patients are separated out, the respective waiting time at different service points was found to be 14.07, 8.53, 7.16 and 30.47 for

the first visit patients, and 6.43, 2.30, 10.93 and 36.00 for the follow-up patients.

Table 1. Patient care in Antenatal Care Clinic of Mandalay General Hospital

Indicator	All patients	First visit patients	Follow-up visit patients
Average patients per day	50	25	25
Average waiting time (in minutes) before seeing:			
• Registration clerk	10.25	14.07	6.43
• Nurses	5.41	8.53	2.30
• Laboratory staff	7.63	7.16	10.93
• Doctors	30.54	30.47	36.00
Average time in contact (in minutes) with:			
• Registration clerk	2.37	3.56	1.09
• Nurses	2.15	2.18	2.11
• Laboratory staff	11.79	12.17	5.50
• Doctors	3.30	4.53	2.06
Average time in clinic (in minutes)	94.23	112.44	76.09
Average proportion of patient's time spent on receiving services from OPD personnel (only for nurses and medical doctors)	5.78%	5.96%	5.48%

medical doctors, for all patients, was 2.37, 2.15, 11.79, and 3.30 respectively. When first visit patients and follow-up patients are separated out, the respective contact time at different service points was found to be 3.56, 2.18, 12.17 and 4.53 for the first visit patients, and 3.56, 2.18, 12.17 and 4.53 for the follow-up patients.

Average time in clinic (in minutes), for all patients, was 94.23 out of which only an average proportion of 5.78% was spent on receiving services from nurses and doctors.

Average time in clinic (in minutes) for first visit patients was 112.44, out of which 5.96% was spent on receiving services from doctors and nurses; similar figures for follow-up patients were 76.09 and 5.48% respectively.

Table 2 shows satisfaction of patients on services received. It can be observed that among first visit patients, only 21% were told of their body weights, only 21% were told of their blood pressures, 66% were told of their urine examination results, and 64% were told of their baby's conditions / clinical conditions after being examined by a medical doctor. Similar figures for follow-up patients were

Table 2. Satisfaction of patients on services received

Service point	Service received		Results/condition told		Satisfaction with the service	
	First visitors	Follow-up visitors	First visitors	Follow-up visitors	First visitors	Follow-up visitors
Body weight measurement	300 (100%)	300 (99%)	62 (21%)	88 (29%)	293 (98%)	294 (98%)
Blood pressure measurement	299 (99%)	300 (99%)	62 (21%)	77 (26%)	294 (98%)	298 (99%)
Blood examination for STD	286 (95%)	8 (3%)			240 (83%)	6 (60%)
Urine examination	296 (99%)	23 (8%)	195 (66%)	20 (83%)	295 (99%)	22 (92%)
Clinical/abdominal examination	297 (99%)	301 (100%)	184 (64%)	241 (80%)	295 (98%)	296 (98%)

Average time in contact (in minutes) with registration clerk, nurses, laboratory staff and

29%, 26%, 83% and 80% respectively. However, 60%-99% of the patients said that

they were satisfied with the services they received at different service points.

DISCUSSION

Quality can be thought of as having two aspects: technical competence and the art of care. The technical aspect, being concrete, is certainly the most easily measured. While assessing technical aspects, an opportunity can be provided to the staff being assessed to improve their approach in the art of care [8]. Retrospective chart audit after the discharge of a patient, concurrent document review while care is in progress, inter-viewing, administering a questionnaire to test knowledge and probe attitude, and observation are the common techniques used in collecting data for quality assessment [8]. In practice, a combination of techniques is used. The design of this study is not comprehensive enough to reveal the true quality of ANC services being rendered at ANC clinic of MGH because it lacked assessing technical competence of ANC staff. However, it does reveal a situation that the quality of ANC services being provided at the OPD of MGH is in need of improvements.

It is found in the study that only about 6% of patients' time was spent on receiving services from nurses and doctors (Table 1). This figure for similar studies in Medico City, Panama City and Caracas were 29%, 9% and 17% respectively [1]. Waiting time at each service point, except for laboratory workers, is long compared with the contact time for receiving service. Waiting time is found to be longest with the doctors.

Although the majority of patients said that they were satisfied with the services, they might have different reasons for saying this way and might not reflect their true opinions. The majority of them, as a matter of fact, did not get any feedback from service providers

as regards what their examination results were. This situation is particularly true for the nurses and medical doctors. Lack of this art of communication in no way could provide true satisfaction to the patients. Health care personnel should encourage and give time for women to express their view and should respect and treat sympathetically what they say [1].

According to the findings of the study – that waiting time to see medical doctors was long but contact time with them was quite short and that the majority of patients did not receive any feedback for what they have been examined – make the investigators conclude that the types of service offered, and the training and the performance of the service providers are far from being adequate.

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Orocaecal transit time measured by breath hydrogen test in pre-school children

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The oro-caecal transit time (OCTT) was measured in 90 healthy children aged 1 to 5 years with the hydrogen breath test using lactulose (10 g in 10% aqueous solution) as the test meal. The relationships between OCTT and gender, age, malnutrition status were assessed. The OCTT for 1.5 year-old children was 90.2 ± 20.25 min (mean $\pm$ SD). There was no significant difference in mean OCTT between boys and girls (89.03 ± 15.45 vs. 91.05 ± 23.24). The mean OCTT of children who were still breast-fed (92.86 ± 27.1 min) was also not different from those who were completely weaned (89.15 ± 17.0 min). There was also no difference in OCTT between malnourished and non-malnourished children, and between age groups (1-2 y, 2-3 y, 3-4 y and 4-5 y).

INTRODUCTION

Malabsorption of rice is common in Myanmar children. Breath-hydrogen tests after a rice meal have shown a prevalence of rice-carbohydrate malabsorption of 66.5% among children aged 1-59 months [1]. This malabsorption is also associated with diminished linear growth [2,3]. As rice is the staple food of Myanmar children, we are seeking to understand the source of this problem. Transit time of food through the small intestine is an important factor related to the absorption of nutrients. Studies have suggested that rapid transit of food through the small intestine may limit absorption by reducing the time food remains in contact with the absorptive epithelium [4-6].

Small intestinal transit time has been evaluated by scintigraphy [7], radiological methods [8-9], intestinal intubation techniques and hydrogen breath tests [10]. Of

these, the hydrogen breath test has been widely used because of its simplicity, sensitivity and noninvasive nature. The validity of this method in determining oro-caecal transit time has been evaluated by comparison with intubation techniques [10], scintigraphic [4,7] and radiological methods [8,9].

Orocaecal transit time has not been studied previously in Myanmar children. Based on their studies of African children, Burkitt and co-workers reported that children in developing countries living on a rural diet have shorter transit times [11]. With the high prevalence of rice-carbohydrate malabsorption, we expected to see an alteration in transit time in Myanmar children.

The present study was carried out to determine the oro-caecal transit time using the lactulose breath hydrogen test in Myanmar children under 5 years of age and to relate the findings to gender, age and nutritional status.

SUBJECTS AND METHODS

Subjects

We studied 90 apparently healthy children between the ages of one and five years living in a semi-urban area of Yangon (Rangoon), Myanmar (Burma). We explained the nature of the study to the children and their parents or guardians and obtained consent. The age of each child was checked on the birth register and a standard form used to take a history of previous illnesses. Those with a history of diarrhoea and those who had taken antibiotics within the last two weeks were not included.

Breath hydrogen test

After an overnight fast, each child was given 15 ml (10 g) of lactulose (Duphar-Duphalac, Sydney, Australia) in 100 ml of water orally. The children were observed for any complaint and undue activity was not permitted.

Breath samples were taken immediately before the test meal, at 20-minute intervals for the first hour, and at 30-minute intervals thereafter for a total of 3 hours. Samples were collected through a mouthpiece from older children who could blow into it or with a soft paediatric facemask connected to a two-way valve system and air collection bag attached to a dead space discard bag. For storage and transport breath samples were transferred into 30 ml plastic syringes (Terumo, Sydney, Australia) closed with three-way stopcocks. Hydrogen and oxygen analyses were done within 24 hours of collecting the breath samples.

Hydrogen and oxygen analysis

The hydrogen concentration of breath samples was determined using two Quinton Model 12 Moralizers (Quinton Instruments Co., Milwaukee, WI) calibrated with a H₂ standard

of 102 ± 2 ppm in nitrogen (CIG, Sydney, Australia).

Analysis of oxygen concentration in the same breath samples was carried out using a portable oxygen analyzer (Draeger Oxywarn 100-I, Draeger Instrument Division, Blyth, Northumberland, UK).

Hydrogen non-producers were defined as children with breath hydrogen concentration less than 10 ppm above base line values in the 90-minute sample or in any of the later samples. Orocaecal transit time was taken as the interval from basal time to the first sustained rise in hydrogen concentration (the first of the three consecutive increasing H₂ values).

Anthropometric measurements and assessment of nutrition status

All children's weights and supine lengths were measured. Bathroom scales sensitive to 0.25 kg were used and lengths were measured to the nearest 0.1 cm by use of an infantometer.

Standard deviation scores were calculated for weight-for-age, length-for-age, and weight-for-length for each child by subtracting the median value of the National Center for Health Statistics (NCHS) Reference from the child's value, then dividing by the SD value of the NCHS reference [13]. For the definition of malnutrition, the cut-off point used was weight-for-age or length-for-age ≤ 3 SD of the corresponding NCHS median or weight-for-length ≤ 2 SD of the NCHS median [13,14].

Statistical analysis

Data processing was carried out with SPSS (Statistical Package For Social Scientists Ver 3; SPSS Corporation, Chicago, IL, USA) on a

Toshiba T3100e computer. Data were expressed as mean $\pm$ SD (Standard Deviation) and the mean differences calculated using Student's 't' test. $P < 0.05$ was chosen as a significant level.

Ethical considerations

The study was approved by the Medical Ethics Committee of the Department of Medical Research, Yangon (Rangoon), Myanmar, (Burma).

RESULTS

Of 90 children in the study, 9 (10%) were non-hydrogen producers. Seven children had

between the different age groups. A liner regression analysis was carried out between age in months and OCTT. No correlation was found. Most (71%; $n = 53$) of the children were weaned and were taking adult food consisting of rice as the staple with some meat / fish / chicken and a vegetable soup. Twenty-one children (29%) were still breast-fed but were also on adult-type food consisting mainly of rice, potato, some meat or fish pieces and peanut oil. The mean oro-caecal transit time of children who were still breast-fed (92.86 ± 27.1 min) was not different from those who were completely weaned (89.15 ± 17.0 min).

Table 1. Orocaecal transit time as determined by hydrogen breath test using lactulose (10 g in 10% aqueous) solution in children under five years of age

Age groups	Orocaecal transit time (Values are mean $\pm$ SD)		
	Boys	Girls	All children
1-2 years	(8)* 86.25 ± 17.47	(8) 99.37 ± 40.03	(16) 92.18 ± 30.60
2-3 years	(10) 87.00 ± 9.49	(15) 85.00 ± 12.25	(25) 85.80 ± 11.06
3-4 years	(9) 95.00 ± 19.84	(16) 90.00 ± 20.49	(25) 91.80 ± 19.99
4-5 years	(1) 86.25 ± 14.36	(4) 101.25 ± 22.5	(8) 93.75 ± 19.26
1-5	(31) 89.03 ± 15.46	(43) 91.05 ± 23.24	(74) 90.24 ± 20.25

* Figures in parentheses denote number of subjects

high (≥ 20 ppm) basal hydrogen values and were excluded from the study. The final study group included 16 children in the 1-year age group, 25 children each in 2-year and 3-year age groups and 8 children in 4-year age group. All tolerated the procedure and there were no complaints of abdominal pain, diarrhoea, flatulence or bloating during or after the test.

The mean ($\pm$ SD) oro-caecal transit time of children 1-to 5 years was 90.2 ± 20.25 min.

Table 1 displays the oro-caecal transit time in boys and girls in different age groups. There was no significant difference in oro-caecal transit time according to sex in all age groups. There was also no significant difference

Table 2. Orocaecal transit time in malnourished children according to weight-for-age, length-for-age, and weight-for-length in children aged 1-5 years

Malnutrition classified as	Orocaecal transit time in minutes (Values are mean $\pm$ SD)	
	Malnourished	Normal
Weight-for-age ≤ 3 SD	(5)* 93.00 ± 26.83	(69) 90.00 ± 19.93
Length-for-age ≤ 3 SD	(21) 93.57 ± 27.1	(53) 88.87 ± 16.86
Weight-for-length ≤ 2 SD	(3) 95.00 ± 34.64	(70) 90.00 ± 19.95

* Figures in parentheses denote number of subjects

Table 2 shows the oro-caecal transit time in normal and malnourished children. There was no significant difference in oro-caecal transit time between normal and malnourished

children as classified by weight-for-age, length-for-age or weight-for-height.

DISCUSSION

There are various methods for determination of OCTT but the hydrogen breath test after ingesting lactulose is the only non-invasive, non-radiological method available for field situations. The underlying principle is that colonic bacteria ferment carbohydrate to produce hydrogen, which is absorbed and exhaled at a concentration accurately reflecting colonic hydrogen production [15].

It has been shown that hydrogen appears in the breath with 5 minutes after the beginning of an infusion of lactulose and ingestion of 5 or more grams of lactulose results in a readily measureable increase in breath H_2 excretion [10].

OCTT is important in regulation intestinal function [5]. It is delayed in adults with tropical malabsorption [16]; and in patients with cystic fibrosis [17], Crohn's disease [18], and anorexia nervosa [19]. Ten percent of the study children were found to be non-hydrogen producers. Douwes *et al.* [20] reported 9.2% of school children to be non-hydrogen producers. However, Strocchi and co-workers [21] recently reported that true "hydrogen no producer" are extremely rare. They suggested the sum of breath H_2 at 5, 6, and 7 hours of > 15 ppm should be used for defining hydrogen producers. In the present study, breath sample collection was done only up to three hours. They also cautioned that the accuracy of a breath H_2 testing could be influenced by the elevated basal H_2 values. We excluded seven children with high basal H_2 values before analysis.

In the present study, 1-5 year old children had a mean OCTT of 90.20 ± 20.25 min. For comparison, only a few published studies on

European children exist. Vreugdenhil *et al.* [22] reported OCTT in 1-14 year old children to be 82.3 ± 25.6 min. Solomon *et al.* [23] and Vajro *et al.* [24] reported slightly lower values of 78 ± 36 min and 66.4 ± 8.1 min respectively.

It has been reported that OCTT does not correlate with body-weight or length and is independent of age [22]. We also found no correlation between OCTT and age. There was also no significant difference between the age groups. Although the length of the intestine increases with increasing age, OCTT appears to be constant, suggesting increasing velocity of the intestinal contents with age [23].

Our findings showed that OCTT in Myanmar children was not significantly shortened or prolonged in comparison with published studies on similar age groups. There was also no significant difference between boys and girls, and normal or malnourished children. There was no correlation between age of the child and OCTT, and no difference in OCTT found in different age groups. In a field situation, measurement of OCTT using the hydrogen breath test is feasible and the procedure was well tolerated.

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Effect of sunlight in decontamination of coliforms and faecal coliforms from drinking water

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Drinking water samples were collected during December 1997 to March 1998 from Mingalar market, Nyaungbinlay market, Thaketa, Pazundaung, Botataung, Lanmadaw, Anawrahta, Ahlone, Sanchaung and Papedan Townships, Yangon. The presumptive coliform and faecal coliform counts were tested on all water samples. The pH and temperature were also recorded during the experiment. The coliforms and faecal coliforms were identified by multiple tube method and the count of coliforms ranged from 17 to > 2400 MPN/100 ml and faecal coliform count ranged from <2 to 140 MPN/100 ml. The temperature ranged from 40 to 47°C during the experiment. There was no association between coliform counts and temperature variation. Forty percent and 90 percent of the samples became free of coliforms after exposure to sunlight for six hours and seven hours, respectively. When exposed to sunlight, 33 percent and 77.8 percent of the samples became free of faecal coliforms after four and six hours respectively. Coliforms and faecal coliforms were totally absent after exposure for 12 hours. It was effective by using clear transparent plastic bottles but the opaque plastic bottles were not. After exposure to sunlight for 12 hours; regrowth of coliforms and faecal coliforms were not observed up to three months, provided that the exposed bottles were tightly closed.

INTRODUCTION

Association of gastroenteritis with contamination of main supply of river water [1] and from bathing sea water [2] indicates the importance of good quality water for consumption. The good quality water is always essential for public use and their importance has been shown by many investigators on the incidence of diarrhoeal disease in children in Southern Thailand [3], in Saudi Arabia [4], and Israel [5]. Association between waterborne diseases and microbiological quality of water had been shown [6-9]. They also reported that breakage of sewage pipes near the drinking water sources was probably the origin of drinking water contamination.

The influence of sanitation upon the prevalence of intestinal infection and diarrhoeal disease in Costa Rica during 1959 to 1961 was reported [10]. There are many ways for treating and elimination of contaminated pathogens such as: physical and chemical treatment, UV irradiation etc. Inactivation of faecal bacteria in drinking water by solar heating was demonstrated [11]. They reported simulations of the thermal effect of strong equatorial sunshine on water samples contaminated with high faecal coliforms. Though there are many ways of disinfecting contaminated water and sunlight seems to be the most convenient, easy, reliable, cheap and unharmed weapon for decontamination of pathogens from water in

the hot season. In a controlled field trial of solar disinfection of drinking water and diarrhoea in Maasai children, the bacterial count of water reduced [12]. Thus, this study aims to decontaminate the contaminated drinking water by direct sunlight in our community.

MATERIALS AND METHODS

Water sample collection

Water samples were collected by the method of WHO [13], during December 1997 to March 1998 from ten sectors of Yangon which includes Mingalar Market, Nyaungbinlay, Market, Thaketa, Pazundaung, Botataung, Lanmadaw, Anawrahta, Ahlone, Sanchaung and Pabedan Townships.

Presumptive test for water quality

It was done by the method of WHO, 1982 [13].

Decontamination of drinking water by sunlight

One litre each of water was transferred into 10 to 12 clear transparent plastic bottles (super Brand) and opaque plastic bottles (Dagon) respectively and was exposed to direct sunlight during 8:00 am to 4:00 pm. The required time was adjusted within those hours i.e. 9:00 am to 3:00 pm for six hours; 8:00 am to 4:00 pm for eight hours and two consecutive days from 9:00 am to 3:00 pm for 12 hours in the fields of DMR and Golden Valley, Bahan. The experiments were not conducted in the cloudy days. However, if there were short cloudy hours, the time was adjusted only to direct exposure time. All the samples were kept refrigerated before analysis or before receiving the exposure time. Every hourly, the presumptive test for coliforms and faecal coliforms were performed and the most probably number were calculated.

RESULTS

Coliforms and faecal coliforms from tested water samples

The Most Probable Numbers (MPN) of coliform and faecal coliforms per 100 ml of water obtained from 10 different sources are shown in Table 1. All the samples (100 %) had coliforms with the range of 17 MPN/100 ml to >2400 MPN/100 ml. Faecal Coliforms were present in 90% of the tested samples with the range of 8-140 MPN/100 ml.

Table 1. Coliforms and faecal coliform counts from tested water samples

Sites	Coliforms MPN/100 ml	Faecal coliforms MPN/100 ml
Mingalar market	540	33
Nyaungbinlay market	77	0
Thaketa	240	79
Pazundaung	540	49
Botataung	>2400	130
Lanmadaw	94	49
Anawrahta	920	8
Ahlone	17	9
Sanchaung	180	9
Pabedan	180	140

Effect of sunlight in decontaminating coliforms

The initial coliform counts vary from 17- >2400 MPN/100 ml. After exposure for two hours under direct sunlight, the coliform counts decreased to 14-540 MPN/100ml; again decreased to 13-350 MPN/100ml after four hours of exposure. After exposure for six hours they decreased to 2-13 MPN/100 ml. It was also found that 90% of the samples became free of coliforms after seven hours of exposure. The coliform counts of various drinking water samples after various times of

exposure to sunlight are shown in Fig. 1. Simultaneously, the coliform counts of water sample from opaque bottles were not decreased, similar temperature although they were exposed to of sunlight as clear transparent bottles

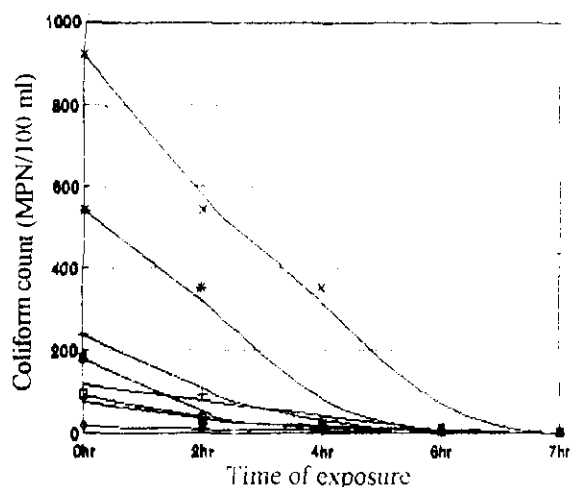


Fig. 1. Effect of sunlight in decontamination of coliforms in association with time of exposure

Effect of sunlight in decontaminating faecal coliforms

The initial faecal coliform counts ranged from 8-79 MPN/100ml. After six hours of exposure to direct sunlight they decreased to 2-4 MPN/100ml.

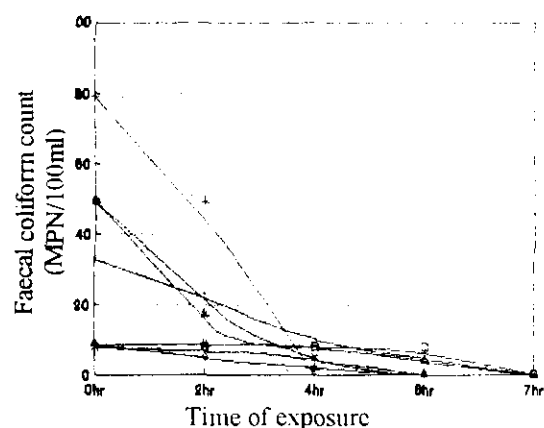


Fig. 2. Effect of sunlight in decontamination of faecal coliforms in association with time of exposure

Fifty six percent of the water samples were

found to be faecal coliforms after six hours of exposure. It was also observed that all the tested water samples were free of viable coliforms and faecal coliforms after 12 hours of exposure. The faecal coliform counts from different water samples in association with time of exposure are shown in Fig.2. Regrowth of bacteria was not detected when the samples were tested weekly up to three months after exposure to sunlight for 12 hours.

Comparative effect of exposure to sunlight on different drinking water samples

The faecal coliform counts in different drinking water after exposure to sunlight samples are shown in Fig. 3. As shown in this figure, the initial faecal coliform counts varied. In sample No.2, faecal coliforms were totally absent after four hours of exposure. In sample No.3, it took about six hours of exposure to decontaminate. Almost all the tested samples (90%) became free of faecal coliforms after exposure to sunlight for seven hours.

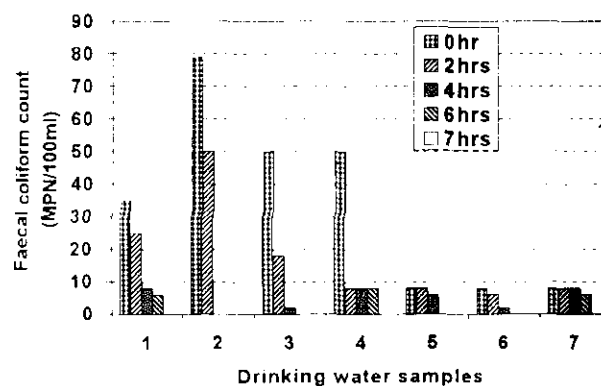


Fig. 3. Effect of sunlight on faecal coliform count in different drinking water samples

DISCUSSION

Microbiological quality of water from different countries reveals the importance of decontamination of water. Illness in a community associated with an episode of water contamination with sewage [14] and

contamination of drinking water with pathogens lead to toxicity to human intestinal cell lines [15] was shown by various authors. The present of *Salmonella* *Campylobacter* and *Yersinia* spp. in river and lake waters [16]; swimming pool associated haemorrhagic colitis [17] demonstrated the importance of decontaminating the water in recreational use. The association of water contamination and rope-pumps [18] shows the importance of materials used in fetching water.

Effect of ultra-violet irradiation and heavy metals on the survival rate of *E. coli* in the water was reported [19] and disinfection of water by sunlight was also reported [11]. In this study the effect of sunlight on water was clearly demonstrated by using clear plastic bottles and not by opaque types of bottles during 12 hours. However, the effect of sunlight varies on different samples regardless of the number of coliforms and faecal coliforms present in the samples. The sunlight also inhibits the regrowth of bacterial organisms up to three months if the bottles are closed tightly indicating that the decontaminated drinking water after treatment with sunlight could be stored as pure water, which will be very useful in our community. Thus sunlight as natural resource is very useful in decontamination of unpure water by using the clear transparent bottles.

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Survival of *Salmonella typhi* in some cold drinks of Yangon

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The study was carried out to obtain information about the survival of *S. typhi* in drinking waters and some cold drinks if it is contaminated. It was carried out from August 1997 to July 1998 in Bacteriology Research Division, Department of Medical Research. The samples were collected from South Okkalapa Township, Yangon. A total of 152 samples were studied. pH was measured in all samples by pH meter. One hundred ml of water and cold drink sample was contaminated with *S. typhi* to a final concentration of 10^5 colony forming unit per ml. Viable counts of *S. typhi* were determined by drop plate method as once daily until the viable counts were negative. *S. typhi* did not survive in tested cold drinks, which have pH between 1.35 and 2.48. The contaminant survived up to 10, 32 and 38 days in some cold drinks (pH between 2.52 and 3.55), sugar cane juice (pH 5.25), Jelly juice (pH 5.94) and drinking waters (pH between 6.6 and 7.1) respectively at 4 degree centigrade. In this study it was found that *S. typhi* survives in acidic cold drinks and also survives in cold drinking waters for a long period.

INTRODUCTION

Enteric fever is one of the clinical syndromes of Salmonellosis. The term enteric fever is used to include typhoid fever and paratyphoid fevers caused by *Salmonella typhi*, *Salmonella paratyphi* A, B and C respectively. The commonest causal agent of enteric fever in Myanmar is *Salmonella typhi* followed by *Salmonella paratyphi* A and B [1].

Enteric fever is a contagious disease and the infectious agent is excreted in faeces of patients. The infection is mainly transmitted by faecal-oral route. Moreover, flies, fingers, food, fomites, poverty and lack of personal hygiene play an important role in transmission. The most important source of infection is chronic carriers. Sporadic cases have been reported due to the introduction of

infection by the carrier into a community totally free from this infection. Even in the endemic area, epidemic outbreaks occur following the contamination of the common source of water supply or the spread of infection from festivals or social gathering where the food become contaminated by carriers.

The infections have worldwide distribution. The incidence of enteric fever varies depending on environmental sanitation and socioeconomical standard.

It remains as a common disease in developing countries. It has been estimated that between 10 and 500 cases per 100,000 populations occur annually throughout the developing world [2]. The most affected parts of the world include Asia, North and West Africa and Latin America. In 1980, the number of

cases occurring yearly was estimated at about seven million in Asia, over four millions in Africa, and 0.5 million in Latin America [3].

Therefore enteric fever still occurs in endemic proportions in many of the tropical and subtropical parts of the world including Myanmar.

Salmonellae grow at temperatures between four and 45°C and in a pH range of 4-8. Salmonellae have been shown to be resistant to drying even for years, especially in dried faces, dust and other dry materials such as feeds and certain foods. Prolonged survival in water and soil has also been described. They survive freezing in water for long period [4].

There is no previous report on *S. typhi* survival in drinking water and cold drinks with various temperatures and pH and thus this study was carried out.

MATERIALS AND METHODS

Sample collection

This study was carried out from August 1997 to July 1998 in Yangon. It was done in Bacteriology Research Division, DMR. The drinking water sample, municipal and tube well water samples were collected from South Okkalapa Township by using the standard method of collection [5]. The cold drinks tested in this study were: sugar cane juice, yogurt, tamarind juice, 'Fantasy' (Lichi, Orange), 'Quench' (plum, orange, barley), and barley juice. 'Star Cola', Than-bu juice and jelly juice (Kyauk-kyaw). They were bought from cold drinks shops in South Okkalapa Township and collected in sterile plastic bags. They were transported to the laboratory without ice and processed within one hour after arrival. A total of 152 samples were studied. pH was measured in all drinking water and cold drinks samples by pH meter.

Experiment on survival time

Eighteen-hour peptone water cultures of *S. typhi* at 37°C were used as inoculum. One hundred ml of water and cold drink sample was contaminated with the above *S. typhi* to a final concentration of 10^5 colony forming units per ml. It was done as duplicates: one contaminated sample was incubated at room temperature (24°C) and the other one at 4°C. Viable counts of *S. typhi* were determined by drop plate method of Miles and Misra [6] using Xylose Lysine Decarboxylose (XLD) agar as once daily until the viable counts were negative. The bacilli from XLD agar was identified as *S. typhi* strain by using Salmonella-Shigella agar, short biochemical tests with Triple Sugar Iron agar, Lysine Iron agar, Urease agar and Sulphide-Solid Indole Motility agar. Then it was confirmed by serotyping with antisera. It was tested at two-week intervals.

RESULTS

The pH of some cold drinks such as: 'Star Cola', 'Sparkling', 'Lemon', Barley and Lemon juice, 'Crusher (orange)', Plum juice, 'Fantasy (orange)' 'Fruito', 'Crusher (barley)' and Than-bu juice were between 1.35 and 2.48. The salmonellae did not survive in all above tested cold drinks.

The pH of some drinks such as: 'Crusher (plum)', 'Fantasy (lychi)', Tamarind juice, 'Quench' and Yogurt were between 2.53 and 3.55. The contaminant survived up to 3 days at room temperature and 3-10 days at 4°C (Table 1).

The pH of sugar cane juice was 5.25. *S. typhi* survived up to 2 days at room temperature and 28 days at 4°C (Table 2). The smell of the juice was changed into acidic odour after 24 hrs at room temperature and pH dropped down to 2.9.

The pH of jelly juice was 5.94 *S. typhi* survived up to 8 days at room temperature and 32 days at 4°C (Table 1).

The pH of drinking waters was between 6.6 and 7.1. *S. typhi* survived up to 16 days at room temperature and 38 days at 4°C (Table 1).

Table 1. Survival of *S. typhi* in some cold drinks in relation to different temperatures

Types of drinks	pH value	Survival days of <i>S. typhi</i> at room temperature	Survival days of <i>S. typhi</i> at 4°C
Star Cola	1.35	0	0
Sparkling lemon	1.92	0	0
Barley	2.08	0	0
Lemon juice	2.08	0	0
Crusher (orange)	2.10	0	0
Plum juice	2.25	0	0
Fantasy (orange)	2.38	0	0
Fruito	2.41	0	0
Crusher (barley)	2.45	0	0
Than-bu juice	2.48	0	0
Crusher (plum)	2.53	3	3.12
Fantasy (lichi)	2.55	3	10
Tamarind juice	2.57	3	8.63
Quench	2.78	3	9.5
Yogurt	3.55	3	10.13
Sugar cane juice	5.25	2	27.88
Jelly juice	5.94	8	32.75
Drinking waters	6.60	16	38.75

All were mean values of 8 samples

The relationship between survival of *S. typhi* in some cold drinks and pH values between groups and within groups were statistically significant (Table 2).

Table 2. Statistical analysis between survival of *S. typhi* in some cold drinks and pH values

	Mean square	F	Significant
Survival *pH			
Between groups	278.789	99.689	p = 0.000
Within groups	2.797		

When the relationship between pH values of tested cold drinks and survival of *S. typhi* was drawn, it appeared as cubic curve (Figure 1).

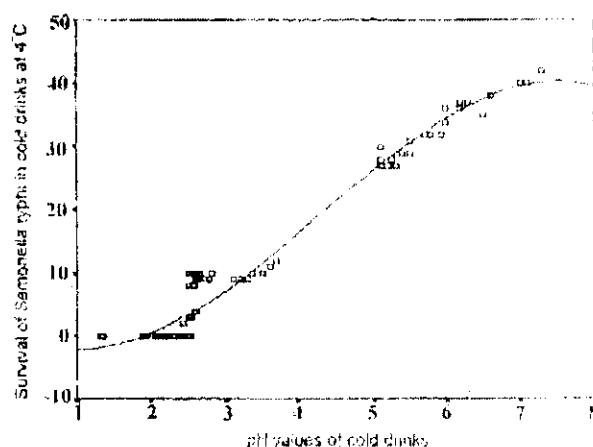


Fig 1. Survival of *Salmonella typhi* in some cold drinks at 4°C in relation with pH values

DISCUSSION

This study was carried out to obtain information about the survival of *S. typhi* in drinking water and some cold drinks if it is contaminated. *S. typhi* did not survive in tested cold drinks which have pH between 1.35 and 2.48. *Salmonellae* grow in a pH range of 4-8 [4]. Therefore the contaminant did not survive in above tested cold drinks. It survived up to 3 days at room temperature in some cold drinks, which had pH between 2.93 and 3.55. Thus, it could survive for a few days only in cold drinks with pH less than four.

It survived up to 8 days in jelly juice (pH 5.94) and up to 16 days in drinking waters at room temperature. Thus, it is known that the

contaminant could survive well in a pH range of 5 to 7.

The contaminant survived up to 10, 28, 32 and 38 days in some cold drinks (pH between 2.55 and 3.55), sugar cane juice (pH 5.25), jelly juice (pH 5.94) and drinking waters respectively at 4°C (Figure 2). Therefore, it seems that it could not survive well in more acidic pH.

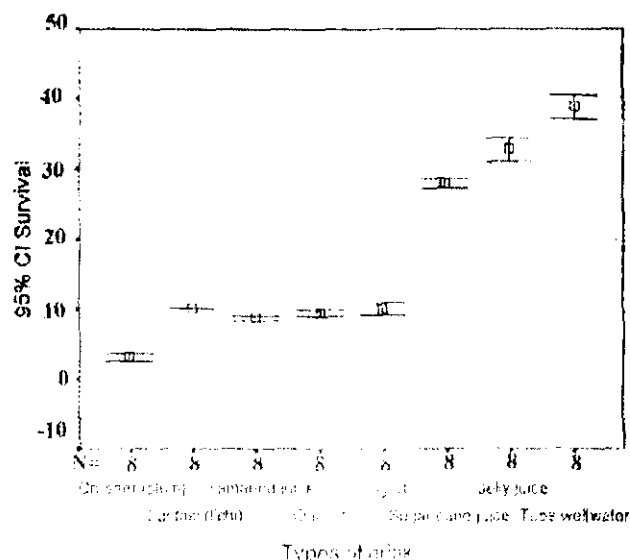


Fig. 2. Mean survival of *Salmonella typhi* in different types of drinks at 4°C

The contaminants survived more at 4°C in all the tested samples. It is because of the slow multiplication of bacteria in low temperature. In other studies, during incubation at 30°C, growth of *Salmonella* spp. occurred at pH values of 3.8-4.0 in one to three days [7]. In tests incubated at 10°C growth occurred at

minimum pH values of 4.4-4.8 in between 10 and 19 days. The minimum pH that will allow growth of *S. typhi* was between 2.53 and 3.55 and it could grow well at a pH range of 5-7. It was observed that *S. typhi* survived in acidic cold drinks depending on the pH and also survive in cold drinking waters for as long as 38 days.

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Evaluation of tuberculin response after BCG vaccination: By gestation and by age at immunization

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Tuberculin response following BCG vaccination was evaluated in 3 groups of babies. One hundred and sixteen full term babies (Group I) were vaccinated with BCG at birth; 89 full term babies (Group II) received BCG at the end of third month of life and Group III was made up of 48 preterm babies (32-36 weeks) given BCG vaccination at birth. The sizes of PPD induration area [mm] (6.3 ± 3.1 Vs 2.5 ± 3.0 ; $P < 0.00001$) and BCG scar diameter (3.7 ± 1.5 vs 2.7 ± 1.3 ; $P < 0.0001$) were significantly larger in full term than preterm babies all of whom were vaccinated at birth, whereas no significant difference was observed between full term babies who were vaccinated at different age. The complications of BCG vaccine were not observed in all study groups. This study suggests that tuberculin responses are equivalent at birth and at third month of age in full term babies. Although immune response is not fully developed in preterm babies (32 to 36 weeks of gestation), they can be safely immunized with BCG at birth.

INTRODUCTION

Tuberculosis is an important health problem in developing countries and the BCG vaccine plays an important role in preventing the disease. Nevertheless, the protective effect of vaccine remains a highly controversial subject and has been reported to range from 80% to less than 5% [1]. There are also varying ideas about the optimum time to vaccinate babies. Some reported that late vaccination confers a high degree of protection [2]. Moreover, the data on the effectiveness and safety of the BCG vaccination in preterm infants who may be at greater risk of infection than term infants has not been well established [3].

This prospective study was planned to evaluate the effectiveness of BCG vaccination by gestation (full term vs. preterm infants) and by different age at vaccination (at birth vs. at third month of life) by comparing tuberculin response, BCG scar size and complications of the vaccine.

SUBJECTS AND METHODS

The subjects selected for the study were 205 healthy full term and 48 preterm babies recruited at neonatal units of Central Women's Hospital and Yangon Children's Hospital during June 1994 to September 1995. The nature of the study was explained to the parents and informed consent was

obtained. The babies were randomly allocated to 3 groups. Babies who had a history of tuberculosis among the family or close contacts were excluded from the study.

In group I, 0.05 ml of BCG vaccine was given to 116 full term babies intradermally in left shoulder at birth (within 3 days after birth) and the second group of 89 full term babies were vaccinated in the same manner at the end of third month. Group III consisted of 48 preterm newborns that were vaccinated at birth. Vaccines were given to all groups by the same trained personnel. The vaccine used

Ethical considerations

The study was approved by the Medical Ethics Committee of the Department of Medical Research.

Statistical analysis

Comparison of PPD induration diameter and BCG scar diameter were done by Student's 't' test between groups. A two-sided p value of 0.05 was selected as the level of statistical significance.

Table 1. Distribution of PPD reactivity and comparison of PPD induration by different age at vaccine and by gestation

Groups (Age at vaccination)	PPD induration size No. (%)			PPD induration Mean $\pm$ SD (mm) (95% C.I)	PPD induration Mean difference (mm)
	No reaction	≤ 5 mm	> 5 mm		
Full term (3mth) n = 89	5 (5.6)	18 (20.2)	66 (74.2)	7.05 $\pm$ 2.72	} 0.711 (-0.10 to 1.53)
Full term (at birth) n = 116	12 (10.3)	23 (19.8)	81 (69.8)	6.34 $\pm$ 3.08	
Preterm (at birth) n = 48	24 (50)	11 (22.9)	13 (27.1)	2.54 $\pm$ 3.05	} 3.803* (2.77 to 4.84)

* P < 0.0001

was heat-stable freeze-dried glutamated vaccine from Japan BCG laboratory. Three months after the vaccination, follow-up examination was performed to detect any reactions or complications of BCG vaccine and BCG scar size was measured and recorded. In addition, the tuberculin test was performed with 2 international units of purified protein tuberculin in 0.1 ml (Statens Seruminstitut artillerivej 52300 Copenhagen Denmark) intradermally on the middle third of flexor surface of the left forearm.

After 48-72 hours of tuberculin test the transverse diameter of the induration was measured with transparent plastic ruler and recorded.

RESULTS

Mean (SD) birth weights of the babies were 6.7 (1.5), 6.3 (1.2) and 3.9 (0.5) pounds respectively. All the babies were breast-fed.

Thirty percent of the group 1, 26% of the group 2, and 73% of the group 3 babies had negative PPD induration (0 - ≤ 5 mm) Table (1). Comparison of mean (SD) PPD induration diameter did not reveal any significant difference between infants vaccinated at different ages in full term babies (group I vs. group II, p > 0.05), however, there was significantly larger induration diameter in

Table 2. Distribution and comparison of BCG scar diameter by different age at vaccination and by gestation

Category of babies (Age at vaccination)	No (%) with no BCG scar	No (%) with BCG scar	BCG scar Diameter (SD) (mm)	P value
Full term (3 months) n=89	2 (16.7)	87 (36.1)	3.9 (1.24)	} 0.289
Full term (at birth) n=116	5 (41.7 %)	111 (46.1)	3.7 (1.47)	
Preterm (at birth) n=48	5 (41.7)	43 (17.8)	2.7 (1.30)	} 0.00006

Some 10.4% (5/48) of the preterm babies had no BCG scar in comparison with 4.3% and 2.2% of the full term babies in group I and II respectively. No significant difference of mean (SD) scar diameter was observed between full term babies vaccinated at different ages, however, significantly larger scar size was noted in full term than preterm infants vaccinated at birth ($P < 0.0001$).

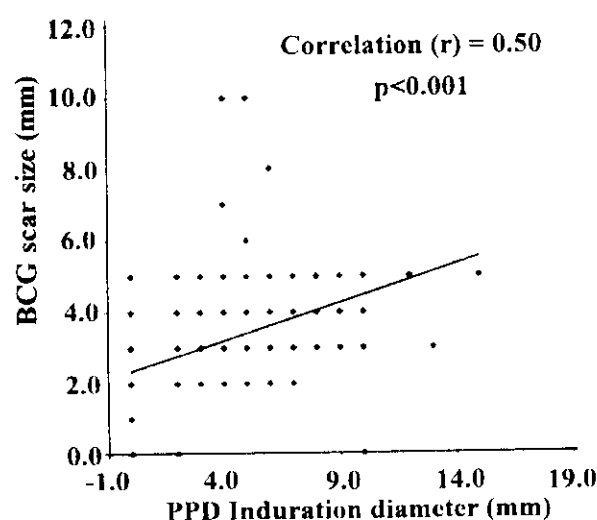


Fig. 1. Correlation between PPD induration and BCG scar size

All babies except one with no BCG scar had negative PPD reactions (PPD induration ≤ 5 mm). Moreover, there was a positive linear correlation between PPD induration and BCG scar size (Figure 1). No adverse effects and complications of BCG vaccine were observed in all 3 study groups.

DISCUSSION

For the prevention of tuberculosis early detection and treatment of cases and tracing contacts are essential. To eliminate the disease it is necessary to improve living conditions and to use chemoprophylaxis or BCG vaccination. Eighty percent of world's population are living in developing countries and it is very hard to improve their living

conditions. For this reason BCG vaccination is accepted as one of the most important protective measures against tuberculosis. Although BCG has been used for >70 years its protective value is still under discussion. Studies have shown that the efficacy of the vaccine varies between 5% and 80% [1].

Several factors may explain the widely divergent results of the major trials. These include technique of vaccination, vaccine potency, study design, age of vaccination, regional difference in *Mycobacterium tuberculosis* strain, nutritional or genetic difference in trial population and interaction of vaccine with different mycobacteria, which may reduce vaccine efficacy [4].

In developing countries BCG plays an important role in the control of tuberculosis and the use of vaccine at birth in full term infants has been shown to protect against the

infants has been shown to protect against the haematogenous spread of primary tuberculosis [5].

Today BCG is used in the neonatal period but there is little information on the efficacy of BCG vaccination in the newborn. The main aim of this study is to know the effectiveness of BCG vaccination given within 3 days of life both for full term and preterm infants.

Our study demonstrated that in full term babies BCG vaccination either at birth or at 3 months of age is equally effective and safe. This is in contrast with the study by Ibrahim Ildirim *et al.* [2] who reported that BCG given at the end of third month provides the higher rate of response and fewer complications than vaccine given during the first 3 days of life.

Also in a previous study conducted by H. Grindulis *et al.*, [6] in England, 149 Asian children who received BCG vaccination shortly after birth were reviewed at the age of 2 years and half of them had a negative response to tuberculin.

In our study higher tuberculin conversion rate was seen more in full term infants than preterm infants whom were immunized at birth. There were also a higher percentage with no BCG scar and non-reactive PPD test among the preterm infants. Low size of scar and tuberculin negativity rate in preterm infant may be due to deficiency of cell-mediated immunity which played an important role in delayed type of hypersensitivity reaction to BCG vaccine.

Our findings were in agreement with the study of Sedaghatian *et al.*, [7] whose study showed that full term infants had a significantly larger size of BCG scar and tuberculin conversion than preterm infants, but complications of vaccine were observed in term infants.

In our study, the complications of BCG were not observed in all 3 groups and also showed that both term and preterm infants can be safely immunized with BCG at birth. But the number of preterm infants in our study is not large enough to draw a firm conclusion. Therefore a controlled study with a larger number of preterm infants should be performed to establish whether routine administration of BCG vaccine in preterm infants at birth is warranted.

With the introduction and increasing trend of HIV/AIDS infection around the world, the number of tuberculosis cases has increased among adults and children and outbreaks of multi-drug resistant TB have occurred in institutions [8]. This resurgence and changing trend of tuberculosis prompted a re-evaluation of the role of BCG vaccination in the prevention and control of tuberculosis, and it might protect the high-risk infants against serious morbidity and mortality associated with childhood tuberculosis [9].

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**Potency assay of the liquid Russell's viper (*Daboia russelii siamensis*)
antivenom stored at different environment**

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Two methods of storing liquid antivenom (a) keeping it in a sand pot embedded in the ground and another (b) keeping antivenom containing sand pot in a larger sand pot and left in the house with daily and every third day watering of the sand was studied for 7 months covering the winter and hot summer months in Taungoo and Taungdwingyi respectively. Daily watering schedule kept the sand 1-2°C cooler than the every third day watering and maintained the temperature of the sand at 30-32°C with a difference of 8-10°C lower than the environmental temperature of 40°C during the hot summer months. The efficacy of the antivenom stored in the first method with daily watering was found to be comparable to the control and superior to the antivenom stored in the first method with every third day watering and the antivenom stored in the second method with daily watering. It is recommended that liquid antivenom should be stored in a sand pot embedded in the ground with daily watering of the sand in places where no cold storage facility is available. This method of storage is simple, effective and inexpensive and could be carried out by the rural farmers.

INTRODUCTION

Snakebite is an occupational hazard of our rural farmers. Early administration of potent antivenom following the bite plays a vital role in the management of snakebites. Early administration of antivenom combined with compression immobilization first-aid were found to be effective in delaying onset of systemic envenoming [1]. In Taungdwingyi district, 15% of the snakebite cases received 1-2 ampoules of either liquid or lyophilised antivenom following the bite in the villages [1]. Antivenom are stored at room temperature. It has been shown that liquid antivenom if stored at 37°C for 6 months began to lose its efficacy [2]. It is desirable that expensive antivenom should be stored at an optimum condition in order to preserve its efficacy. This experiment attempts to find out

the optimal environment for storage of liquid antivenom with minimal loss of its efficacy in rural snakebite endemic areas.

MATERIALS AND METHODS

A batch of liquid nonspecific Russell's viper antivenom batch no. F96770, expiry 7/99 manufactured by Myanmar Pharmaceutical Factory was used in the experiment. Antivenom kept at 4°C in the Venom Research Laboratory, Department of Medical Research served as a control for the experiments. Since environmental temperature of the midland varies, two sites (Taungdwingyi and Taungoo) were chosen for study. Because of lack of security of storage of antivenom in the ground in Taungdwingyi, two different methods of storing antivenom were carried out at the two sites.

In Taungoo, (method 1) the antivenom wrapped with a piece of polythene sheet embedded in the ground to its neck in the shade. About 10mm thick sand was layered between the pot and the ground. A similar experiment was set up a distance of 45cm. Two sets of experiment, daily (schedule A) and every third day (schedule B) watering of the sand were carried out. Two and 3 glassful of water were used to water the inside and the outside sand of the pot respectively. The temperature of environment and the sand inside the pot were recorded at midday before watering.

A similar experiment as in (method 1) was carried out in Taungdwingyi where a similar size sand pot containing the antivenom was embedded in a larger sand pot which was kept inside the house (method 2). The same schedule of watering the sand and recording the temperature was followed. Experiment lasted for 7 months in Taungoo and 6 months in Taungdwingyi, which covered the winter and the hot summer months of the year.

At the end of the study the efficacy of the antivenom was assessed by testing neutralization of different biological properties of Russell's viper venom such as lethality (LD_{50} i.v.), coagulant (10MCD), haemorrhagic (3MHD), necrotic (3MND), defibrinogenating, (5MDD) and capillary permeability increasing (100MCPI) activities using WHO recommended standard test of neutralizing activity [3].

Briefly, a fixed amount of venom was mixed with a variable dilution of antivenom, incubated at 37°C for 30 min, and injected into laboratory animals. The end point was taken as the minimum amount of antivenom required to neutralise 100% of the biological effects of venom. For determination of neutralisation of lethal activity ED_{50} (effective neutralizing dose) was used. It is the

minimum amount of ASV that will save 50% of the test animals.

RESULTS

Results of neutralisation of the different biological properties of the venom by the antivenom are shown in Table 1.

In the first method, the neutralizing efficacy of the antivenom in schedule (A) was comparable to the reference control (except in neutralizing lethal activity) and has a better performance than the antivenom in schedule (B).

In the second method, the efficacy of the antivenom in schedule (A) was 2-4 times inferior in neutralizing, necrotic, coagulant and defibrinogenating activities and has a comparable efficacy to that of schedule (B) except in increase in capillary permeability increasing activity. A better preservation of antivenom efficacy was observed in daily watering of the sand using the first method than the second method.

Relationship between the temperatures of environment and the sand inside the pot are shown in Table (2).

Daily watering of the sand keeps the temperature of the sand 1-2°C cooler than that of the every third day watering. Moreover, it could maintain the temperature of the sand at 30-32°C (8-10°C lower) when the maximum environmental temperature during the hot summer months was 40°C.

DISCUSSION

The study highlighted that the potency of the liquid antivenom stored in a sand pot embedded in the ground with daily watering of the sand for 7 months covering the hottest summer of the mid land was well preserved compared to the control stored at 4°C for the

Table 1. Amount of antivenom required to neutralise different biological properties of the Russell's viper venom

Method/Antivenom	5LD ₅₀ 233.7 ug	3MHD 2.53 mg	3MND 2.39 mg	10MCD 50.25 ug	5MDD 120 ug	100MCPID 14.48 ug
Control	5 ul	5 ul	5 ul	0.0781 ul	2.5 ul	20 ul
Method 1/Schdle A	10	5	5	0.0781	2.5	20
Method 1/Schdle B	10	10	2.5	0.1562	5	20
Method 2/Schdle A	5	5	10	0.3125	5	10
Method 2/Schdle B	5	5	10	0.0781	5	40

Control = the same batch of antivenom stored at 4°C
Method 1 = antivenom containing sand pot embedded in the ground
Method 2 = antivenom containing sand pot embedded in a largest pot filled with sand was kept inside the house
Schdle A = daily watering of the sand
Schdle B = every third day watering of the sand
LD₅₀ = lethality
MCD = minimum coagulant dose
MHD = minimum haemorrhagic dose
MND = minimum necrotic dose
MDD = minimum defibrinogenating dose
MCPID = minimum capillary permeability increasing dose

Table 2 Relationship between the temperatures of environment and sand inside the pot in two study sites

Season	Study site	Month	Environment temp. °C	Sand temp. inside the pot °C	Temp. differences °C
			Min-max	Min-max	Min-max
Winter	Taungoo	Dec-Feb	23-32	19-26	4- 6
	Taungdwingyi	Jan-Feb	21-32	17-23	4- 9
Summer	Taungoo	Mar-Jun	29-40	28-32	1- 8
	Taungdwingyi	Mar-May	23-40	18-30	5-10

same duration. Daily watering of the sand has an advantage over every third day watering in keeping the temperature of the sand 1-2°C cooler and it could be carried out routinely at the villages.

The objective of the study is to find out an optimal storage condition for liquid ASV in the field. ASV should be stored at 4°C, however the temperature, which could be, achieved with our method ranges from 18-32°C where the room temperature ranges from 23-40°C during summer months.

Although our study lasted for 6-7 months, it covered vital hot summer months. In our earlier studies [4] we observed that liquid ASV stored in the cupboard at room temperature in midland hospital turned cloudy and precipitated out. Variable reduction in venom neutralizing activities was observed.

According to British Pharmacopoeia [5] enzyme refined antitoxin are more stable than the whole sera preparation and deterioration at temperature between 0 and 5°C is negligible. At 37°C the preparation may loose 10-20% of

their activity in one year. A slight reduction in neutralising activity to different biological activities observed in our antivenom could be due to storage of the products at a temperature well above 4°C. If liquid antivenom is stored at 37°C for 6 months, it started to precipitate out indicating loss of efficacy [2]. In order to have a storage temperature of 37°C the environmental temperature should be 45-47°C, which is unlikely but could not be ruled out especially during summer months in the midland. Although venom neutralising efficacy of the antivenom in the second method with daily watering of the sand was slightly inferior to that of the first method, it could be used if the latter method of storage is not feasible as in our case.

It is concluded that since liquid antivenom stored in a sand pot embedded in the ground with daily watering of the sand preserved its venom neutralising efficacy, it is recommended to store liquid and lyophilized antivenom in this way in snake bite endemic areas where no cold storage facility is available. Moreover, it is simple, inexpensive, and effective and could be carried out properly in rural villages without much effort. However, practice of rapid turnover of the

fresh stock of liquid antivenom especially during the summer months in the midland areas should also be encouraged [4].

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Urinary fibrin(-ogen) degradation products in pregnancy associated hypertension

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The relationship between the urinary fibrin(-ogen) degradation products (FDP) and high blood pressure and other features like proteinuria and oedema were studied in 42 cases of pregnancy associated hypertension (PAH) and/or pre-eclampsia (PE). Urinary FDP were detected in 64.3% of cases. All cases with systolic blood pressure >180 mmHg and/or diastolic blood pressure >100 mmHg showed FDP in urine in various concentrations. In 91% of cases with proteinuria more than 2+ urinary FDP was also detected. In some cases with no proteinuria FDP was found. There was no definite relationship between severity of oedema and urinary FDP level. When a patient is under treatment and responding well to that treatment urinary FDP level also becomes reduced or undetectable.

INTRODUCTION

Measurement of urinary FDP is useful in describing disease activity in some glomerular disorders [1] and may be helpful in evaluating the response of glomerulonephritis patients to treatment [2]. Although exact aetiology and pathogenetic mechanism of pre-eclampsia and pregnancy induced hypertension (PIH) is not known there are well-established facts showing renal involvements in it. Fibrins are deposited in the sub-endothelium of spiral arteries leading to proteinuria and hypertension [3]. Extensive studies have been done on changes of homeostasis in PIH/PE and accepted that disseminated intravascular coagulation (DIC) is responsible for many of the clinical manifestations [4]. Although this is disputed by some investigators it is irrefutable that extensive haemostatic changes including increased fibrinolysis exist in PE/PIH. Although a few studies were well reported about urinary FDP in this clinical syndrome [5] it has never been studied in

relation with management of it.

This study was conducted to assess the relationship between clinical severity of cases and urinary FDP level, and to observe the value of determination of FDP in urine in relation to response to treatment.

PATIENTS AND METHODS

Forty-two pregnant mothers admitted to Central Women's Hospital for both (a) persistent hypertension or a sudden rise of blood pressure (BP) and (b) proteinuria and/or generalised oedema during last four months of pregnancy were included in this study. Urinary FDP levels were determined twice, one each on admission and before discharge by staphylococcal clumping test (SCT) using test kit which is developed locally in Pathology Research Division, Department of Medical Research [6,7]. Clinical data such as BP, proteinuria and oedema were obtained from patients' clinical charts by the permission

of medical officer in-charge concerned. Thirty samples of urine collected from age and gestation- matched normal pregnant mothers were also included in this study as controls.

RESULTS AND FINDINGS

Fifteen out of 42 urine samples had no detectable amount of FDP (i.e. <2ug/ml, the sensitivity level of SCT). Distribution of urinary FDP levels among these samples is shown in Table 1.

Table 1. Distribution of FDP in urine samples

FDP concentration (ug/ml)	No. of cases
<2	15
>02-<10	08
>10-<20	01
>20-<40	04
>40	01
Total cases	42

FDP was detected in urine in 27 out of 42 cases, concentration ranging from. 02-10 ug/ml to >40 ug/ml. All of the control urine samples had no detectable amount of FDP except in one sample where FDP was found to be >20>10 ug/ml.

Urinary FDP and BP

Table 2 shows the relationship between diastolic BP and urinary FDP level. All the cases under this study had diastolic BP>90 mmHg.

Table 3 shows urinary FDP titre in relation to systolic BP of the cases. There were eight cases with systolic BP <140 mmHg and remaining 34 cases had >140 mmHg.

Urinary FDP and proteinuria

Proteinuria was found in 28 cases in which FDP was also detected in various concentrations ranging from >2 ug/ml to >40

Table 2. Diastolic BP and urinary FDP titre

Diastolic B.P	No. of cases	<2 ug/ml	>2 - <10 ug/ml	>10 - <20 ug/ml	>20 - <40 ug/ml	>40 ug/ml
>90-100	23	15	04	03	01	-
>100-110	12	00	03	07	01	01
>110-120	04	00	00	03	01	-
>120	03	00	01	01	01	-
Total	42	15	08	14	04	01

Table 3. Systolic BP and Urinary FDP titre

Systolic BP	No. of cases	<2 ug/ml	>2 - <10 ug/ml	>10 - <20 ug/ml	>20 - <40 ug/ml	>40 ug/ml
<140	08	04	02	02	-	-
140-160	15	06	03	04	01	01
>160-180	11	05	00	06	00	-
>180-200	05	00	02	01	02	-
>200	03	00	01	01	01	-
Total	42	15	08	14	04	01

Table 4. Proteinuria and urinary FDP titre

Protein cases	No. of cases	<2 ug/ml	>2 - <10 ug/ml	>10 - <20 ug/ml	>20 - <40 ug/ml	>40 ug/ml	%
Clear	14	4	5	3	2	-	70.1
Trace	6	4	0	2	-	-	33.3
+	11	6	1	4	-	-	44.4
++	4	1	0	3	-	-	75
+++	5	0	1	1	2	1	100
Solid	2	0	1	1	-	-	100
Total	42	15	8	14	4	1	64.4

Table 5. Oedema and urinary FDP titre

Oedema	No. of cases	<2 ug/ml	>2 - <10 ug/ml	>10 - <20 ug/ml	>20 - <40 ug/ml	>40 ug/ml
Mild	3	2	1			
Moderate	26	9	4	11	1	1
Severe	13	4	3	3	3	
Total	42	15	8	14	4	1

ug/ml. Fourteen cases had no proteinuria where 10 cases (70.1%) had FDP up to >20 - <40 ug/ml range titre. Table 4 shows the relationship between proteinuria and urinary FDP.

Urinary FDP and oedema

Oedema was present in all 42 cases ranging from mild, moderate to severe. Urinary FDP has no correlation with severity of oedema. Table 5 shows clinical grading of oedema and distribution of urinary FDP in cases under study.

Urinary FDP level fell to a certain extent or to normal along with treatment in all cases. Second time urinary FDP value was lower than that of first time value, which were taken before discharge and on admission respectively.

DISCUSSION

In normal healthy persons urinary FDP are undetectable but levels of up to 100ug/ml have

been recorded in persons suffering from types of kidney diseases [8,9,10]. It can be detected in urine of cases with glomerulonephritis, urinary tract infection and disseminated intravascular coagulation. The source of FDP in urine may be either glomerular filtration of circulating FDP or intra-renal deposition of fibrin and subsequent lysis or both. This study demonstrates that FDP is present in urine of more than 64% of pregnant mothers with PAH/PE. Although we cannot identify the source of FDP this is an indirect evidence supporting the hypothesis of occurrence of either delayed form of DIC and /or local deposition of fibrin in the tubules and glomeruli in toxemia of pregnancy.

All of 15 cases with diastolic BP>100 mmHg and all of 8 cases with systolic BP>180 mmHg also have urinary FDP. It can be assumed that FDP is present in urine whenever there is moderate to severe degree of hypertension. There are 11 cases with proteinuria 2+ and above. All of these cases, except in one, also

have urinary FDP in various concentrations. This finding too leads to give an assumption that proteinuria 2+ and/or above is almost always associated with presence of FDP in urine in PE/PAH. These assumptions give rise to some clinical significance. If one or both of the features (moderate to severe degree of hypertension and/or proteinuria 2+ and above) is observed in PE/PAH, clinician should be aware that the patient is either in a state of compensated DIC or renal involvement like fibrin deposition or both. There is no clear-cut correlation between severity of oedema and urinary FDP.

Second time FDP, which was taken during management or just before discharge, fell to normal (<2 ug/ml) or to a lower titre in all cases. So urinary FDP can be used as a reliable indicator for the assessment of response to treatment in PE/PAH.

Staphylococcal clumping test, which was used in this study, cannot identify the origin of FDP, either fibrinogen or fibrin. D-dimer assays were suggested for confirmation of DIC where both coagulation and fibrinolysis were activated [11]. Since urine samples were treated with thrombin, false positive test usually caused by whole fibrinogen molecule was totally excluded. In this study culture of urine was not done to exclude associated urinary tract infection where staphylococcal-clumping test may be positive [12].

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**Correlation between Immunofluorescence Assay (IFA) positivity
and malaria endemicity in Myanmar**

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Immunofluorescence assay (IFA) for intra-erythrocytic *Plasmodium falciparum* parasite was determined in all ages and both sexes of permanent inhabitants of 3 villages in Myanmar with differing malaria endemicity. According to the WHO criteria, malaria endemicity depends on the parasite positive rate and spleen rate and the 3 villages could be characterized as one village each of hypoendemicity, mesoendemicity and hyperendemicity. The prevalence of IFA positivity were 30%, 71% and 97% and the mean IFA titers were 800, 13,800 and 174,000 in the hypo, meso and hyperendemic villages respectively. Thus, there is a good correlation between malaria endemicity and the IFA positivity and mean IFA titers. These data indicate that IFA assay can be used to assess malaria endemicity and applicable where proper epidemiological surveys especially in low and medium endemic areas are not possible.

INTRODUCTION

The twin tragedies of broad-spectrum insecticide resistance in malaria-transmitting mosquitoes and the continuing spread of multi-drug resistant malaria parasites have justified the global efforts for the control of malaria and hundreds of recent reports on malaria immunology. Several studies have demonstrated that IFA positivity has a good correlation with malaria endemicity, if so IFA test could be a preferred test for the determination of endemicity compared to the gold-standard malariometric data, which are time-consuming, tedious and expensive. To confirm this possibility, we performed IFA tests on 120 villagers per village, of all age groups and both sexes residing permanently in three regions of Myanmar with differing malaria endemicity, which ranges from hypo to hyperendemicity.

MATERIALS AND METHODS

Study area

The study was performed in 3 rural villages of Myanmar namely Oo Do, Eindayaza and The Chaung where malaria epidemiologist has been studied in details [1]. In all 3 villages only *Plasmodium falciparum* and *Plasmodium vivax* were detected with the former accounting for 60-90%.

Oo Do village is situated in Hlegu Township and it is a receded forested foothill of Bago Yoma mountain range. In the village of Oo Do, the parasite positive rate was 53% and the spleen rate in children was 63%. Both parasite rate and spleen rate were over 50% that the village was identified as a hyper endemic malaria area [2].

Eindayaza village is located in the hilly part of Taninthayi Division and the villagers earn their living by plantation and gardening. The parasite positive rate was 26%. However, for unknown reasons, the spleen rate in children was 7% only. The village could be characterized as mesoendemic according to

rate and spleen rate were performed for 3 consecutive years from 1995 to 1997, and all the data were compiled. For Eindayaza and The Chaung villages 5 cross-sectional surveys were performed during 1995-1996 covering all 3 seasons and pre and postmonsoon. All those results were compiled. The coverage of

Table 1. Parasite rate, spleen rate, IFA prevalence and mean IFA titers of the 3 villages

Village	Parasite rate (n=120)	spleen rate (n=40)	IFA prevalence (n=120)	Mean IFA titer (n=120)
OoDo	53%	64%	97%	17300
Eindayaza	26%	7%	71%	1400
The chaung	10%	3%	30%	200

n = Number of cases

the parasite rate.

The Chaung village is on a plain part of Taninthayi Division and the villagers are farmers. The parasite rate was 10% and the spleen rate was 3%. According to the spleen rate and the parasite rate, the village is hypo endemic area.

Parasitological examination

Both thick and thin films from each subject were stained with the standard Giemsa method. Parasite species were identified and parasite counts determined against 300 leukocytes in the thick smear.

Spleen rate

Splenic enlargement was assessed by the subject in lying position with relaxed abdomen without clothes in children between 2 to 9 years.

Calculation of parasite rate and spleen rate for endemicity

In Oo Do village monthly surveys for parasite

villagers for endemicity calculation varied from 50-90%. Number of villagers tested for parasite in each village is shown in Table 1.

Serum collection

Venous blood was collected in sterile vacutainer, aliquoted and stored at -20°C until tested. Since the parents did not allow taking venous blood from their small children sera from children less than 2 year-old were not available for the study.

IFA test

As previously described [3]. Briefly, culture adopted parasite strain T-23 containing a high percentage of mature schizont-infected erythrocytes (10% parasitemia) were spread as thin film, air dried and fixed with cold acetone. Serially diluted sera were applied to the films, incubated 30 min, washed 3 times in PBS, and then incubated again with fluorescein-conjugated goat anti-human IgG (Cappel Laboratories, Cochranville, Pennsylvania), 1:200 containing 0.02% Evan's blue to visualize parasite by fluorescence microscopy. IFA titre less than

1:200 are regarded as negative. We put on the hyper-immune serum from Africa for positive control and serum of normal person from non-endemic area for negative control in every test. Both sensitivity and specificity of the IFA test are 100%.

RESULTS

Levels of IFA antibodies

As shown in Table 1, the prevalence of IFA antibodies to *P. falciparum* schizont stage differed markedly in the three villages studied.

In the village of The Chaung, where malaria transmission is low, IFA positivity was 30% and the mean IFA titer was 200.

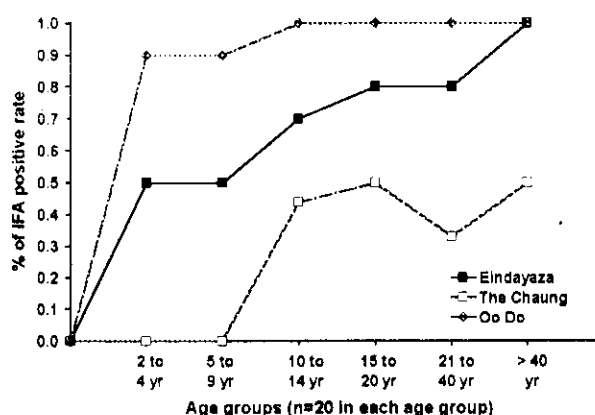


Fig 1. Correlation between IFA positivity according to age groups in 3 villages

prevalence was 71% and the mean titer was 1,400. Therefore both the positive rate and the degree of positivity expressed by the mean titer have a positive relation with the malaria endemicity (Fig. 1).

Table 2. IFA prevalence and titers according to age groups in all 3 villages

Age group	Eindayaza	Eindayaza	The Chaung	The Chaung	Oo Do	Oo Do
	IFA positivity (n=20)	Mean titer	IFA positivity (n=20)	Mean titer	IFA positivity (n=20)	Mean titer
2 to 4 yr	50%	130	0%	0	90%	800
5 to 9 yr	50%	200	0%	0	90%	7000
10 to 14 yr	70%	200	44%	200	100%	24000
15 to 20 yr	80%	200	50%	200	100%	24000
21 to 40 yr	80%	1500	33%	200	100%	24000
>40 yr	100%	6600	50%	200	100%	24000
Mean	71%	1400	30%	200	97%	17300

In contrast, in Oo Do village where malaria is hyperendemic, the prevalence of IFA positivity was 97% and the mean titre was 17,300.

Among the Eindayaza villagers who are residing in malaria mesoendemic area the IFA positivity was in between those of The Chaung and Oo Do. Here, IFA antibodies

When the IFA positivity as well as the mean titer was plotted against the age of the subjects as in Table 2, there is an age-dependent increase in the IFA positivity and mean titer in each village. In the low endemicity village (The Chaung), IFA was negative up to 9 year old. From 10 years onwards it became positive and at adult age about 50% of the people were positive. The mean titer was 200 throughout.

age about 50% of the people were positive. The mean titer was 200 throughout.

In the village with high endemicity, IFA was positive in 90% of the population from 2 years onwards and became 100% from 10 years onwards. The mean titer was 800 in 2-4-year group to 7,000 in 5-9-year group and became 24,000 from 10 years onwards. In Eindayaza village where malaria was mesoendemic, the IFA positivity was 50% in children and steadily increased with age and became 100% in adults more than 40 years old. Thus there is an excellent correlation between IFA positivity and the malaria endemicity expressed by parasite rate and spleen rates.

DISCUSSION

In our study there was a well-correlated increase in both IFA prevalence and median titers in relation to the malaria endemicity ranging from low to hyperendemic areas. There was also age-dependant rise and fall in IFA positivity and amount of antibodies in all 3 villages with differing endemicity.

Wahlgren *et al.*, 1986 reported that reactivity of IFA antibodies against intra-erythrocytic malaria parasite is related to the degree of malaria exposure [4]. However, they could not find any relation with the age. This is understandable as their subjects were living under intense malaria pressure that the IFA positivity and titer has attained maximum in early childhood, most probably at the age of 5 years. Even in our study, in Oo Do village where malaria is hyperendemic, the IFA positivity was 100% and maximized by 10 years of age.

Druilhe *et al.*, 1986 demonstrated that IFA antibodies against *Plasmodium falciparum* sporozoite surface antigens were markedly

correlated with the malaria transmission level differing from 1 to 100 infective bites per person per individual [5]. Compared to their test ours is simpler technically as blood stage schizonts are easier to obtain than the sporozoites from infected mosquitoes.

From our results it can be concluded that the frequency of positive sera as well as the anti-*Plasmodium falciparum* titers rose in parallel with the endemicity level measured by the standard parasite rate and spleen rate. Thus serological tests seem to be useful and applicable where proper epidemiological surveys especially in low and medium endemic areas are not possible.

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Bacteriological quality of ice available around Yangon area

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Fifty samples of ice from ice stalls of Ahlone, Botataung, Kamaryut, Kyaukmyaung, Mingalartaungnyunt, Myenigone, North and South Okkalapa, Thaketa and Thingangyun townships were collected randomly. Ice weights ranging from 654.9 to 2218.2 grams were tested for bacteriological quality. The study period lasted from August to November 1997. Total coliforms were present in all the ice samples (100 percent) and faecal coliforms were in (74 percent). The range of total coliform count was from five MPN/100ml to >2400 MPN/100ml and that of faecal coliform count was from two MPN/100ml to >2400 MPN/100ml. From this study it was known that ice were not suitable for drinking purpose.

INTRODUCTION

Waterborne outbreaks by bacterial pathogens were common in various countries. Surveillance of waterborne outbreaks in United States during 1993 to 1994 revealed that bacterial and protozoan infection plays an important role [1]. Numerous species of bacteria including *Aeromonas*, *Clostridium*, *Mycobacterium* and *Yersinia* could be isolated from water supplies. Enterotoxigenic *E. coli* and *E. coli* harboring enteroaggregative *E. coli* (EAST 1) gene were isolated from waterborne outbreak [2]. *Shigella sonnei* outbreak associated with contaminated drinking water was reported [3,4]. A common source outbreak of shigellosis involving a piped water supply in Northern Thai communities was occurred and reported that about 30 percent of the cases were caused by *Sh. flexneri* type 2a in associated with water quality [5]. Thus, this research aims to determine the microbiological quality of ice from various areas of Yangon. It is to

identify the presence of total and faecal coliforms in it.

MATERIALS AND METHODS

Specimen collection

Ice samples with the range of 564.9 grams to 2218 grams in weight from ice stalls of Ahone, Botataung, Kamaryut, Kyaukmyaung, Mingalartaungnyunt, Myenigone, North Okkalapa, South Okkalapa, Thaketa and Thingangyun townships were collected in sterile plastic bags during August to November, 1997. Prior to the determination of total and faecal coliforms, the ice was washed thrice with clean water, followed by sufficient sterilized distilled water. Samples were kept frozen before testing.

Determination of bacteriological quality of ice

It was done by using the criteria as described in World Health Organization manual, 1982 [6].

RESULTS

Presumptive total coliforms count of tested ice samples

Presumptive total coliform count of tested ice samples is shown in Table 1. All the samples were present with coliforms. The most probable number of coliforms ranged from five to >2400/100ml. It is observed that from Ahlone, the coliform ranged from 11 to 920 MPN/100ml; Botataung, 79 to >2400 MPN/100ml; Kamaryut, five to >2400 MPN/100ml; Kyaukmyaung, 11 to 920 MPN/100ml; Mingalartaungnyunt, 17 to 350 MPN/100ml; Myeingone, 79 to >2400 MPN/100ml; North Okkalapa, 11 to 920 MPN/100ml; South Okkalapa, 79 to 1600 MPN/ml; Thaketa, 70 to 1600 MPN/ml and Thingangyun, 130 to > 2400 MPN/ml.

Table 1. Presumptive total coliform count of tested ice samples

Sr. No	Study sites	Presence of coliforms/samples	Range MPN/100ml
1	Ahlone	5/5	11-920
2	Botataung	5/5	79->2400
3	Kamaryut	5/5	5->2400
4	Kyaukmyaung	5/5	11-920
5	Mingalartaung-Nyunt	5/5	17-350
6	Myenigon	5/5	79-2400
7	Okkalapa, North	5/5	11-920
8	Okkalapa, South	5/5	79-1600
9	Thaketa	5/5	70-1600
10	Thingangyun	5/5	130->2400
Total		50/50	5->2400

Table 2. Presumptive faecal coliforms (FC) count of tested ice samples

Sr. No	Study sites	Presence of FC/samples	Range MPN/100ml
1	Ahlone	2/5	2-49
2	Botataung	5/5	2->2400
3	Kamaryut	5/5	2->2400
4	Kyaukmyaung	4/5	2-70
5	Mingalartaung-Nyunt	2/5	5-23
6	Myenigon	4/5	2->2400
7	Okkalapa, North	4/5	2-23
8	Okkalapa, South	3/5	5-23
9	Thaketa	4/5	2-46
10	Thingangyun	4/5	8-49
Total		37/50	2->2400

Presumptive faecal coliform (FC) count of tested ice samples

Presumptive faecal coliform (FC) count of tested ice samples from study sites is shown in Table 2. It shows that 37 samples (74 percent) out of 50 samples tested were present with faecal coliforms. The counts varied with the range of two to >2400 MPN/100 ml. The two samples from Ahlone had FC count of two and 49 MPN/100 ml. From Botataung the FC counts were 2, 13, 240, 920 and >2400 MPN/100 ml. From Kamaryut, it was 2, 5, 5, 8 and >2400 MPN/100 ml. From Kyaukmyaung it was 2, 4, 5 and 70 MPN/100 ml; from Mingalartaungnyunt, 5 and 23 MPN/100 ml; from Myenigone 2, 5, 540 and >2400 MPN/100 ml; North Okkalapa 2, 5, 23 and 23 MPN/100 ml; and South Okkalapa 5, 13 and 23 MPN/100 ml. From Thaketa the FC count were 2, 13, 23 and 46 MPN/100 ml and from Thingangyun 8, 13, 17 and 49 MPN/100 ml.

DISCUSSION

Surveillance of waterborne disease reveals that various kinds of bacterial pathogens play an important role in transmission of the disease [7]. Many investigators from different parts of the world reported various types of pathogens isolated from water sources. These include: *Aeromonas* strains [8]; *Cryptosporidium* species [9]; *Clostridium perfringens* [10]; Enterobacteria [11]; *E. coli* 0157 [12]; *Legionella* species [13]; *Mycobacterium* species [14]; *Pseudomonas* species [15]; *Salmonella* species [16]; *Shigella* species [12]; *Staphylococcus* species [17]; *Vibrio* species [18]; and *Yersinia* species [19]. This study shown that all the ice samples tested were contaminated with coliforms and 74 percent of them were also contaminated with faecal coliforms. Handling of water before ice production is important and proper treatment is also necessary. Thus, it is advised to use decontaminated water for the production of ice for drinking purposes and to practice container washing and hand washing properly in ice factories. Ice can also be contaminating during transportation to the ice stalls, storage and handling of vendors in ice stalls. Therefore, health education is also necessary to the vendors of ice stalls not to get contamination.

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SHORT REPORT

Plasmodium malariae from Tha-Hton Township, Union of Myanmar

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P. malariae is the only human malarial parasite, which is associated with the development of nephrotic syndrome, thus its identification is of importance for the control and treatment of malaria as well as the prevention of subsequent nephrotic syndrome. The incidence of nephrotic syndrome in Myanmar is high and it accounts for 39-46% of the total admission in the Renal Unit of the Defense Services General Hospital, Mingaladon, Yangon, Myanmar (personal communication). *P. malariae* is prevalent in the neighboring countries like Thailand [1] and was also reported from the Shan State of the Union of Myanmar [2]. However, to our knowledge *P. malariae* was not reported from other parts of the country including the Mon Division.

A 48 year-old female was admitted to the North Okkalapa General Hospital, for fever of 4 days duration. She gave history of stay in Tha-Hton, Mon State, and arrived Yangon 10 days prior to the febrile episode. On admission her body temperature was 100°F. Her sclera had slight tinge of yellow color. Her liver was just palpable but the spleen was not palpable. There was slight neck stiffness. She was semiconscious and scored 7 out of the 15 modified Glasgow Coma Scale (MGCS).

According to the WHO criteria [3] GCS ≤ 7 is

regarded as cerebral malaria. However, the immunochromatographic test (ICT Diagnostics, Australia) for the qualitative detection of *P. falciparum* antigen was negative and blood films for microscopic examination revealed both ring and schizont stages of malaria parasites and was reported as *P. vivax*, plus 4 [3]. To exclude hypoglycemic attack or diabetic ketoacidosis blood sugar level was determined and was within normal (100 mg/dl) value. Cerebrospinal fluid examination was not carried out. Other laboratory examinations like urine for routine examination were normal. She was diagnosed as malaria with viral encephalitis. Since cerebral malaria cannot be totally excluded, she was treated with injection artemeter 160 mg loading dose and 80 mg 12 hourly for 2 days and mefloquine 15 mg base/kg single dose through the intra-nasal tube. She regained consciousness the next day and improved progressively. On day 4, she had completely recovered with no jaundice; no palpable liver and blood films were negative for malaria parasites.

When the pretreatment blood films, both thick and thin films stained with Giemsa's were examined by one of the authors, the characteristic band forms (the trophozoites stretched across the entire width of the RBCs with no changes in the host RBCs) were observed. Other forms such as young

trophozoites and young schizonts of *P. malariae* were also noted. The degree of parasitemia in *P. malariae* infection was reported to be less than 10,000 per μ l of blood [4], however, the parasitemia in our case was 126,000 per μ l. Whether this high parasite load is the cause of meningeal symptoms like neck stiffness and the reduced coma scale needs further evaluation.

Nephropathy associated with malaria is well documented and the most convincing evidence for an immune-complex type of renal lesion has been established in *P. malariae* [5]. Thus identification of *P. malariae* has not only an academic importance but it is of crucial value in the prevention of the subsequent nephropathy. Since nephrotic syndrome accounts for nearly half of the admissions in the Renal Unit of the Defense Services General Hospital No. 1, which drains the majority of malaria patients in the whole country, it is advisable to carry

out further studies with regard to *P. malariae* infection and its renal complications.

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SHORT REPORT

Vibrio cholerae O139 in Yangon

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The novel strain causing the outbreaks of cholera like infection was clinically, morphologically and epidemiologically indistinguishable from *Vibrio cholerae* O1 serogroups. But it did not agglutinate with O1 antiserum or with antisera against any of 137 non-O1 serogroups. Hence, given the name O139 [1]. *V. cholerae* O139 possessed an epidemic potential as seen in cholera-like epidemics in Calcutta, India with 13,000 cases and 3.2 percent death, whereas in Bangladesh, it occurred with 10,000 cases and five percent death. Both incidences took place during early period of 1993 [2].

Rectal swabs from 100 cases of acute gastroenteritis cases admitted to Yangon Infectious Diseases Hospital during 8th March to 21st March 1994 were collected and transported in Cary Blairs transport media. *Vibrio* species were isolated according to the method of WHO. The specific diagnostic O139 antiserum was obtained from Professor Y. Takeda, Japan. Antibiotic susceptibility was determined by agar disc diffusion technique as described by Kirby and Bauer [3].

Vibrio cholerae O139 was detected from 41 cases (41%), *V. cholerae* O1 Eltor in 18 cases (18%) and other *Vibrio* species from 8 cases (8%). The results of antibiotic sensitivity

pattern are shown in Table 1 with identical pattern.

Table 1. Antibiotics susceptibility pattern of *Vibrio cholerae* O139 and O1

Antibiotics	<i>V. cholerae</i> O139	<i>V. cholerae</i> O1
Tetracycline	Sensitive	Sensitive
Gentamycin	Sensitive	Sensitive
Erythromycin	Sensitive	Sensitive
Cephalothin	Sensitive	Sensitive
Nalidixic acid	Sensitive	Sensitive
Furazolidone	Sensitive	Resistant
Cotrimoxazole (Septrin)	Resistant	Sensitive
Ampicillin	Resistant	Resistant
Sulfisoxazole	Resistant	Resistant
Streptomycin	Resistant	Resistant
Chloramphenicol	Intermediate susceptible	Sensitive

Indigenous cases of cholera due to *V. cholerae* O139 were spreading in several Asian countries. This study indicated that spreading of disease in prostrated forms had occurred in Yangon. Cases admitted were referred from different townships of greater

Yangon areas. Some came from Hlegu, Tonte, Bogalay townships etc. From the country report, there was a spread of cholera-like illness in four townships of Ayeyawady Division with 780 cases and 2.7% death. Thus it can be concluded that Myanmar, due to its geographic location, lies along the wave of the spread of O139. Although O139 spread of cholera-like illness appears, it is treatable with oral and intravenous rehydration therapy [4]. The isolates of O139 and O1 in this study are sensitive to tetracycline. However, they are resistant to cotrimoxazole, ampicillin and sulpha groups.

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