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**Lights and shadows of people affected with leprosy
in Sittaung Area, Myanmar**

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The study was conducted with the general objective of exploring the effect of leprosy on social lives of persons affected by leprosy (PALs) so as to socially integrate them into local society in Sittaung Area. This was a multiple case study using individual as embedded unit of analysis. The analysis focused on how the PALs told their stories about their social lives in their community. Study population was PALs aged 18 years and above residing in Sittaung Area. The emphasis was on studying PALs from social group difference perspectives. A total of 38 PALs were included in the study. Among PALs of lower social group, economic difficulties were their concerns more than social problems emanating from their disability. The study highlighted that improvement in the economic status of PAL could bring the person out of shadow. It was also found that allowing PALs, especially of lower social group, participate in local social organizations by the community would discard away their feelings of being in shadows. Resilient spirit of each individual PAL was found as the key factor that could pull a PAL out of shadow. It is recommended that, especially for PALs of low social group, empowerment education approach complimented with socio-economic strategies could bring their lives out of shadows.

Prologue

“Taung-soke-a-kut-mae” (*a broken basket without lining*)

PAL spoke of being socially accepted or not depended to a great extent on their economic status in their community. It did not depend on their disease status. A female PAL from a lower social group encountered a serious discrimination by her community when the community came to know about her disease. Her family was not allowed to take water from the wells owned by her neighbors. She compared her poor life of that time to a broken basket without lining (*taung-soke-a-kut-mae*). However, after struggling and accumulating wealth,

her family’s status in the community changed. This woman, now a 59-year-old grade 2 PAL, of upper social group, and a released from treatment (RFT), said:

“Formerly, they told us not to take water from their wells. Now many people come to us to fetch water from our well.”

INTRODUCTION

Leprosy is a disease with social stigma. Social stigma has been defined as a physical, mental or social attribute of an individual or group that elicits an adverse or discriminatory response from others [1]. The ideology of the stigma of leprosy is strongly felt and expressed verbally in

the community [2]. Simultaneously, self-stigmatization exists among the patients with visible disfigurement: they withdraw from most social activities permanently. The impact of the disease clearly affected in the patient's everyday life. They considered leprosy as a constant threat to their lives.

Social prejudices contributed to emotional and physical suffering, abandonment, deformities and psychosocial problems [3]. Leprosy patients and their families reported encountering social, physical and mental problems. Some patients said they dared not walk around in the community that other people appeared disgusting them, which made them feel depressed and ashamed [4]. Some patients mentioned difficulties in their jobs after the onset of the disease. In addition to physical manifestation, indisposition, depression and worries limited their productivity. Therefore, many preferred to hide the disease in order to avoid being fired or given early retirement [3]. Children of several patients were not able to get jobs easily if the employers knew about their parent's condition [4].

Although the stigma of leprosy exists, there is a lack of knowledge about what it is like to be a person affected by leprosy (PAL) or how he or she adjusts his or her life with social ostracism in the society [2]. Health workers who fight against leprosy and those involved in health education and rehabilitation programmes for combating stigma of leprosy thus need to be aware of not only the significant impact that social and cultural constructions produce the stigma surrounding leprosy, but also how it is directly related to their service activities [2].

Understanding the effect of leprosy on social lives of persons affected by the disease and the way they cope and adjust their social lives in their communities could provide information to be taken into consideration in rehabilitation programmes for PAL. It is with these considerations that this study was undertaken because no similar previous study exists in Myanmar.

Aim and objectives

The study aimed to explore the effect of leprosy on social lives of persons affected by the disease so as to socially integrate them into local society in Sittaung Area.

Specific objectives

1. to determine the social group differences among PAL in Sittaung Area
2. to explore how the PAL cope and adjust their social lives in the community; and
3. to make recommendations on how to socially integrate the PAL in Sittaung Area.

MATERIALS AND METHODS

Study design

This is a multiple case study using individuals as embedded units of analysis. A case study is an empirical inquiry that investigates a complimentary phenomenon within its real life context especially when the boundaries between phenomenon and context are not clearly evident. This study relies mainly on qualitative data. The analysis focuses on how the PAL tell their story about their social lives in their community.

Study area

Sittaung Area, situated in Kyaikhto Township, Mon State, was chosen purposely as the study area. Although it is not included in the six hyper-endemic leprosy regions, the registered prevalence rate of leprosy was 2.4 per 10,000 population in 2000 and disability grade 2 among new cases was 14% in 1999 [6].

After discussion with responsible persons from the Sittaung Area during the pilot trip, starting from Theinzayat Town, which is quite close to the Sittaung Bridge, we included 9 sites - towns/villages where there is a station hospital, a rural health centre (RHC) or a rural health sub-centre (RHSC). Two towns (Theinzayat and Kyaikhto) and seven villages (Mokepalin, Sittaung,

Inngapo, Thitseik, Kyaikhto, Kaukhtinn, Boyargyi, Kauksan and Kyaikkathar) were involved in this study. These study locations are situated along the east of the Sittaung River.

Study population and sampling

Study population was the PAL aged 18 years and above residing in Sittaung Area. We first made a visit to Sittaung Area and held informal interviews with basic health staff and community representatives (local leaders and local NGO members). We requested local basic health staff to make a list of PAL who were 18 years and above, each having different disability grades. WHO disability grade(1998) was used for this study. We inquired local job categories by which local people could be classified into different social groups. We did not define the sample size before the study and we planned to stop till we obtained saturated information which gave a total of 38 PAL.

Data collection

The interviewees were requested to describe their social lives emphasising on their lived experiences, implications of social stigma, coping with social stigma and adjusting their social lives in the community. We did not identify any theme in advance for interviews. We just followed the topics what they told us, but tried to obtain their changing lives before and after contracting the disease as much as we could. All the interviews were tape-recorded.

Data analysis

The dialogues were transcribed. The tapes were listened many times over and the transcripts were reread for several times to develop insights into the lived experiences of the PAL. Themes were extracted from the dialogue.

RESULTS

Social groups in Sittaung Area

Economic activities of the Sittaung Area are related to some extent on Kyaikhtiyoe

Pagoda. The festival of this pagoda begins in October and lasts till April every year. The economic activities also relate to fishing in Sittaung River.

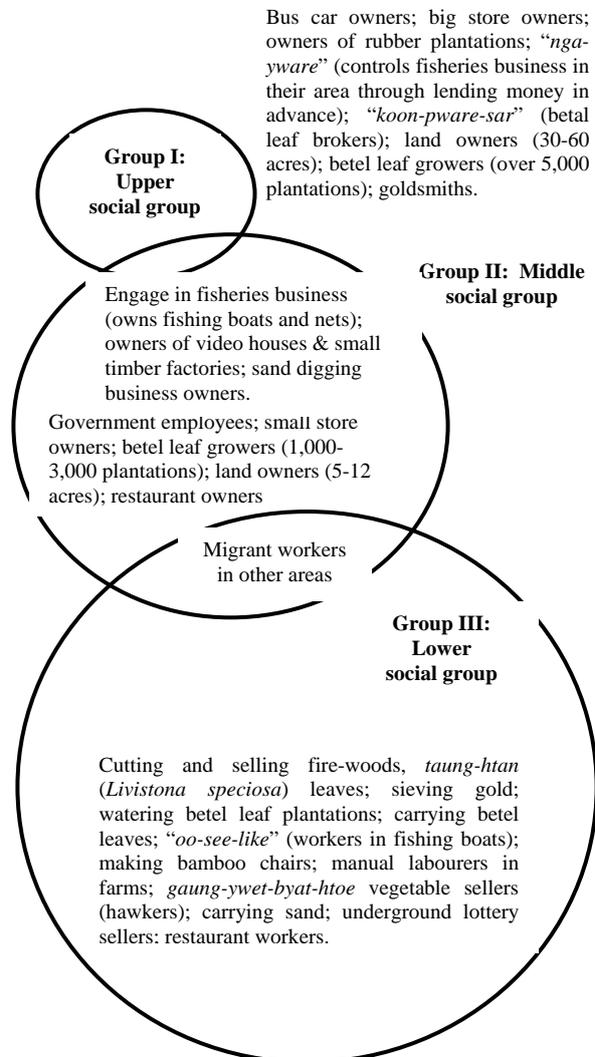


Fig 1. Social groups and their related economic structures in Sittaung Area (size of circles in relative proportions)

Social groups in Sittaung Area can be divided into three, basing economic activities of the local people: upper group, middle group, and lower group. This division into three social groups is in consonance with the study findings in Myanmar's rural areas elsewhere [7, 8]. The relative proportions of the social groups and their related economic structures in Sittaung Area and population movements are graphically presented in Figure 1.

At Kyaikhto Town, there is one very special social group that can be considered much higher than the upper social group categorized above. They are very rich people, about 40-50 families, but constituting a very small fraction of the total families in Sittaung Area. Their annual income is said to be Kyat 20-30 million. The Kyaikhtiyoe Pagoda festival business is said to be totally controlled by these families. People from middle and lower social groups work in their businesses as employees.

Some “Oo-see-like” workers migrate far to the south to a place known as Ahlat in Ye Township, Mon State, to be engaged in fisheries business there. Some families migrate to the same township to work at rubber plantations there. Some young people, especially girls (20-30 years age), migrate to border areas in the east to work as factory workers there.

Social characteristics of study samples

The social group characteristics and disability grades of the PAL included in our study are as shown in Table 1.

Table 1. Social group characteristics and disability grades of PAL

Social group	Disability grade 0	Disability grade 1	Disability grade 2	Total
High	4	0	2	6
Middle	5	0	3	8
Low	9	4	11	24
Total	18	4	16	38

Disability grade: a factor affecting social life?

It is clear that disability grade is a factor affecting social life. Generally, a PAL with low disability grade will have less social problems whether he or she comes from a low or high social group.

One 26-year-old married male PAL of lower social group with grade 0 deformity expressed his satisfaction in his social life. However, he spoke of economic difficulties as lacking in financial resources to invest in their Sittaung Area which was abundant with natural resources to be exploited. This

situation had no relationship of any kind to being a PAL. He was born and brought up in a poor family, he studied at a monastery because he could not go to a school, he earned as a manual laborer, he got married to a woman of the same social group when he was 23 years old and at the time of interview he had two children. He said:

“I came to know about my disease when I was 15 years old. At first I thought I was having some kind of skin allergy. The midwife staying in our village diagnosed the disease. I took treatment and was said to be cured after about a year I think ... I got married when I was 23 years old. Before I got married, my wife and her parents did not know that I was having this disease. After we got married, they knew about it but there was no problem.”

He spoke of his concerns for his children not because of his disease but because of their poor status and financial problems.

A 30-year-old male PAL of high social group with grade 0 deformity expressed his satisfaction in both his economic and social lives. He was also married and had one son who was now attending a nursery school. Both he and his wife were from rich families and they were neighbors. His wife knew about his disease before they were married and there was no problem. His younger brother and his aunty were also PALs with similar grades.

Having feelings of inconsequential within a PAL particularly with grade 2 disabilities could become one important factor for putting oneself into isolation from others. One 42-year-old female PAL, having shortened fingers and toes, and also having serious facial disfigurements (flattened nose and eye deformity) described about her feelings of inconsequential. She said: *“My daughter fell in love with a young man. I did not want my daughter to get married to anyone because I was afraid that people would look down at her. I told my daughter to bring the parents of the young man to me to make a request from me to get their son*

married to her. They came to me and they did. Even then, I did not feel comfortable. I personally met the boy at a billiard parlor and told him I did not agree him to marry my daughter. Three days later, he and my daughter eloped. I did not go to their wedding ceremony, because I felt ashamed to go out and meet people.”

The saying that “love is blind” might hold true. Disfigurement of a person might not deter away someone in love if an attachment between the two became too strong. However, love alone might not keep the attachment string strong in the long run. The following story revealed this issue.

The parents of a 35-year-old grade 2 PAL of low social group, sold rice and curry to train passengers at a railway station. His father got a second marriage, divorced his mother and took away their business. He had to leave school (third grade) to help his mother in their earning activities. His mother became a *gaung-ywet-byat-htoe* vegetable seller. He came to know that he was having skin patches when he was 14 years old; but he did not take treatment for two years. Later because of appearance of disfigurements he went to a health center and took treatment. When he proposed a girl who was also a *gaung-ywet-byat-htoe* vegetable seller like his mother, the girl refused because she detested him. He assisted the girl in carrying her goods, accompanied her to her house when it was late at night and proposed her quite often. Later, she became very sympathetic on him and they eloped because the girl’s side did not approve their love. He had already completed his treatment one year before eloping. After having four children, his wife started to have an affair with another man who was better looking compared to him. He said since they were very poor and sometimes they could eat only one meal for a day, he could understand the frustration of his wife towards him. His wife’s relatives stood on his side and persuaded his wife to stop the affair. She changed her behavior and was now staying with him.

Did the disease drive PAL into poverty?

In our study we discovered that PAL of different social groups were in their respective social groups long before getting the disease. There were exceptional few. One finding for this exception is described as “a broken basket without lining” on how a female grade 2 PAL from a poor family struggled to become rich. Some might be from well-to-do families who encountered economic failures and became poor before becoming a PAL.

Changing jobs because of disfigurements might, in some cases, drive a PAL and his or her family to become poor. Whether families of those PALs of lower social group remained in the vicious cycle of poverty in the same way as in other poor families or not would depend on existence of opportunities for creeping out of the cycle in their local context.

The family of a 51-year-old grade 2 PAL of low social group, became very poor when he was 13 years old. His parents had to sell their cows and belongings to pay back debts because of crop failures. Since then, they were involved in odd jobs. He got married when he was 22 and both husband and wife did odd jobs to earn their living. Although not rich, they had no debts and were able to survive. However, they encountered more hardship in their economic life as they began to have children and the wife was unable to participate much in earning activities. He discovered that he was suffering from the disease in 1984 and at that time they had four children. As he dared not go out while he was taking treatment, his wife had to do odd jobs. A story was heard where the chance to get out of poverty cycle seemed dim because children could not continue schooling.

A 42-year-old male PAL with grade 2 disability from a lower social group said: *“I am not lu-yar-win (able to socialize) not because of my disease. It is because I am poor. There are others who are also like me (with some disfigurements) but they are*

lu-yar-win because they are rich. Money is very important. I will continue working hard to earn money. I have sons and I want to perform shin-pyu ceremony (ceremony where young boys are put into novice-hood) for them”.

Sometimes this might not hold true for some social groups and this was found among educated people. A 57-year-old married male grade 2 PAL of high social group was an educated person (passed 10th grade) and was working as a sub-division manager in a paper factory. He narrated how he was forced to retire from his job by a female factory manager in 1986. When he retired, the tables and chairs he used in his office were said to have been burnt. His sister, a school teacher, and his brother, a university graduate working as a government official, also cut off contacts with him. When he went to a meditation center, some of the mediators did not want to stay in the same room with him.

Resilient spirit: a pull factor out of shadows?

Although discriminated by the community and discarded by husband, a female PAL (with grade 2 deformity) struggled hard for the survival of her family consisting of a daughter and her mother. Her mother fried Myanmar snacks and her daughter sold these around the village. After saving some money, they bought rice from merchants and sold back to local villagers and villagers from hill tracts in the eastern part of Sittaung Area. Gradually their family’s economic status started to rise. Her family even started saving gold. Now, because of this social status, her family is included in the high social group of their village.

A 42-year-old male PAL with grade 2 disability from a lower social group described how he and his family worked hard to improve their living conditions. He said: “my friends told me that in my situation (with disabilities) I should have died. However, I do not want to die. I will do whatever possible while I am still alive.

Even my wife sometimes told me that some of my wishes were not practical for me to do. But, still I do not easily give up my hopes.”

The strong driving forces for such a hard work were his strong desires to perform a *shinpyu* ceremony and also to get his children married.

There were also stories revealing lack of resilient spirit leading to encountering failures in their lives. A 30-year-old male, grade 0 PAL of high social group, said he discovered that he was suffering from the disease when he was 13-14 years old while attending 8th grade and he failed in the final examination. He did not relate the failure in examination to discovery of the disease. He said he got “*seight-lay* (drifting of mind)” because of the failure and he discontinued his schooling although his parents could afford for continuing his schooling. A 52-year-old female, a divorcee, grade 0 PAL of middle social group, attempted suicide two times after coming to know about the disease.

DISCUSSION

A PAL with low disability grade could be considered to have less social problems whether he or she comes from a low or high social group. In our study we found that among PAL of lower social group, economic difficulties were their concerns more than social problems emanating from their disability grade. Sittaung Area is rich with natural resources - for fishing, rubber plantation and betel leaf plantation. However, for poor people, opportunities to improve their socio-economic lives in Sittaung Area seem to be quite dim. Young people migrate out of Sittaung Area to nearby border areas in search of jobs and this is no exception for the sons and daughters of PAL in the area. Some PAL could not send their children to schools not because their children encountered discrimination, but they could not afford for their children’s educational expenses.

Although isolation was imposed on oneself by some PAL because of feeling ashamed over disfigurements, disfigurement might not always deter away someone in love when attachment bindings became very strong. A PAL with grade 2 could get married if he could show his tenderness to a woman of the same social group and could make her become bounded to him. In the long run, “love” and “attachment” might not ensure stability of the union. Financial problems were the key factors that could hurt this binding. Several social problems came in with economic problems than with the disease problem itself.

We did not find any case in our study that was driven into poverty after being affected with leprosy. PAL of low or high social groups were in the respective groups long before getting the disease. On the other hand, our study findings highlighted that improvement in the economic status of a PAL could bring the person out of shadow. PAL of low social group were said to be like “broken baskets without linings (*taung-soke-a-kut-mae*)” and they are not *lu-yar-win* (able to socialize others). If the economic status of a PAL is good, they become *lu-win-sant* (able to socialize others).

Our study findings indicate the need for including socio-economic rehabilitation (SER) programmes for people cured of leprosy as a complement to health education programmes. The respect accorded to wealth counters the stigma associated with leprosy. Through SER programmes, PAL would be helped to regain their place in the community as opportunities are developed to help them find productive employment. We would recommend that such SER programmes for PAL of low social group, although specific individual needs may also have to be considered for those PALs with physical disabilities, should be part and parcel of poverty alleviation programmes for poor people as a whole.

For most of poor women who are economically and socially dependent, their inferiority status in their family and

community could be heightened by the social stigma associated with leprosy. One of the female PAL in our study who was divorced by her husband and was discriminated by her community, became socially accepted by the community when her economic conditions improved. This indicates the importance of economic empowerment of poor women including those affected with leprosy.

It was found that allowing PAL, especially of lower social group, to participate in local social organizations by the community would discard away their feelings of being in shadows. This change is found to be taking place in Sittaung Area and PAL interviewed said this change was due to health education efforts made by local basic health staff.

Stigma is one important factor in the vicious cycle of leprosy persistence and spread among the community. In order to get rid of the existing stigma, health education needs to be carried out continuously and unremittingly in the form of a long-term programme of health education on leprosy among various social groups in a community.

For behavioural change to occur and be accompanied by destigmatization, knowledge must not remain abstract. Instead, knowledge should be actively generated by regular interaction with the people who form part of one’s immediate social world [8]. This concept is based on the participatory model of development communication.

Changes in attitudes and behaviour depend on several factors - the accuracy and understanding of the information disseminated and whether the information is presented in a way that recognizes local beliefs and attitudes about illness and healing. For behavioural change to take place and de-stigmatization to be followed, health education programmes should put emphasis on behavioural involvement between the group that is suffering from stigma and the wider community [9].

Myanmar has tried to disseminate key messages on leprosy to the community through volunteers of Maternal and Child Welfare Association (MMCWA) members after providing training to these members. However, the approach fell short of involving PAL in the same group education sessions with other community members. And, an assessment study made on the approach showed that using MMCWA volunteers as communicators needed further reinforcement [12].

We found in our study that resilient spirit of each individual PAL is one of the key factors that could pull a PAL out of shadow. We encountered many stories told by PAL of lower social group how they struggled hard to improve the lives of their families. Religious beliefs and related practices were found to be driving forces for some PAL for the resilient spirit - strong desire to make donations for the religion, strong desire to perform *shin-pyu* ceremony, staying single and working hard to take care of their mothers.

While studying PAL in a selected area of Sittaung from social group difference perspectives, we tried to elicit individual and contextual factors that push PAL into or pull out of shadows. We would like to recommend that, especially for PAL of low social group, empowerment education approach complimented with SER strategies could bring their lives out of shadows.

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**Feasibility of providing hepatitis B birth dose in Myanmar's community setting:
a qualitative assessment**

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Myanmar, being considered a country with high endemicity of HBV infection with perinatal mode of transmission playing an important role and HB vaccination at the grass root level being implemented in full swing now, the feasibility of expanding HBBD needs to be explored. This study specifically aimed to elicit opinions of health staff and mothers as regards feasibility of expanding HBBD in Myanmar's community setting. A cross-sectional design was used and qualitative methods of data collection employed in four townships. Qualitative data collection methods involved performing 10 Focus Group Discussions (FGDs) with midwives and 15 FGDs with mothers. Our study highlighted that midwives are at the moment overburdened with so many tasks in addition to their primary duties of maternal and child care. In spite of this situation, they expressed their willingness to implement HBBD for home deliveries if they were given necessary support, for example, vehicles for traveling, allowances for transports, single dose vials, proper cold chain system, etc. All the midwives were aware that providing HBBD to all babies was the best practice. All the mothers in both urban and rural areas were willing to let their newly born babies vaccinated for HB. The participants in our study identified all the possible facilitating factors and obstacles for expanding HBBD to deliveries made at homes.

INTRODUCTION

Based on small scale studies conducted in Myanmar during 1981-2000 [1-11] hepatitis B surface antigen (HBsAg) prevalence among general population is estimated at 10-12%. This has placed Myanmar in an area of high endemicity. In southern and eastern Asia, up to 50% of chronic hepatitis B virus (HBV) infection results from perinatal transmission from mother to infant, during or soon after birth [12,13]. Although precise data on modes of transmission is not available, it has been indicated that in Myanmar an Asian pattern of infection is very likely to prevail [14].

Hepatitis B birth dose (HBBD) was first introduced in July 2003 in 10 hospitals of Yangon Division and 11 hospitals of Mandalay Division all having beds over

150. The birth dose is defined as that provided within 24 hours of birth. After providing HBBD in hospitals, the second dose and the third dose were also given in some of these hospitals. But in some hospitals, the birth dose immunization registers were sent to respective township health departments. The basic health staff of respective township health departments issued immunization cards to the mothers. The midwife of respective community had to check completion of HB immunization and then provided follow-up second and third dose immunizations.

At the time of this study in 2004, HBBD is being provided free of charge at 27 district level hospitals and 12 tertiary level hospitals all over the country. These hospitals are selected according to the following criteria: having a monthly birth delivery of at least

30; being a district level hospital and above; and existence of cold chain.

Myanmar, being considered a country with high endemicity of HBV infection with perinatal mode of transmission playing an important role and HB vaccination at the grass root level being implemented in full swing now, the feasibility of expanding HBBD needs to be explored. This study specifically aimed to elicit opinions of health staff and mothers as regards feasibility of expanding HBBD in Myanmar's community setting.

MATERIALS AND METHODS

A cross-sectional design was used and qualitative methods of data collection employed. Four divisions - Yangon, Bago (West), Ayeyawady and Mandalay - were chosen purposively. One township was chosen randomly in each division among those that met the criteria: existence of a 100 to 200-bedded district hospital at the township headquarter; the hospital delivers HBBD; and the township possesses rural characteristics, i.e., about 70% of the Township population resides in rural areas and there exists 3-5 Rural Health Centers (RHCs).

This gave four townships as study areas: Thanlyin Township in Yangon Division, Pyay Township in Bago (West) Division, Maubin Township in Ayeyawady Division and Bagan NyaungU Township in Mandalay Division. In each township, two Rural Health Center (RHC) areas were chosen randomly for data collection.

Qualitative data collection methods involved performing Focus Group Discussions (FGDs) with mothers and midwives. There was a total of 5 FGDs each with urban midwives and rural midwives who are immunization providers. These FGD sessions took place at the township head quarter. Mothers were chosen among those having a child less than 12 months of age. There were a total of 5 FGDs with

urban mothers and 10 FGDs with rural mothers. These FGD sessions took place at non-threatening places away from health centers.

Qualitative data analysis was performed manually, using matrix prepared according to each theme/sub-theme for each FGD session. Triangulation was made between different groups of interviewees.

RESULTS

Voices of health staff

According to the interviewees, most of mothers came to midwives for antenatal care in both rural and urban areas except for those pregnant mothers whose villages were far away from the villages where midwives resided or those staying at outskirts of the town. Only very few went to traditional birth attendants (TBAs) or auxiliary midwives (AMWs) for antenatal care. Mothers were said to be quite aware for getting anti-tetanus toxoid (ATT) injections and this was also an important entry point for providing antenatal care and getting the pregnant mothers' list. Local volunteer health workers (AMWs and community health workers), local authorities, local NGO members and TBAs assisted the midwives in getting the information of pregnant mothers. Getting information of pregnant mothers in a village was said to be a very easy task; everybody knew everyone's situation in the villages.

“When I went for ATT vaccination of mothers, local people reported who were pregnant in their village”

(a 30-year-old midwife with 4 years experience working in urban area in Bagan NyaungU Township)

Although most mothers came to midwives for antenatal care, all the deliveries might not be delivered by the midwives and most of the deliveries took place at homes. Estimates made by some interviewees as regards percentages of deliveries by midwives at homes varied from 60%-80%.

The remaining 20% - 40% were delivered by AMWs, TBAs, retired midwives or others. These figures could be overestimations for some areas because some midwives admitted that TBAs were still the key birth attendants in rural area as well as in urban area, especially for poor people.

“Total number of deliveries made by a TBA per month is more than that combined for a midwife and an AMW...TBA stays at a mother’s home for some days helping her in household chores during the puerperium...we are unable to provide this kind of service”

(a 32-year-old midwife with 9 years experience working in a rural area in one of the study townships)

Generally, deliveries were notified to a midwife either by TBAs, AMWs, the husbands of mothers, or relatives of mothers. This notification was an important necessity for getting a birth certificate from the township health department.

“We told local people that if they do not inform us their births, we will not give recommendations for birth certificates”

(a 48-year-old midwife with 23 years experience working in a rural area in Bago Township)

However, birth reports did not take place within 24 hours. It could even be more difficult to get the reporting within 24 hours in rural areas as some villages were quite far away from the villages where midwives resided. It usually took 2-3 days, or even up to one week, particularly for those families staying scattered in huts in the rice fields, to report the births. The situation could be worsened during rainy seasons as travels became more difficult.

All the midwives were aware that providing a birth dose to a baby was the best practice. However, opinions varied as regards operational feasibility to provide HBBD for deliveries made at homes because there would be many problems to make the

programme a success. Most of the urban midwives expressed that providing HBBD might be possible and on the other hand, most of the rural midwives gave negative views that providing HBBD was impossible.

Issues that were raised by the interviewees on either supporting or opposing the idea of providing HBBD for home deliveries were as follows:

- HB vaccine being quite popular among the mothers, they would collaborate with health staff for providing birth dose to their babies.
- Some of the Sub-centers were located not so far away from the RHC or from the township health department from where they might have to fetch vaccines. For such Sub-centers, HBBD programme might be feasible.
- One important issue was to get birth information within 24 hours. This would require collaboration of local authorities and NGO members. In order to get the information of births with TBAs within 24 hours, the first task would be to educate the mothers on the importance of receiving HBBD for their babies. At the moment this information (the importance of receiving HBBD) was not given to pregnant mothers because HBBD was not yet implemented to a wider scale in the community.

The second task would be to organize TBAs. The third task would be to get collaboration of local authorities to give proper instructions to TBAs. The fourth task would be to get collaboration from local NGO members (especially maternal and child welfare association) in the educational programme for mothers.

- The distance of the majority of the Sub-centers from the RHC was very far away and travel mode was very difficult. Rural interviewees in one township said there was only about 10% possibility for making the programme feasible for

those villages located close to the town or close to RHCs with proper cold chain system. They said this kind of selective implementation would create discrimination and would cause dissents among local rural people. The interviewees said that midwives should be provided with bicycles or motor cycles. Even, bicycles were said to be not suitable for carrying vaccine carriers; each midwife would need to hire tricycles and this would involve travel expenses.

- The interviewees said they were worried for transport costs and costs for buying ice.

“Nobody supported our expenses for transport and for buying ice”

(a 59-year-old midwife with 33 years experience working in a rural area in Maubin Township)

“When we go to town to get vaccines and while waiting for a bus the bus drivers do not stop the cars if they see someone with a uniform because they know they will have to give a free lift ... so I have to wear a ‘one set’ dress and only then the bus stops”

(a 39-year-old midwife with 16 years experience working in a rural area in Pyay Township)

- There is no electricity at their villages for proper cold storage. The interviewees requested to provide them with appropriate cold storage facilities because at the moment 6-dose vials were being used and a midwife would require to keep unused doses for some days. Suggestions were made to provide one dose vials.
- Few midwives suggested to provide a refrigerator and a solar energy system and refrigerators at each Sub-center or at the RHC, and the Public Health Supervisors at each rural health center should be assigned to take care of the facilities.
- The midwives said that it would be impossible to keep the vaccines at their

homes and also might not be feasible for them to go and get the vaccines from the township health department by themselves. If the midwives themselves were to go and fetch the vaccines from the main store, they might encounter difficulties because they had many other works to do. They said the system should allow some other person sent by a midwife on her behalf to take the vaccines. Mothers, after delivering a baby with someone other than the midwife, would have to inform the responsible midwife from the area through one of the family members (husband or elder children or a relative) about the birth. Then the midwife would write a letter to the person on duty at the vaccine storage depot of the township health department. This letter was to be carried by the same family member and get the vaccine. Then the midwife would be able to give a birth dose to the baby.

- The interviewees suggested that there should be someone on duty for 24 hours at the vaccine storage depot of the township health department for distributing HB vaccines everyday.
- Most of the interviewees said they did not mind carrying HB vaccines with them when visiting home to perform deliveries. However, some made a caution by saying they would need cold flasks and ice. There were also interviewees who said that it would not be practically feasible to carry the vaccines with them when they made home visits for deliveries because it would not always be sure whether a birth would take place or not and also because they would need to carry the vaccines with an ice pack. Another reason given was that they did not possess proper vaccine storage systems at their Sub-centers.
- There were insufficient staff to perform the task. Interviewees said that they were already overburdened with the current EPI programme. They indicated the burden of workload that would be posed on

them with the HBBD programme for home deliveries. A midwife, stationed at each Sub-center, was said to be the key implementer of hepatitis B immunization programme for children. Each Sub-center midwife had to take care of 4-5 villages. Sometimes, a midwife was away at town to attend a meeting or a training course or to draw salary and she could miss some births for providing HBBD in time. Thus more manpower would be required at each Sub-center to meet the HBBD requirements of all births in the jurisdiction of each Sub-center.

“We are all overburdened with our work ... we even have to take help from our family members to help us in our work”

(a 49-year-old midwife with 20 years experience working in a rural area in Maubin Township)

- Another issue was that the baby being very small at that time, in case something happened to the baby after giving HBBD, people would blame the midwife who gave the injection. This kind of incident in hospitals might be more manageable where there are doctors and specialists.

“If something happens with the HBBD given at hospitals, there would be no complaints from mothers ... but if such a mishap takes place at home while giving HBBD, then the mothers will create problems to us”

(a 58-year-old midwife with 37 years experience working in a rural area in Pyay Township)

- Providing birth dose within 72 hours was considered relatively more feasible by some interviewees, particularly from urban areas. Even then, rural midwives said, due considerations needed to be paid to cold chain and logistics and suggested to provide refrigerators at RHCs or if possible at Sub-centers. They did not guarantee a 100% success with this extended time duration.

“It is 100% possible if we are to provide HBBD within 72 hours”

(a 31-year-old midwife with 6 years experience working in urban area in Maubin Township)

“Even to implement HBBD for births within 72 hours, we can guarantee only 10% possibility”

(a 37-year-old midwife with 14 years experience working in a rural area in Pyay Township)

- Another situation that could pose a problem on provision of birth dose for home deliveries would be the local culture that both the mother and the child stayed confined in the delivery room for a few days after delivery, i.e., the puerperial period. These mothers would accept the birth dose if it could be given at their homes.

“Mothers do not come out of their delivery rooms during puerperium”

(a 57-year-old midwife with 30 years experience working in urban area in Bagan NyaungU Township)

Voices from the community

It was found that majority of the mothers took antenatal care with midwives while going to the midwives for ATT immunizations. Majority of mothers interviewed in both urban and rural areas delivered their last children at homes, with either a health staff or a TBA (especially those who were poor). There were also deliveries made with AMWs in some villages. The births delivered by AMWs and TBAs were reported to midwives some time later to get birth certificates.

“Those who can afford, deliver with sayama (a midwife), and those who cannot afford, deliver with a let-the (a TBA)”

(a 36-year-old rural mother of two children, whose last delivery was made with a midwife at home in Thanlyin Township)

All the mothers in both urban and rural areas expressed their willingness to accept HBBD after home deliveries. However, there were differing views as regards taking their newly born babies to an immunization post to get HBBD within 24 hours. For those who gave negative views, the reasons were that they would not like to take a very small baby out of their homes and they wanted to wait for the baby to reach a few days of age to take the baby out of the house; and they would not be able to go out for 7 days as it was the traditional puerperal practice.

For those who expressed positive views, they said that although a mother might not be able to accompany the baby because she was in puerperium, the baby could be carried by their husbands or parents or in-laws or a relative to the immunization post for getting HBBD. Mothers requested that some care should be given so that a baby after receiving a birth dose would not have fever.

“My husband will carry my baby to the place for immunization”

(a 24-year-old rural mother of one child, whose last delivery was made with a TBA at home in Bago Township)

“I will let my husband carry my baby to the place for immunization”

(a 34-year-old rural mother of one child, whose last delivery was made with a midwife at home in Bagan NyaungU Township)

Rural interviewees from one rural area in Maubin Township made interesting suggestions for implementation of HBBD in their rural area. They said they just needed a letter of recommendation from a health staff saying that there was a birth and that HB vaccine be provided to the person who came to the store in Maubin Town. They would send someone with the letter to Maubin and the transport was said to be very easy as there were motor cycle taxis. They would

carry the vaccine with a cold flask. These rural interviewees said that electricity was available at some villages in Maubin Township and there were refrigerators at some homes. These people possessing refrigerators could help the HBBD programme by keeping the vaccines at their home in their refrigerators.

DISCUSSION

Most mothers, both in rural and urban areas, took antenatal care with midwives. ATT immunization programme was an entry point for getting contacts with pregnant mothers, making their list and giving antenatal care. Midwives also got assistance from local authorities and NGO members in finding pregnant mothers. Not all deliveries took place with midwives that gave the pregnant mothers the antenatal care. Some of the deliveries were made by TBAs and AMWs. Although the use of TBAs for deliveries was said to have gone down, TBAs were still being used particularly by poor families.

To get information of births at homes (for those delivered by persons other than health staff) within 24 hours was said to be uneasy. Majority of deliveries in both rural and urban areas took place at homes. Two issues - home deliveries and deliveries with untrained persons - are of particular importance for consideration in formulation of strategies for providing HBBD in Myanmar. One important point here to note is that poor people are the ones more entangled in these two issues.

There is one factor, if properly employed, might become an entry point for getting birth information as early as possible. This is the practice of reporting (usually after some days) by all birth attendants to midwives of the births to get birth certificates. This practice made TBAs and other untrained accouchers report births compulsorily. Even then, to report births to a midwife within 24 hours for deliveries made by these untrained accouchers at far

away villages would not be easy, particularly in rural areas.

Our study highlighted that midwives are at the moment overburdened with so many tasks in addition to their primary duties of maternal and child care. In spite of this situation, they expressed their willingness to implement HBBD for home deliveries if they were given necessary support, for example, vehicles for traveling, allowances for transports, single dose vials, proper cold chain system, etc.

All the midwives were aware that providing HBBD to all babies was the best practice. All the mothers in both urban and rural areas were willing to let their newly born babies vaccinated for HB. The participants in our study identified all the possible facilitating factors and obstacles for expanding HBBD to deliveries made at homes.

HB vaccine and tetanus toxoid are relatively heat-stable and it has been shown that there was only a small loss in potency when stored for 2-6 months at 37 degrees Centigrade [15,16,17]. One Indonesian study described a success story of an immunization approach that took advantage of the heat stability of hepatitis B vaccine and tetanus toxoid [18]. In this approach, a pre-filled single use injection device known as Uniject^a was used together with heat-stable vaccines in an outreach programme conducted beyond the cold chain. Midwives used these devices for providing hepatitis B to new born infants delivered at homes and tetanus toxoid to postpartum mothers. It is recommended to conduct an operational research to look into feasibility of implementing HBBD for home deliveries in Myanmar.

^a The Uniject device, developed by Programme for Appropriate Technology in Health (PATH), is a pre-filled, single-dose injection device specifically designed to prevent attempts at reuse. It combines drug or biological, syringe, and needle packaged in a sealed foil pouch.

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**Experimental study on hypoglycemic activity of ethanolic extract of
Andrographis paniculata Nees. on rats**

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The ethanolic extract of the whole plant of *Andrographis paniculata* (aq;cg;NuD;/i&kwfcg;) was tested for its acute hypoglycemic activity in adrenaline-induced hyperglycemic rats. It was examined after single oral administration of tested drug with the dosage of 400 mg/kg and 300 mg/kg body weight, standard drug (Glibenclamide) 0.5 mg/kg and distilled water 4ml/kg on rats which were seven numbers in each group. High dose of tested drug was as effective as standard drug in 4 consecutive hours after drugs administration ($p>0.5$). Low dose of tested drug had no significant difference with standard drug at 2, 3 & 4 hours ($p>0.5$) after the drug administration. The result revealed that *A. paniculata* in high dose was as effective as Glibenclamide whereas low dose of *A. paniculata* had less effectiveness at first hour. This study clearly indicated that an ethanolic extract of a whole plant of *A. paniculata* has a significant acute hypoglycemic activity and gave scientific support in traditional usage of this plant.

INTRODUCTION

The number of people with diabetes is increasing due to population growth, aging, urbanization and increasing prevalence of obesity and physical inactivity. Quantifying the prevalence of diabetes and the number of people affected by diabetes, now and in the future is important to allow rational planning and allowance of resources.

The prevalence of diabetes for all age groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The prevalence of diabetes is higher in men than women. But there are double between 2000 and 2030. The most important demographic change to diabetes prevalence across the world appears to be the increase in the proportion of people > 65 years of age [1]. In 1997, Amos estimated that 124 million people worldwide have diabetes, 97% NIDDM and that by 2010 the total

number with diabetes is projected to reach 221 million [2]. According to Sorensen report, World Health Organization has recorded in 2000 that there was a “global epidemic of obesity” and the prevalence of type 2 diabetes was rising in parallel. In 2001, Boyle estimated the number of Americans with diabetes is projected to increase from prevalence of 4.0% in 2000 to a prevalence of 7.2% in 2050 [2].

In Myanmar, out of 364 subjects 20(5.5%) had diabetes mellitus mentioned in one study which described the patterns of hypertension, obesity, diabetes mellitus and dietary habit of those subjects [3]. A cross-sectional survey among 4613 people aged 20 years and above in Yangon Division in 2003 reported the overall prevalence of diabetes mellitus was 11.9% (95% CI 10.1 to 13.4), urban prevalence was 13.9% and rural prevalence was 7.3%, with a slight female preponderance [4]. Traditional herbal medicines are widely used to treat diabetes mellitus, however, very few have

been clinically evaluated [5]. Diabetes has been treated with plant product medicines. Recent scientific investigation has confirmed the efficacy of many of these preparations, some of which are remarkably effective [5].

Andrographis paniculata (AP) also known commonly as “King of Bitters” is a member of the plant family Acanthaceae, and has been used for centuries in Asia to treat gastrointestinal tract and upper respiratory infections, fever, herpes, sore throat and a variety of other chronic and infectious diseases. It is found in the Indian Pharmacopeia and is prominent in at least 26 Ayurvedic formulas; whereas in Traditional Chinese Medicine (TCM), *Andrographis* is an important “cold property” herb. Chemically the drug contains flavones and lactones. Among lactones, andrographolide is the main constituent and it is also active principle of the plant [6]. The leaves contain the highest amount of andrographolide (2.39%), while the seeds contain the lowest.

It grows abundantly in southeastern Asia. India (and Sri Lanka), Pakistan and Indonesia but it is cultivated extensively in China and Thailand, the East and West Indies and Mauritius. Normally it grows from seeds in all types of soil. It is, therefore, cultivated quite easily.

The prevalence of diabetes mellitus is increasing worldwide, and patients need lifelong therapy with hypoglycemic drugs. The cost of treatment for lifelong therapy will burden onto the patients and family. On top of that, most of the patients have exhaustion for taking drug and willing to switch on alternative medicine like herbal drugs which are relatively cheap compared to western drugs. However, they are not supported by good scientific studies.

This study made an attempt to fill this gap. Thus the present study was undertaken to evaluate the evidence-based, scientifically proved acute hypoglycemic activity of ethanolic extract of the whole plant of

A. paniculata Nees. in adrenaline-induced hyperglycemic rat models and to characterize the phytochemical properties of that plant.

MATERIALS AND METHODS

Collection of plant materials and preparation of extracts

The whole plants of *A. paniculata* Nees. were collected from Mandalay Division and shaded air dried until a completely dried product was obtained. The authenticity of the sample was identified by taxonomist from Department of Botany, University of Mandalay.

Before extraction, plant samples (whole plant) were air dried and cut into pieces. Exactly 100 gm of sample was packaged and subjected to solvent extraction by soxhlet assembling. This sample was extracted into two different solvents by chloroform and 96% ethanol successively. The time for extraction was about 6 hours. Then the extract was evaporated to concentrate by means of rotary evaporator. It was followed by drying in air until solid residue was obtained. Such a residue was desiccated and weighed to record respective yield of extracts. All extracts were stored in desiccators.

Phytochemical analysis

Types of compounds present in *A. paniculata* were analysed by doing phytochemical tests [7] and compounds were listed in Table 1.

Chemicals used

Glibenclamide (Gibic) 5mg, Thai, Reg no: 1A 448/38 was purchased from the market. Adrenaline tartrate (adrenaline 0.1% W/V) from Myanmar Pharmaceutical Factory was also obtained.

Animal experiments

Wistar strain rats, both male and female, weighing between 200 to 250 gms produced from Laboratory Animal Services Division, Department of Medical Research (Upper

Myanmar) were used for the study. All the animals were divided into 4 groups of 7 number each and were fed the standard diet and water ad libitum. They were kept in clean and dry cages and maintained in a well-ventilated animal house.

Screening of experimental animals

It was done one week before starting experiment. Animals were made fasting for 18 hours and baseline fasting blood sugar levels were measured by cutting tails about 1 mm length and using Omnitest glucometer. Then they were given subcutaneous injection of adrenaline 0.2 ml/kg body weight and 1 hour, 2 hour post injection fasting sugar levels were measured. Fasting blood sugar levels equal and above 8 mmol/l were selected for the study and those who did not respond the induction were rejected.

Study on acute hypoglycemic activity

Animals were fasted for 18 hours prior to drug administration allowing access only to water. Blood samples were collected by cutting 1 mm length of tail and baseline fasting blood sugar levels were measured with Omnitest glucometer in all four groups. After that following procedures were done.

- Group I & II were given a single oral administration of ethanolic extract of whole plant of *A. paniculata* (suspended in distilled water) at doses of 400 mg/kg body weight (high dose) and 300 mg/kg body weight (low dose) respectively.
- Group III received a single oral administration of glibenclamide at a dose of 0.5 mg/kg body weight and it served as a standard.
- Group IV served as an antihyperglycemic control group and received 4 ml/kg of distilled water only.

One hour after giving the corresponding drugs or vehicles, subcutaneous injection of adrenaline 0.2 ml/kg was given to all four groups. Then fasting blood sugar levels of all rats were measured again at 1, 2, 3 and

4 hours serially after giving injection adrenaline and recorded the results separately and safely. Percent inhibition was calculated according to the formula mentioned here [8].

Percent inhibition of requested drug = {blood glucose level of (control-requested drug) / blood glucose level of control} x 100%

Acute toxicity study

Seven albino mice in each four groups (three tested groups and one control group) were fasted overnight before administration of the ethanolic extract. Increasing doses of 0.4, 0.5 and 0.6 gm/kg of ethanolic extract of *A. paniculata* were orally administered respectively. The mice were housed separately in individual cage with free access to food and water and observed clinically for 1 week. LD₅₀ was determined from the number of animals surviving at the end of 1 week period [9].

Statistical analysis

Data were checked and entered using Epidata software 3.1. Data were expressed as means of FBS at 0hr and blood sugar level at 1hr up to 4 hours. The comparison between test extract and western drug along with distilled water, using paired t-test was done. The results were expressed in figure and tables.

RESULTS

Phytochemical analysis

Phytochemical data of dried *A. paniculata* are shown in Table 1. It constituted various compounds, extracted from *A. paniculata*.

Table 1. Types of compound present in *Andrographis paniculata*

No.	Types of compound	Presence(+) / Absence(-)
1	Alkaloid	+
2	Amino acid	+
3	Carbohydrate	+
4	Phenol	+
5	Flavonoid	+
6	Glycoside	+
7	Resin	-
8	Saponin	+
9	Steroid	+
10	Tannin	+

Altogether 9 chemical compounds were identified qualitatively. They were alkaloid, amino acid, carbohydrate, phenol, flavonoid, glycoside, saponin, steroid and tannin. The yield percentage of *Andrographis paniculata* was 4.0% with the usage of 96% ethanol.

Hypoglycemic action

The hypoglycemic effect of ethanolic extract of *Andrographis paniculata* Nees. was studied and found to be effective on albino rats. The results of extracts (low dose and high dose), standard drug and negative control (distilled water) are shown in Figure 1.

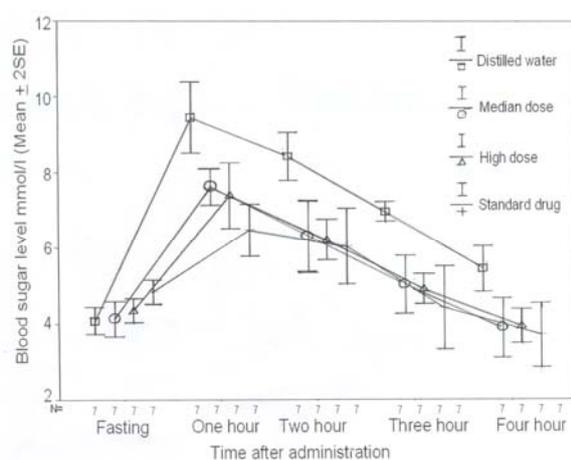


Fig 1. Mean blood sugar level after giving ethanolic extract of *Andrographis paniculata* Nees.

The ethanolic extract of the whole plant of *A. paniculata* produced a dose-dependent acute hypoglycemia in adrenaline-induced hyperglycemic rats. Two dose of extracts i.e., 400 mg/kg (high dose) and 300 mg/kg (low dose) produced a significant reduction in blood glucose level, compared to control (distilled water) ($p < 0.05$). In other words, the extract had definite hypoglycemic effect on hyperglycemic rats.

However, it was found that high dose extract was as effective as standard drug. There was no significant difference in means blood glucose level at all four hours in comparison with standard drug

(glibenclamide) and high dose of ethanolic extract ($p < 0.5$). It indicated that the hypoglycemic effects of ethanolic extract of *A. paniculata* and standard drug (glibenclamide) were the same.

On contrary, low dose of extract was found to be less effective because there was significant difference in blood glucose reduction at 1 hour when compared with standard drug ($p < 0.02$). But the glucose levels in successive hours showed no significant difference. It indicated that low dose extract was inferior to standard drug. Percent inhibition of glibenclamide, high and low dose of ethanolic extract of *A. paniculata* were calculated and shown in Table 2.

Table 2. Percent inhibition of ethanolic extract and glibenclamide

Type of drug	1 hour %	2 hour %	3 hour %	4 hour %
Glibenclamide	31.57	28.57	37.14	32.72
High dose of ethanolic extract	22.10	26.19	30.00	29.09
Low dose of ethanolic extract	18.94	25.00	28.57	29.09

The percent inhibition of glibenclamide was higher than that of high and low dosage levels at all four hours. Maximum inhibition was found at 3 hour for standard drug and high dose extract, but at 4 hour for low dose extract. However, the trend of percent inhibition showed fluctuation in standard drug, smooth or even in high dose extract and low dose extract.

Acute toxicity test

Acute toxicity test indicated no death in all doses tested. Thus ethanolic extract of the drug was safe up to 0.6 gm/kg when administered orally.

DISCUSSION

A. paniculata was used traditionally in Myanmar. There were many literatures concerning the anti-diabetic activity of this

plant on alloxan-induced or streptozotocin-induced rats. One study showed a significant anti-diabetic acute activity of ethanolic extract of whole plant with the dosage of 0.1, 0.2 and 0.3 mg/kg body weight against the streptozotocin-induced rat models [9]. But here we conducted upon adrenaline-induced model for acute activity.

In this study, our results indicated the potent action in acute activity of ethanolic extract with the dosage of 400 mg/kg and 300 mg/kg body weight in adrenaline-induced hyperglycemic rats. In other study of Zhang XF and Tan BK, *A. paniculata* has significant effect on both streptozotocin- and adrenaline-induced hyperglycemic rats [10].

Another study reported that andrographolide (1.5 mg/kg), an active principle in the leaves of *A. paniculata*, had significant anti-diabetic activity [11] and suggested that andrographolide can increase glucose utilization to lower the plasma glucose level in diabetic rats lacking insulin. In our study, we used crude extract of ethanolic extract form only since we have limitations to separate the active principle from these extracts even though the active principle (andrographolide) was found to contain in the extract.

Thus *A. paniculata* is shown to have significant anti-hyperglycemic activity and it is suggested that andrographolide can increase glucose utilization to lower plasma glucose in diabetic rats lacking insulin but other possibility of extra pancreatic action such as increased glucose uptake by *A. paniculata* cannot be ruled out. This study revealed that ethanolic extract of *A. paniculata* was useful in diabetes for its prompt action. Further work on identifying active principle, chronic anti-hyperglycemic action of this plant is obviously required.

According to the results shown in Table 2, this herbal plant has strong antihyperglycemic activity as compared to the western drug (glibenclamide), thus studies

on pre-clinical and clinical trial should be continued to complete the full picture of this precious herbal plant. It is needed to know the chronic activity of indigenous anti-hyperglycemic drug and try to study the experimental trial with alloxan-induced model.

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Identification of host-derived *Hansenula polymorpha* DNA in the recombinant hepatitis B vaccine by using a dot-blot hybridization method

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In the recombinant hepatitis B (HB) vaccine produced by using yeast as an host organism, the residue of the host-derived DNA in more than permissible amount can cause undesirable effect on vaccine recipients. In this study, the host-derived *Hansenula polymorpha* Deoxyribonucleic Acid (DNA) in the recombinant hepatitis B vaccine produced by CJ Pharmaceutical Plant, Republic of Korea was identified by using a dot blot hybridization method. First, a single strand hybridization probe was prepared by a template extracted from *Hansenula polymorpha* DNA and was labeled with d-UTP-DIG by using PCR technique followed by testing of the labeling efficacy of the probe. The host-derived DNA from recombinant HB vaccine samples was extracted by using phenol/chloroform method to obtain DNA pellets whereas standard DNA with known concentration was prepared in different dilutions. Then hybridization of vaccine samples and standards was done on hybridization nylon membrane by using a prepared hybridization probe labeled with dUTP-DIG in the UV cross linker, hybridization oven, sealable plastic bag and several kinds of washing, detecting and developing solutions/buffers. Finally, DNA contents in vaccine samples were quantified on hybridization membrane by comparing the intensity of specific color signals with those of the standard DNA in different concentrations. No apparent color signal was observed in all 3 test samples of recombinant HB vaccine thus indicating the total absence of host-derived DNA in recombinant HB vaccine and total safety of it for human use.

INTRODUCTION

Advances in molecular genetics and nucleic acid chemistry now enable genes coding for natural biological active proteins to be identified, analyzed in detail, transformed from one organism to another and to express under controlled conditions so as to synthesize efficiently the specific protein for which they coded [1]. For production of recombinant hepatitis B (HB) vaccine, hepatitis B surface antigen (HBsAg) expressed gene which is characterized by specific nucleotide sequence in each strand of the double stranded DNA molecule with 678 base pairs that code for HBsAg protein was isolated and propagated by insertion into a suitable vector, pH-HBs, with an aid of highly specific restriction endonucleases and ligase enzymes. This vector was then

introduced into the chromosomal DNA of *Hansenula polymorpha* yeast cell and individual clones that carry the desired gene was selected and propagated in mass culture, followed by steps of purification process to obtain the desired protein. During process of recombinant HB vaccine production in the CJ Pharmaceutical Plant, Republic of Korea, first the chromosomal DNA of *Hansenula polymorpha* yeast cell is fragmented by high pressure in cell disruption procedure using a homogenizer. Most of the host-derived DNA were removed by serial steps of purification process i.e pH precipitation, ultracentrifugation and gel filtration processes [2]. Since the residue of the host-derived DNA in more than permissible amount in final vaccine product can cause undesirable effect on vaccine recipients, the amount of host

derived-DNA in recombinant HB vaccine needs to be determined and to be within specific limits [3]. In this study, an appropriate method for identification of host-derived DNA in the recombinant HB vaccine produced at the CJ Pharmaceutical Plant was established with an aim to assure the quality and safety of the final product .

MATERIALS AND METHODS

This is a laboratory-based study carried out at the Viral Vaccines Laboratory, CJ Corporation, Ichon City, Republic of Korea. First, a single strand hybridization probe was prepared by a template, labeled with d-UTP-DIG by using PCR technique followed by testing of the labeling efficacy of the probe. The host-derived DNA in recombinant HB vaccine was extracted by using phenol / chloroform method to obtain DNA pellets. Commercially available standard DNA with known concentration was prepared in different dilutions.

Hybridization of 3 vaccine samples and DNA standards was done on hybridization nylon membrane by using a prepared hybridization probe labeled with dUTP-DIG using a UV cross linker, hybridization oven, sealable plastic bag, prepared washing, detecting and developing solutions/buffers. Finally, DNA contents in vaccine samples were quantified on hybridization membrane by comparing the intensity of specific color signals with those of the standard DNA in different concentrations. Detailed procedures were as follows;

Preparation of a single strand hybridization probe labeled with dUTP-DIG

First, a mixture containing a template extracted from *Hansenula polymorpha* DNA hexamer (TTAGGG) dNTP-DIG and Klenow fragment (DNA polymerase I) was under PCR program at 37°C for 18 hours. The PCR mixture was treated with 4 M lithium chloride and 100% ethanol to precipitate the desired DNA probe which was kept in Tris-EDTA (TE) buffer at -20°C. The labeling efficacy of the above

probe was confirmed by comparing with a commercially available standard DNA probe of 5µg/µl. Serial dilutions of sample and standard probes in 10⁻¹ to 10⁻⁷ (i.e. equivalent to 500 to 0.005 pg/µl) was carried out, followed by applying onto the hybridizationnylon membrane and keeping in the UV crosslinker for 30 seconds (fig.1). Then the above nylon membrane was incubated in blocking solution at room temperature for 30 minutes, in antibody solution (i.e antidigoxygenin-Ap) for 60 minutes and in washing buffer for 15 minutes. After discarding washing buffer, the membrane was equilibrated in the detection buffer for 2 minutes and incubated in color developing mixture (NBT/ BCIP solution) for 30 minutes. Finally the reaction was stopped by TE buffer. The specific (yellow) color signals were observed on the hybridized nylon membrane.



Fig.1. UV cross linker for fixation of DNA to the hybridization nylon membrane.

Extraction of host-derived DNA from the recombinant HB vaccine samples by using phenol/ chloroform method

Seven hundred microliters of vaccine sample was added into an equal volume of phenol, followed by vigorous vortexing, centrifugation at 13,000 rpm for 15 minutes and transferring supernatant into a new microfuge tube. Equal volume of phenol was added into the supernatant followed by vigorous vortexing, centrifugation and transferring supernatant into a new microfuge tube. One-tenth volume of 3 % sodium acetate was added into the supernatant followed by vigorous vortexing. After

adding of 2 volumes of 100 % ethanol into the sample, it was kept on ice for 30 minutes, followed by centrifugation at 13,000 rpm for 15 minutes and collecting the DNA pellets. Finally, one volume of 70% ethanol was added, followed by vortexing and kept at 60°C for 30 minute to obtain a dried DNA pellet. Before application onto the hybridization nylon membrane, DNA pellets were resuspended in TE buffer to make a final DNA concentration of 10 µg/µl followed by incubation at 37°C for 30 minutes and kept on ice.

Preparation of standard DNA into different dilutions

Commercially available standard DNA 5 ng/ µl of Invitrogen, Life Technologies, was diluted to 50, 100, 200, 400, 800 and 1600 pg / 2 µl by using 2xSCC buffer.

Application of samples and standard into the hybridization nylon membrane

Two microliters each of 3 vaccine samples and DNA solutions in 6 different dilutions (i.e 1600, 800, 400, 200, 100, 50 pg per 2 ml) were applied onto the nylon membrane which was then kept in a UV cross linker for one minute, followed by introducing into the heat sealable plastic bag containing 2 ml of hybridization solution and 20 µl of probe labeled with d UTP-DIG. After sealing the bag, it was incubated in the hybridization oven at 42°C for 1 hour (Fig. 2).

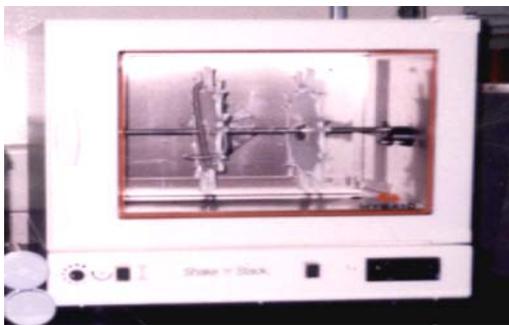


Fig.2. Hybridization oven used for hybridization of standards and vaccine samples with prepared probe labeled with dUTP-DIG

Then the membrane was removed and transferred into the new bag containing 2 ml

of hybridization solution, followed by tight sealing and kept in the hybridization oven at 42°C for 48 hours.

Detection of specific signals for DNA contents

The hybridization membrane was then removed and put into a 50 ml falcon tube containing 20 ml of 2xSCC and 0.1% SDS mixture and kept in the hybridization oven with rotatory shaking at 37°C for 15 minutes. The serial treatment of the mixture with 0.5xSCC+0.1% SDS mixture, blocking solution containing maleic acid buffer, antibody solution of anti-digoxigenin-Ap, Dig-washing buffer and detection buffer i.e NBT/BCIT solution from Roche [4], was followed by developing the mixture at 37°C for 30 minutes (or) till the appearance of specific colored signals. Finally, the reaction was stopped by using TE buffer to obtain a hybridization membrane with the colored signals representing the DNA content in the DNA standards and vaccine samples.

RESULTS

Figure 3 illustrates specific colored signals on the hybridization membrane in the probe labeling efficacy test, representing the different dilutions of DNA standards and a prepared probe. Specific colored signals were identified up to 10^{-4} (i.e.500 pg/ml) in the standards and 10^{-5} (i.e.50 pg/ml) in the sample probe, indicating the acceptable efficiency of the prepared probe labeled with dUTP-DIG.

Hybridization nylon membrane with specific colored signals of DNA was illustrated in Figure 4. The standard lane showed respective colored signals at different dilutions of DNA contents whereas no apparent colored signal was observed at sample lane with 3 different test vaccine samples, thus indicating the absence of DNA in the vaccine samples of recombinant HB vaccine.

DISCUSSION

Contamination of recombinant HB vaccine with biologically active extraneous DNA from host-derived transformed *Hansenula polymorpha* yeast cell is undesirable and is particular concern for the possible presence of potentially oncogenic DNA. The WHO Study Group on Biologicals mentioned that the possibility of risk associated with heterogeneous contaminating DNA in a product derived from recombinant yeast cell line is negligible when the amount of such DNA is 100 pg or less in a single dose given parenterally [3]. Therefore, the amount of plasmid or host-derived DNA in each lot of vaccine should be determined and be within specified limits. The analysis method should be sensitive and reliable. In most of the GMP standard vaccine-producing countries, the maximum acceptable levels of DNA per vaccine dose and an appropriate method for determination is approved by the National Control Authority (NCA) [3].

DNA Standards	Results	Prepared Probe
10 ⁻¹		
10 ⁻²		
10 ⁻³		
10 ⁻⁴		
10 ⁻⁵		
10 ⁻⁶		
10 ⁻⁷		

1 2

Lane 1 = DNA standards , Lane 2 = prepared probe

Fig. 3. Specific colored signals on the hybridization nylon membranes in the probe labeling efficacy test

In this study, before detecting the host-derived DNA in vaccine sample by hybridization procedure, a probe labeling efficiency test for the prepared probe labeled with dUPT-DIG by using PCR

method was carried out. Since the colored signals elicited by the prepared probe was comparable to those of the standards and passed the efficacy test, the result of further hybridization procedure was assumed to be accurate and valid (Fig. 3).

DNA Standards	Results	Vaccine Samples
1600 pg		
800 pg		
400 pg		Vaccine1
200 pg		Vaccine2
100 pg		Vaccine3
50 pg		
0 pg		

1 2

Lane 1=6 DNA standards, Lane 2=3 vaccine samples

Fig. 4. Hybridization nylon membrane with specific colored signals of DNA in 6 different dilutions of DNA standards and 3 samples of recombinant hepatitis B vaccine

After hybridization procedure, different dilutions of DNA standards showed specific colored signals in linear decreasing order on hybridization nylon membrane. However, vaccine samples elicited no signals which indicated the absence of host-derived DNA in the vaccine (Fig. 4). Therefore, the amount of host-derived DNA present in the recombinant hepatitis B vaccine produced from *Hansenula polymorpha* yeast cell was in accordance with specifications recommended by WHO.

It could be concluded that there was no possibility of risk associated with the host-derived DNA in recombinant HB vaccine produced by the CJ Pharmaceutical Plant from which the technology of recombinant HB vaccine production was transferred to the Department of Medical Research (Lower Myanmar) (DMR,LM) in 2003 under the EDCF loan of US\$ 12.6 millions from

Republic of Korea. The recombinant HB vaccine was successfully developed in GMP standard HB Vaccine Plant in Myanmar by scientists from DMR(LM) under supervision of Korean scientists in 2004. This vaccine was also tested and recommended to be totally safe and immunogenic for prevention of hepatitis B viral infection [5, 6].

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Risk factors for fatal outcome of malaria: A hospital-based study in PyinOoLwin District

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A hospital-based prospective study was conducted to identify risk factors influencing malaria mortality in PyinOoLwin district from 1st September, 2005 to 31st August, 2006. Face-to-face interview with patients or attendants using pre-tested, closed-ended questionnaire was conducted for all admitted malaria cases during study period. Among 822 cases, 47.4% were severe and complicated malaria cases and 56 patients expired at hospital. Patients aged above 13 years, being male with history of traveling to malaria endemic area, who denied past history of malaria attack, with duration of illness more than five days before hospitalization, who sought treatment from untrained practitioners as second healthcare provider, presented with fits, heavy parasitaemia, deep jaundice, and without clinical spleen enlargement were significant risk factors for malaria death ($p < 0.05$). Prompt and adequate treatment at the community level, early referral and specific treatment at hospital should be ensured to reduce malaria mortality.

INTRODUCTION

Malaria has been ranked as one of the top priority diseases in Myanmar. Malaria accounted for more than 10% of out-patient attendance in 2004 [1]. Malaria mortality became declined gradually during last 14 years. It reduced from 12.6 to 3.7 per hundred-thousand populations during 1990 to 2004. Although the trend of malaria mortality is declining, reported number of deaths is still high. Malaria mortality rate in Myanmar was highest in South East Asia Region [2].

Malaria control program in Myanmar sets the objective of reducing malaria morbidity and mortality 50% by 2010 taking the year 2000 as base year [3]. In planning and implementing the disease management components, understanding the risk factors of severe and complicated malaria cases is paramount important. Identifying and combating risk factors at their earliest stage of manifestation can prevent further deteriorations and mortality.

This study was conducted to find out the risk factors for malaria fatality among admitted patients in Madayar, Singu and Moegoke township hospitals in PyinOoLwin District, Myanmar.

MATERIALS AND METHODS

The study was a hospital-based cross-sectional one. The study population was malaria patients admitted to 3 township hospitals (Madayar, Singu and Moegoke) in PyinOoLwin District.

Data were collected using a pre-coded and pre-tested questionnaire which composed of closed-ended questions on patient personal data, history of present malaria attack, health care seeking behavior, clinical features on admission, parasitological diagnosis in hospital, treatment in hospital, and outcome of patient.

In each township hospital, the civil assistant surgeons (CAS) assigned in medical wards were trained for data collection. The team

spent at least two days with each CAS to ensure that the questionnaire was filled as required. CAS obtained a written informed consent from each malaria patient or attendant before collecting data. CAS filled up the forms by asking either the patients or their attendants during their hospital stay. Final diagnosis and clinical outcomes were recorded by CAS only after discharge or death of the patients. Collected data in hospitals were gathered on monthly basis. The responses in the questionnaires were compiled, coded, and entered into computer by using Epi-data 3.01 software. Data analysis was done using SPSS version 11.5 computer software. Frequency and percentage tables were used to describe background characteristics of patients. Bivariate and multivariate binary logistic regression analyses were done to find out the risk factors for malaria fatality. The level of significant was set at p-value <0.05.

RESULTS

Characteristics of admitted malaria patients

A total of 822 malaria cases were admitted to township hospitals of PynOoLwin District during one year study period. The mean age of admitted patients was 24.6 years. Majority (54.1%) were young adults aged between 18 and 40 years while 13.7 % were under five children and only 2.7% over 60 years. Male patients accounted for 56% and the female patients 44%. Among female patients, 14 cases were admitted for pregnancy with malaria. Regarding occupation, 28.6% were farmers followed by gold-digging laborers (27.3%), ruby-digging laborers (16.2%), dependent housewives and children (11.9%), forest related workers (3.1%), students (3.4%), government servants including soldiers and polices (9.0%), and wandering traders (0.6%). As regard the education level, 9.4% were preschool children. Illiterates accounted for 5.6%. Forty-seven per cent of cases can read and write or primary school followed by completed up to middle school

(28.4%). Completed high school, university student, graduates, and post graduates accounted for 5.3%, 3.0%, 1.2%, and 0.2%, respectively (Table 1).

Table 1. Background characteristics of malaria patients

Variables	Frequency	Percent
<i>Age (years) (n=822)</i>		
<5	113	13.7
5 - 17	156	19
18 - 39	445	54.1
40 - 60	86	10.5
>60	22	2.7
Mean ± SD	24.6 ± 15.1	Range (1 to 67)
<i>Gender(n=822)</i>		
Male	460	56
Female	362	44
<i>Occupation (n=802)</i>		
Farmers	229	28.6
Gold-digging laborers	219	27.3
Ruby- digging laborers	130	16.2
Dependents	13	1.6
Children	82	10.2
Government servants	72	9
Students	27	3.4
Forest related workers	25	3.1
Wandering traders	5	0.6
<i>Education (n=809)</i>		
Illiterate	45	5.6
Preschool	77	9.5
Primary	379	46.8
Middle	230	28.4
High	43	5.3
University	24	3
Graduate	10	1.2
Postgraduate	1	0.2

Clinical presentation

Among total 822 admitted malaria cases, 69.7% of patients had history of traveling to malaria endemic area. Past history of malaria attack was revealed by 33.9% of patients. Among them, 30% suffered from more than three malaria attacks within one year. Only 0.7% of cases gave history of blood transfusion. The mean duration of fever before admission was 5.3 days on average and ranged from 1 to 22 days. Among recorded 809 cases, 66.2% presented with fever of 37.7 to 39 degree Celsius, 24% with hyperpyrexia of 39.4 degree Celsius and above, and 9.8% with normal temperature. The mean body temperature of patient on admission was 38.7 with SD of 1.04 degree Celsius.

Sensorial changes ranged from impaired consciousness up to deep coma were presented in 45.5% of total admitted cases. According to modified Glasgow coma scale (GCS), 34.2% of cases were GCS scores more than seven while the remaining 65.8% with GCS scores seven or less (unrousable coma) at the time of admission. The time between impaired consciousness and admission varied from 3 hours to 48 hours with an average duration of 8.1 with SD of 5.8 hours. History of fit was investigated in 36.6% of unconscious cases.

Of total admitted cases, clinical anemia was recorded in 88.3% of patients. Among them, only 201 cases (29.4%) were tested for hemoglobin level. The mean hemoglobin concentration was 5.3 gram% with SD of 2.4 gram%. Clinical jaundice was detected in 13.8% of admitted cases.

All malarial hepatitis cases (n=38), all hepato-renal failure cases (n=3), 35.7% (5/14) of malaria with pregnancy cases, 12.3% (37/302) of cerebral malaria cases, 18.3% (3/16) of black water fever cases, 8.3% (1/12) of hyperpyrexia cases, 60% (3/5) of algid malaria cases, and 5.3% (23/432) of uncomplicated malaria cases presented with jaundice.

Liver enlargement was detected in 37.8% of cases with mean of 4 cm with SD of 2 cm below the costal margin. Splenomegaly was detected in 15.9% of all cases with a mean size of 5 cm with SD of 2 cm below the costal margin. Dark urine was recorded in 44 cases. All 16 black water fever cases, 5.6% (17/302) of cerebral malaria cases, and 28.9% (11/38) of malaria hepatitis cases passed dark urine.

Shock occurred in nine cases of cerebral malaria (including two cases of cerebral malaria with pregnancy and two cases of cerebral malaria with pulmonary edema), five cases of algid malaria, and two cases of black water fever. Eight cases presented with shock expired at hospital and one case of malaria with pregnancy with shock was referred to Mandalay specialist hospital.

Treatment seeking behavior before admission

Among all cases, the main sources of initial treatment were basic health staff (BHS) (28.9%), taking anti-malarial drugs mentioned by drug shop owners (26.9%), general practitioners (GP) (21.4%), quacks (9.8%), indigenous medical practitioners (5.3%), self treatment at home (5%), and volunteer health workers (VHW) (2.7%). Second source of treatment was revealed by 602 cases. The second malaria treatment providers were GP (32.1%), self treatment (25.7%), BHS (15.6%), indigenous medical practitioners (14.8%), VHW (4.8%), local drug shops (3.8%), and quacks (3.2%). Third source of treatment was also revealed by 183 patients. They sought treatment from GP (73.8%) and BHS (12.6%) as third health care provider just before admission to hospital.

The majority of cases were referred to hospital by GP and BHS, 56.6% and 22.9% respectively. Only 12.3% of cases came to hospital on their own decision. Among cases referred by GP, 51% showed referral chip paper on admission while only 5.4% of cases referred by BHS attached with referral chips. As regards drugs used before admission, answers were obtained only from 62.1% of all admitted cases. Drugs used were chloroquine tablets, quinine tablets, artesunate tablets, and sulfadoxine-pyrimethamine (SP): 45.8%, 18.3%, 12.7%, and 10.6% respectively. The remaining 12.6% of patients received complicated combinations of drugs including antimalarials, antibiotics and symptomatic drugs.

Treatment at hospital

Diagnosis

In 64.2% of admitted patients, malaria diagnosis was confirmed by blood for malaria parasite microscopy (MP), and 35.8% by Rapid Diagnostic Test (RDT). Blood slides for MP were taken from 37.6% of patients within 30 minutes after admission. It was between 30 minutes to 1 hour in 32.3% of patients, between 1 to 12

hours in 12.3%, and over 12 hours in 17.8% of patients. Interval between blood for MP taken and MP results returned from laboratory varied from within one to twenty-four hours with mean duration of 4.9 ± 4.2 hours.

Parasite density was expressed in terms of 1+, 2+, 3+, and 4+ [6]. Parasite density was stated in 513 out of 528 results. Among them, 9.0% were 1+, 50.9% were 2+, 24.0% were 3+, and 10.1% were 4+. Follow-up MP examination was done in none of the cases. Results from laboratory stated that: 74.2% were *Plasmodium falciparum*, 22.5% were *Plasmodium vivax*, and 3.3% showed mixed infection.

Treatment

Among 610 *Plasmodium falciparum* cases confirmed by microscopy or RDT, 42.8% received quinine alone, 4.4% received quinine plus artemisinin, and 26.6% received artemisinin-based combination therapy. The remaining 26.2% of cases were treated with miscellaneous combinations of anti-malarial drugs.

Majority (88.2%) of *Plasmodium vivax* confirmed cases by microscopy, received chloroquine plus antibiotics while remaining cases received SP, primaquine, and clindamycin.

Of all admitted cases, 34.5% of patients received antibiotics. Frequently using antibiotics included tetracycline, septrin, quinolones (ciprofloxacin & norfloxacin), chloramphenicol, amoxicillin, and ampicillin.

Glucose, steroids (hydrocortisone, and dexamethasone), mannitol, and nootrophil were used as ancillary treatments in severe and complicated malaria cases. Blood transfusion was given in 14 severe anemia cases (1.7% of total cases). Plasma expanders were also used in three patients presented with shock.

The average duration of stay in hospital was 5.8 days with SD of 6.3 days with a range of 0 to 32 days. The mean duration of stay for

56 expired cases was 1.4 days with SD of 3.7 days with a range of 0 to 6 days. Among 56 expired cases, 28.6% died within 24 hours after admission.

Category specific outcomes of severe malaria cases

Among 822 admitted cases, 52.6% were uncomplicated while 47.4% were severe and complicated malaria (SCM). Of SCM cases, 74.9% survived and discharged from hospital and only 14.4% cases expired at hospital. Among SCM cases, most of the patients were cerebral malaria (77.4%) followed by malarial hepatitis (9.7%), black water fever (4.1%), severe anemia (3.6%), hyperpyrexia (3.1%), algid malaria (1.3%) and hepato-renal failure (0.8%). Among cerebral malaria cases, outcomes were recorded as survived and discharged (72.2%), expired (14.9%), and signed and left (11.3%). Only one pregnancy with cerebral malaria was referred to hospital.

Among malarial hepatitis cases (n=38), six cases expired and the remaining were survived and discharged from hospital. Among black water fever cases, two patients died in hospital and other two patients signed and left. One malaria case presented with hyperpyrexia absconded while all others survived. One case out of 14 severe anemia cases and one out of five algid malaria cases died in hospital.

Factors responsible for malaria fatality

To execute the logistic analysis, the outcomes were categorized into discharged and death. Deaths included 'deaths in hospital' plus 'sign & left' cases i.e. the latter outcome was assumed to be expired at home. Referred case (n=1) and absconded cases (n=5) were excluded from analysis since the exact outcomes were unknown. Therefore, 384 SCM cases were analyzed.

In bivariate analysis, there was no significant difference in death of malaria due to occupation, education, initial and final treatment provider, high fever, clinical anemia, and liver enlargement. The crude

odds ratios of malaria death were higher in patients aged above 13 years [OR=2.0 (95%CI 1.1 to 3.4), p=0.012], being male [OR=2.3 (95%CI 1.6 to 3.6), p=0.000], with history of traveling to malaria endemic area [OR=1.8 (95%CI 1.1 to 3.2), p=0.061], who denied past history of malaria attack [OR=3.8 (95%CI 2.3 to 6.6), p=0.000], with deep jaundice [OR=4.3 (95%CI 2.0 to 9.5), p=0.000], and without clinical spleen enlargement [OR=3.0 (95%CI 1.2 to 12.5), p=0.003].

Table 2. Associations between risk factors and outcomes of SCM

Variables	No. of SCM	% of Death	Crude OR (95%CI)	p	Adjusted OR (95%CI)	p
Background characteristics						
<i>Age</i>						
≤ 13 years	81	34.6	1.0		1.0	
> 13 years	303	21.1	2.0 (1.1-3.4)	0.012	0.4 (0.1-1.9)	0.308
<i>Gender</i>						
Female	191	14.1	1.0		1.0	
Male	193	33.7	2.3 (1.6-3.6)	0.000	1.1 (0.4-3.2)	0.874
<i>Occupation</i>						
High-risk	259	26.3	1.0			
Low-risk	122	18.9	1.5 (0.9-2.6)	0.114	-	-
<i>Education</i>						
High	155	30.3	1.0			
Low	159	23.9	1.37 (0.8-1.8)	0.200	-	-
<i>History of present illness</i>						
<i>Past history</i>						
Yes	270	17.0	1.0		1.0	
No	102	44.1	3.8 (2.3-6.6)	0.000	7.5 (2.6-21.9)	0.000
<i>Travel history</i>						
No	148	17.6	1.0			
Yes	236	27.9	1.8 (1.1-3.2)	0.061	-	-
<i>Duration of illness</i>						
≤ 5 days	225	11.6	1.0		1.0	
> 5 days	157	42.0	5.6 (3.2-9.7)	0.000	8.2 (2.8-24.5)	0.000
<i>History of fits</i>						
No	259	15.1	1.0		1.0	0.000
Yes	125	42.4	4.2 (2.5-6.89)	0.000	3.2 (2.7- 6.2)	
<i>Treatment seeking behavior</i>						
<i>1st provider</i>						
GP/BHS	188	23.5	1.0			
Others	153	26.6	1.1 (0.8-1.6)	0.517	-	-
<i>2nd provider</i>						
GP/BHS	146	11.6	1.0		1.0	
Others	161	37.9	4.6 (2.6-8.4)	0.000	4.7 (1.6-13.6)	0.005
<i>3rd provider</i>						
GP/BHS	84	25.0	1.0			
Others	92	38.1	1.5 (1.0-2.4)	0.061	-	-

<i>General conditions on admission</i>						
<i>Anemia</i>						
No / Mild	261	22.1	1.0			
Severe	114	22.2	1.0 (0.6-1.8)	0.901	-	-
<i>Jaundice</i>						
No / mild	352	21.0	1.0		1.00	
Deep	28	53.6	4.3 (2.0-9.5)	0.000	1.2 (0.03-2.4)	0.243
<i>Fever</i>						
<39.4 °C	276	23.9	1.0			
≥39.4 °C	105	22.9	0.9 (0.6-1.6)	0.828	-	-
<i>Spleen size</i>						
Not palpable	106	34.9	3.0 (1.2-12.5)	0.003	1.6 (0.1-12.2)	0.126
Palpable	247	19.8	1.0		1.0	
<i>Liver</i>						
Not palpable	92	17.4	1.0			
Palpable	71	26.8	1.7 (0.8-3.7)	0.149	-	-
<i>Treatment at hospital</i>						
<i>Parasite density</i>						
1+ , 2+	178	7.3	1.0		1.0	
3+ & 4+	179	39.1	8.2 (4.2-16.8)	0.000	4.7 (1.5-14.3)	0.007
<i>Hospital treatment</i>						
Simple	344	22.4	1.00			
Complicated	40	37.5	2.1 (1.1-4.1)	0.054	-	-

In the multiple logistic regression analysis, the factors significantly associated with increased likelihood of malaria death were patients who presented with history of fits [OR=3.2 (95%CI 2.7 to 6.2)], treated with untrained practitioners as second health care provider [OR= 4.7 (95%CI 1.6 to 13.6)], duration of illness more than five days before admission [OR=8.2(95%CI 2.8 to 24.5)], and heavy parasite load (3+ and above) [OR= 4.7 (95%CI 1.5 to 14.3)] (Table 2).

DISCUSSION

Our study aimed to identify the factors responsible for malaria fatality in order to reduce malaria mortality by eliminating or modifying those factors. Combating risk factors at their earliest stage of manifestation may prevent further deteriorations.

The overall case-fatality rate (CFR) among the admitted malaria cases was 6.8%. It did not include 36 'signed and left' cases that might likely have died at home. Therefore, CFR might go up to 11.2% if the outcome of 'signed and left' cases could be

confirmed as expired. The fatality rate among severe cases was 14.36%. It might go up to 23.59% if the 'sign and left' cases were regarded as mortality.

Our results revealed that duration of illness more than five days before admission is significantly associated with high fatality of malaria. A study in Myanmar reported that the highest proportion of deaths occurred if mean duration of illness ≥ 8.5 days while the lowest proportions of deaths occurred in mean duration of illness ≤ 3.13 days before hospitalization [4].

Our study showed that treating with untrained providers during second healthcare seeking leading to delay in effective, prompt and timelessness of anti-malarial management and increase severity and death of malaria. Therefore, the stage of disease when the patient usually search for second treatment should be considered as 'critical stage' that may determine the outcome. A study in Myanmar reported malaria mortality among the adult population was associated with a long delay in seeking treatment [4]. Studies done in Philippine, Kenya and Guinea [5] [6] [7] supported that severity of malaria is associated with use of official health sectors and hospitals. Patients sought treatment from untrained practitioners in early stage. They were admitted to hospitals when disease became more severe and complicated in late stage.

In present study, malaria patients presented with fits were three to four times increase in risk of death. Similar finding regarding cerebral manifestation of malaria as one of the major causes of death was reported in Myanmar [4] as well as global literature [8]. Fits might be partly due to hyperpyrexia, especially in children. However, neither relations between fits and age of patients, nor between fits and hyperpyrexia (≥ 39.4 degree Celsius) were found. There was no significant relation between high parasite density and fits.

Our results revealed that the factor significantly associated with increased

likelihood of malaria death was patients with heavy parasite load. The results of a program trial conducted in France [9] also reported that high-level parasitaemia was associated with increased risk for death among malaria patients.

In univariate analysis, the results from this study showed that malaria death was higher in patients aged above 13 years, being male gender, with history of traveling to malaria endemic area, who denied past history of malaria attack and without clinical spleen enlargement. In a study of Myanmar, adults were 2.8 times more likely to die from malaria than children [4]. Increasing age as a risk factor for death of malaria has been reported in Europeans [10], and France [11]. In a study in France [9] reported increased likelihood of malaria death is associated with age and male sex.

The non-immunes with history of travel to malaria endemic areas were also more prone to malaria death. Many rural and sub-urban areas in PyinOoLwin District are malaria endemic areas. Migratory non-immune floating populations incidentally entered into malaria endemic areas acquired malaria were more likely to suffer from severe malaria and more prone to die of malaria. A study in France also reported that traveling to malaria endemic area in East Africa is significantly associated with death of malaria [9]. A study in United States [12] suggested that travelers to malaria-endemic areas were resulting in potentially severe illness and high CFR.

Regarding treatment, hospital treatment should be strictly in line with latest national anti-malarial treatment guidelines (NAM TG). Township hospitals in PyinOoLwin District obeyed NAMTG such as diagnosis using microscopy (64.2%) and RDT (35.8%) and use of ACT (26.6%) in confirmed *Plasmodium falciparum* cases. However, minor deviations such as use of non-recommended combinations of anti-malarial drugs, over use of antibiotics, and ancillary treatments e.g. steroids, mannitol, and nootphil should be abandoned in

order to improve compliance with NAMTG in hospitals. In conclusion, risk factors impeding prompt and adequate treatment at the community level, early referral and specific treatment at hospital should be revised to reduce malaria mortality.

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Prevalence and associated risks of hepatitis B and C infections among Injecting Drug Users (IDU) attending the Registered Drug Treatment Centers in Yangon, Mandalay, Myitkyina, Bamaw and Moekaung in 2007

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A cross-sectional study was conducted at Drug Treatment Centers in Yangon, Mandalay, and Kachin State. The objectives of this study were to determine the sero-prevalence of both individual and dual infection of hepatitis B and hepatitis C to assess their knowledge on hepatitis B and C infection and to find out associated risks of these two infections among IDUs attending drug treatment centers. Face-to-face interviews were conducted among 298 IDUs in all study areas during December 2007. The serology of HBsAg and Anti-HCV was assessed by WHO recognized test kits. The HBsAg positive rate was 8.1% each in Yangon and Mandalay Divisions, 11.4% in Moegaung, 3.2% in Bamaw and 11.9% in Myitkyina while the anti-HCV seropositive rate was 74.2% in Yangon, 66.3% in Mandalay, 88.6% in Moegaung, 93.5% in Bamaw and 86.9% in Myitkyina. Common associated risks were found to be tattooing (57%), ear piercing (54.7%), dental procedure (44.3%), and frequent injection for minor ailment (36.1%). More than half of IDUs attained high school education and 61.4% had their own business. Transmission through infected blood (74.7%) and contaminated syringe (86.9%) were identified as associated risks for both hepatitis B and C infection. Nearly 50% knew vaccination could prevent infection. Risk factors for Anti-HCV were needle sharing ($P=0.002$) and ear piercing ($p=0.023$). Health education towards harm reduction among IDUs should be promoted by target group counselling.

INTRODUCTION

The prevention of hepatitis B and C virus (HBV and HCV) infection is also of major public health concern. The infected individual carries a substantial risk of chronic liver disease of 5 to 10% in HBV, and more than 50% in HCV infection. Moreover, individuals infected with HBV, and to a lesser degree with HCV infection, may transmit the virus to their sexual partners, and in case of females to their offspring [1, 2]. Injecting drug users (IDUs)

are at high risk of acquiring parentally transmitted disease. For human immunodeficiency (HIV) infection a variety of more specific factors have been identified such as needle sharing, use of shooting galleries, cocaine use, or number of drug injecting sex partners [3, 4]. The overall prevalence of HCV infection in the general population is estimated to be between 1 and 2.4% but it is observed as 40-95% among IDUs [2]. Active drug users are considered as the primary source of new HCV infections. Little is known about data on occurrence

and possible associations between risk behavior among IDU, and HBV or HCV infection. Only few studies have been carried out on HBV and HCV transmission among institutionalized IDUs in which HBsAg positive rate was 11.4% and that of anti-HCV antibody was 94% [5]. According to these findings there is still a room for improvement in their knowledge and preventing practices among IDUs about these infections.

General objective

To find out prevalence, knowledge, and associated risks of hepatitis B and C infections among injecting drug users.

Specific objectives

1. To identify socio-demographic characteristics of injecting drug users (IDUs) attending drug treatment centers.
2. To determine the sero-prevalence of both individual and dual infection of hepatitis B, hepatitis C among injecting drug users (IDUs) attending drug treatment centers.
3. To assess their knowledge of hepatitis B and C infection as regards to mode of transmission, risks, prevention, and complications.
4. To find out associated risks of these two infections among injecting drug users (IDUs) attending drug treatment centers.

MATERIALS AND METHOD

Study design

Cross-sectional

Study population and study site

A total of 305 registered IDUs attending the Drug Treatment Centers of Yangon, Mandalay, Myitkyina, Moekaung and Bamaw.

Study period

September 2007 to February 2008.

Inclusion criteria

All injecting drug users who were willing to participate and gave consent

Exclusion criteria

IDUs without giving consent

Sample size and sampling procedure

All IDUs who fulfill the inclusion criteria were enrolled. And all the participants, who were willing to participate in the study were explained and asked to sign in written informed consent forms approved by institutional ethical review board.

Data collection method

A. Questionnaire survey

Face-to-face interviews were conducted by trained research assistants using pre-tested semi-structured questionnaire. The variables collected were socio-demographic (age, sex, education etc), knowledge related variables (mode of transmission, risks, prevention), risk behaviors and risks experienced.

B. Laboratory procedure

Serum specimen: Blood samples were obtained from all injecting drug users from the study areas. Informed consents were obtained from IDUs who agree to participate. Three milliliters of venous blood were drawn from the ante-cubital fossa under aseptic measures and centrifuged at 3,000 rpm and serum samples were transferred into Eppendorf tubes labeled with the code number of each subject. Sera samples were transported to Department of Medical Research (Lower Myanmar) on ice and stored at -20°C until testing.

Serological analyses were performed for hepatitis B virus marker (HBsAg), using one step HBsAg rapid test device (Standard Diagnostic Inc, BIOLINE, with sensitivity and specificity >99%) together with positive and negative controls.

Antibodies to hepatitis C virus were tested by one step anti-HCV rapid test device (Standard Diagnostic Inc, BIOLINE, with sensitivity 93% and specificity 99%) together with positive and negative controls.

Data entry and data analysis

Data were checked for incompleteness, errors and inconsistency in each and every day after data collection and before entry to computer.

Data were entered into computer software (Epi data 2.1) and cleaning was done before analysis. Data analysis was also done by computer software.

For univariate analysis - Continuous data were presented by mean \pm SD, and median (range), for that of category were shown by proportion or percentage. Bivariate category data were analyzed by χ^2 test, and set $p < 0.05$ as significant.

RESULTS

A total of three hundred and five IDUs were recruited from Yangon, Mandalay, Myitkyina, Moekaung, and Bamaw during the study period. Blood samples of six IDUs from Yangon and one IDU from Moekaung were not available because most of their veins were scleroses. Therefore, the analysis was only based on 298 IDUs.

The mean age of IDUs was found to be 29.49 ± 6.3 years. They started to use intravenous drug at the age of 22.7 ± 5.69 years. The median duration of using intravenous drug was 48 months and it ranged from one month to 336 months. Nearly a third of respondents (27.6%) were eldest sons. Of respondents, 53.7% were single and 54% could be able to study high school education. Sixty-one percent had their own business.

Table 1. Serological status of HBsAg and Anti-HCV among intravenous drug users

Study areas	No. of cases (%)	Both markers positive No. (%)	Anti-HCV positive No. (%)	HBsAg positive No. (%)
Yangon	62 (20.8)	3 (4.8)	46 (74.2)	5 (8.1)
Myitkyina	84 (28.2)	8 (9.5)	73 (86.9)	10 (11.9)
Moekaung	35 (11.7)	3 (8.5)	31 (88.6)	4 (11.4)
Bamaw	31 (10.4)	1 (3.2)	29 (93.5)	1 (3.2)
Mandalay	86 (28.9)	5 (5.8)	57 (66.3)	7 (8.1)
Total	298 (100)	20 (6.7)	236 (79.2)	27 (9.1)

Table 1 shows that the overall dual infection rate was found to be 6.7% (20/298). Highest dual infection was observed in Myitkyina (9.5%) and Moekaung (8.5%). Regarding overall single infection rate, 79.2% (236/298) were positive for HCV and 9.1% (27/298) were positive for HBsAg. The highest occurrence of anti-HCV positivity was found at 93.5% in Bamaw followed by 88.6% in Moekaung and 86.9% in Myitkyina. The HBsAg positive rates were 11.9% in Myitkyina and 11.4% in Moekaung whereas in Yangon and Mandalay both were 8.1%. Bamaw had the lowest positive rate (3.2%) in HBsAg among the study areas.

Table 2. Risk behaviors among respondents

Risk behaviors	No.	%
Smoking (n= 294)	287	97.6
Alcohol drinking (n= 294)	161	54.8
*Substance abuse (n=293)		
Opium	220	75.1
Dolotram	9	3.1
Heroin	285	97.3
Marijuana	144	49.1
Yarma	178	60.8
Diazepam	173	59
Codeine	166	56.7
Sosegon	137	46.8
Bupronorphine	26	8.9
Ketamine	8	2.7
Needle use (n= 285)		
Single	222	77.9
Two and more	63	22.1

* Allowed multiple responses

In Table 2, nearly all IDUs (97.6%) were smokers but only halves were drinking alcohol. Most of the substances which found to be abused were heroin (97.3%), opium (75.1%), Yarma (60.8%), and diazepam (59%). Only 22.1% of respondents shared needles during their injection.

One fourth of IDUs had experienced some surgical operations. Ear piercing and tattooing practices were found at 54.7% and 57% respectively (Table 3). More than 40% of IDUs had history of dental procedure (tooth extraction) during their life time. Use of injection during minor ailment was very frequently responded by 36.1% of IDUs. Not using condoms during sex with sex

workers was found in 11.5% of respondents. Twenty percent of respondents had past history of viral hepatitis. Most of IDUs (85.6%) did not receive hepatitis B vaccination.

Table 3. Distribution of risk of exposure experienced by the respondents

Exposure to risks (n=298)	No	%
History of blood transfusion	23	7.7
History of surgical operation	76	25.5
History of ear piercing	163	54.7
Tattooing	170	57
Sharing razor (n=295)	7	3.4
Sharing tooth brush	5	1.7
History of tooth extraction (n=297)	132	44.3
Family history of viral hepatitis	21	7
History of taking frequent injection	107	36.1
Sex with sex workers (n=295)	131	44
No condom use during sex with sex workers (n=130)	15	11.5
Past history of viral hepatitis (VH)	61	20.5
No history of HVB vaccination (n=297)	254	85.6

About 90% of respondents could identify persons having multiple sex partners and intravenous drug users were at risk of contracting hepatitis virus infection. About 53.5% recognized the health persons were also at risk. The respondents knew that sharing contaminated syringe and needle (92.3%), sex without using condom (89.9%), and blood transfusion (86.9%) were risk conditions for getting these viral infections. Concerning mode of transmission, through blood (74.7%) and through contaminated syringe and needle (86.9%) were commonly known methods. Mother-to-child (vertical transmission) transmission was reported by 70.5% of IDUs. Approximately half of respondents knew vaccination could prevent hepatitis infection. Being a carrier (82.7%), chronic hepatitis (74.5%), and cirrhosis (81.9%) were commonly known complications of these infections (not shown in table).

Duration of intravenous drug use was marginally related to HBsAg ($p=0.059$) infection status but it was significantly related to that of Anti-HCV (0.049).

Table 4. Association between selected risks experienced, risk behaviors and hepatitis serology statuses among IDUs

Variables	HBV		p value	Anti-HCV		P value
	+	-		+	-	
Duration of IV abuse (n=288)						
≤ 4 years	9 (6.2)	137 (93.8)	0.058	111 (76.0)	35 (24.0)	0.049
> 4 years	18 (12.8)	124 (87.2)		121 (85.2)	21 (14.8)	
Frequency of IV use (n=286)						
≤ 3 times	19 (9.1)	190 (90.9)	0.74	167 (79.9)	42 (20.1)	0.72
> 3 times	8 (10.4)	69 (89.6)		63 (81.8)	14 (18.2)	
Needle sharing (n=288)						
No	18 (8.0)	206 (92.0)	0.33	171 (76.3)	53 (23.7)	0.002
Two	4 (12.9)	27 (87.1)		28 (90.3)	3 (9.7)	
Three and more	5 (15.2)	28 (84.8)		33 (100)	0 (0)	
Ear piercing						
Yes	17 (10.4)	146 (89.6)	0.34	137 (84.0)	26 (16.0)	0.023
No	10 (7.4)	125 (92.6)		99 (73.3)	36 (26.7)	

Needle sharing ($p=0.002$) and ear piercing ($p=0.023$) were strongly related to HCV infection but not for HBV infection (Table 4).

DISCUSSION

A review of international studies suggests that 50%-95% of IDU populations are HCV infected [6]. Similar results were obtained from this study in which positive rate of HCV antibodies was observed at 66.3% in Mandalay and 93.5% in Bamaw. The present study found that the HCV antibodies positive rates were lower in the major cities such as Yangon (74.2%) and Mandalay (66.3%) as compared to Myitkina (86.9%), Moekaung (88.6%), and Bamaw (93.5%). HBsAg positive rates were also high in Myitkyina (11.9%) and Moekaung (11.4%) townships. Although there was variation in HBsAg positive rates among townships in the present study, the overall positive rate was a bit lower than previous study, by Myo Khin, 2004 (9.1% vs 11.4%) [5] but it remained relatively constant. The differences in socio-economic status such as education,

income, availability of health services and vaccination might contribute to lower rates of both HBV and HCV serological markers in Yangon and Mandalay.

The evidence of relationship between duration of injection drug use and seroprevalence of HCV in our study was consistent with the study of young injecting heroin users in Southern China, in 2004 [7] in which HCV prevalence continued to climb reaching over 90% within 4 years of injection use as compared to 70% within a year use. High HCV prevalence among IDU could reflect rapid transmission and that evidence was supported by low prevalence of hepatitis B virus among IDU. Another explanation for high HCV was that the more frequent persistence of HCV compared to that of HBV [8] after getting these infections. Previous study revealed that more than 90% of adults become non infectious after HBV infection, limiting the reservoir of transmission [9], in contrast, over 80% of HCV infections persist [10]. Thus, among IDUs there is a large reservoir of HCV infection from which new injection drug users are infected.

Meanwhile, the present study showed that needle sharing among IDUs was strongly related to HCV status and that was similar with Berlin study, in 1997 (22.1% vs. 22%) [6].

Although the seropositive rate of HCV was high, the reported number of IDUs who shared syringe in the present study was found to be low (only 22%). It might be due to under reporting of sharing syringe or possibility of alternative route of transmission other than needle sharing.

Some experts believe that the virus is not only spread by using intravenous drugs, but also by sharing the straws used to snort substances [11]. The IDUs in present study abused heroin (97.3%), opium (75.1%), Yarma (amphetamine) (60.8%), and diazepam (59%). Probably these were administered by inhalation with sharing practice of inhalation equipment or by

ingestion among drug users and that is the another possibility of high HCV in our IDUs. This has important implications for prevention where a pragmatic approach is necessary. It is not possible to entirely prevent the injection use of illicit drug. However, injection with contaminated equipment could be substantially reduced if sterile injection equipment was available. In addition to that harm reduction initiative, other preventive health education message should be expanded to cover all IDUs.

It has also been identified that body piercing is one of the possible mode of HCV transmission from the present study. It is in accordance with one study in which alcohol and other drugs use were the significant correlates of tattooing and body piercing [12]. Therefore, attention should be given to get awareness on using or sharing contaminated equipment used for such procedures or sharing earrings carried out by professional and non-professional works of body cosmetic procedure for the preventive aspect of this infection.

Although the reported knowledge of risks, mode of transmission, prevention, and complication seem to be high, the HCV seroprevalence among IDUs was quite alarming high. In addition to that giving the associated morbidity and mortality and lack of an HCV vaccine, efforts to prevent HCV infection must be intensified and focused on reducing injection drug use, practices involving the sharing of drug use equipment. Besides promoting behavioral change and harm reduction among established users, responsible health personnel need to consider seriously for establishment of prevention campaigns that address the risk of HCV infection.

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Awareness of tobacco-related health information among military community in Taikkyi Cantonment, 2008

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The increased use of tobacco is one of the greatest public health threats for the 21st century. Studies on tobacco use in the military community were seldom done and the awareness of tobacco-related health information among military personnel is needed to be explored. To fulfil this gap, a cross-sectional study was carried out in Taikkyi Cantonment. The study was done during 2008. A total of 298 persons, military personnel and civilians working at No. (11) Defense Industry in Taikkyi Cantonment area, were interviewed with the pre-tested questionnaire. About one-third of the respondents were still using tobacco at the time of survey - smoking and/or betel chewing. The majority (99%) said they heard about health information relating to tobacco. Health talk was mentioned as the main source of information - either from TV (96.9%), anti-smoking talk (62%) or from radio (36.3%). About 71% reported that anti-smoking activities in Myanmar were not sufficient.

INTRODUCTION

The increased use of tobacco is one of the greatest public health threats for the 21st century. Tobacco is a silent epidemic and remains a major killer, particularly in developing countries. Tobacco kills 4.9 million people every year globally. By 2020, it is predicted that tobacco will become a leading cause of death and disability, killing 10 million people every year. About quarters of all regular smokers are killed prematurely by their smoking and smoking shortens a person's lifespan by 13 to 14.5 years [1].

It is well accepted that smoking is the avoidable cause of death and disability and World Health Organization (WHO) points out that tobacco is not only the major cause of death worldwide but also the fourth most common risk factor for various diseases [2]. Apart from the tragic health consequences, smoking encompasses several other economic and social costs.

Prevalence of smoking for Myanmar males ranged from 30% to nearly 50% and female

prevalence around 20% [3]. According to 2005 WHO report, overall prevalence of all ages use in Myanmar was 32.9%. Likewise, prevalence of tobacco consumption among military persons was apparently high - overall prevalence of smoking was nearly 50% and of betel chewing was 28% [4].

Use of smokeless tobacco is also common in Myanmar. According to 2001 sentinel prevalence study, prevalence of current smokeless tobacco use as 14.9% of population above 15 years of age, 23.8% of males and 8.0% of females [3].

Rapid changes in industrialization, urbanization, higher incomes and globalization in South East Asia Region including Myanmar contribute negatively on life-styles such as increased tobacco use, which in turn the rising trend of non communicable diseases.

Media takes place an important role in prevention of public health problems by competing against or complementing prevention messages. Hence, to increase the public awareness of relationship between the diseases and tobacco use, tobacco

control campaigns were implemented worldwide through various channels like media campaigns, counter-advertising and school-based programs. Since 2000, Myanmar Tobacco Free Initiative Project (TFIP) has been carrying out anti-tobacco campaigns to fight the tobacco epidemic and to reduce the morbidity and mortality related to the use of tobacco [5]. Consequently, information, education and communication (IEC) materials about danger of tobacco use - pamphlets, posters, stickers, wall posters, badges, video tapes, VCDs - had been distributed. 'Tobacco-free programmes' were introduced at all elementary schools during the academic year 2001-2003 by The School Health Project [6]. Also, work places were designated as 'tobacco free' by TFIP. In spite of these activities, the prevalence of tobacco use is still increasing in most of the developing countries [7].

It is time to find out whether information about the risks of smoking can influence consumers' use of tobacco: are they aware of either the addictive properties or the health consequences of tobacco? As the consumption of tobacco is highly prevalent among Myanmar community, the study aimed to explore the awareness of tobacco-related health information among military persons as a partial fulfilment in reducing the risk of tobacco uses.

Objective

The objective was to explore the awareness of smoking-related health information among military community in Taikkyi Cantonment Area, Yangon Division.

MATERIALS AND METHODS

Military community-based cross-sectional study was carried out in No. (11) Defense Industry (DI) in Taikkyi Cantonment Area, Yangon Division. The area was chosen purposively due to the nature of sedentary unit and consists the largest and heterogeneous population among military units in Taikkyi, i.e., military person and

families of military person from other military units within Taikkyi Cantonment Area. With the estimated proportion of people who were aware of tobacco-related health information in Myanmar, i.e., 25% (Personal communication with Dr. Nyo Nyo Kyaing, Project manager of tobacco control) and precision of 5%, at 95% confidence interval, the study involved 300 respondents. They were chosen by systematic sampling. Of which, only 2 respondents were not able to participate.

Face-to-face interview with the selected persons were carried out by trained medical officers by pre-tested questionnaire. Prior to interviewing, informed consent was obtained from each interviewee and the purpose of study and nature of interviewing was explained. At the night of every interviewing day, discussion was done among team members about difficulties they had faced during interview, the questions and answers were checked and then reconsidered and managed to create the better condition. The study was conducted from July to October 2008.

RESULTS

Socio-demographic characteristics of the respondents

Out of 300 respondents, 298 persons were interviewed with a response rate of 99.3%. The majority (82.9%) of the respondents were in the age group of 21-50 years, which is the working age group (Table 1). Males and married respondents were the dominant groups (61.7% and 70.1% respectively). About 95% had attained at least middle level education. In the occupation group, staff from production section like section relating to explosive materials was the largest (59.7%).

Among 298 respondents, current-, ex- and non-smokers were 30.2%, 11.1% and 58.7%. And current-, ex- and non-betel chewers were 41.9%, 3% and 55% respectively.

Table 1. Socio-demographic characteristics of subjects (n = 298)

Characteristics	No.	%
Age group (in years)		
18 - 20	19	6.4
21 - 30	109	36.6
31 - 40	76	25.5
41 - 50	62	20.8
51 - 60	32	10.7
Sex		
Male	184	61.7
Female	114	38.3
Marital status		
Single	84	28.2
Married	209	70.1
Divorced	2	0.7
Widow	3	1
Education		
Lower level	15	5
Middle level	96	32.2
Higher level	135	45.3
Graduated	52	17.4
Occupation		
Administration section	28	9.4
Inspection section	32	10.7
Head quarter	60	20.1
Production section	178	59.7

Situation of getting information

Majority (99%) said they heard about health information relating to tobacco from more than one source. Three respondents, who were neither smokers nor betel chewers, said they were not interested in it. Health talk was the main source of information - either from TV (96.9%), anti-smoking talk (62%) or from radio (36.3%) (Table 2).

Table 2. Sources of information (n = 295)

Sources *	No.	%
Health talk on TV	286	96.9
Poster and notice board	221	74.9
Health talk in group	183	62
Pamphlets and books	173	58.6
Radio health talk	107	36.3
From other people	37	12.5
Newspaper	20	6.8
From health worker	4	1.4
Others	18	6.4

*Multiple responses

Printed materials came next in the form of poster and notice boards (74.9%), pamphlets

and books (58.6%) and newspaper (6.8%). Only 1.4% received it from health workers.

Type of messages obtained

All of them said they obtained messages on health effects and illness due to tobacco uses (90.9% of smokers and 100% of betel users), followed by messages about avoidance of smoking in public area (13.6% of smokers and 33.3% of betel users). A few respondents also mentioned about health risk associated with tobacco for a child and pregnant woman and bad consequences of smoking.

Utilization of health messages obtained

Nearly all respondents said they applied these messages more for themselves regarding quitting, avoiding smoking near the pregnant woman, a child and family. Some also said they used it for encouraging other people to quit smoking and betel chewing, not to smoke near the pregnant woman and child. A very few explained to other people about the messages they acquired.

Inconsistencies between practices and their statements about utilization were found. Most current- and ex-smokers reported that they utilized such messages, yet, nearly all of them said they smoked in public areas. However, some avoided smoking near their family, stopped other people to smoke near the pregnant woman and child. Only a few of ex-smokers and non-smokers used none of these messages. The same pattern was reported by the betel chewers.

Preferred health education media and channels

Among 298 respondents, 295 (98.9%) mentioned about their type of preferred media (Table 3). The majority chose TV the highest (93.6%), while most selected printed materials such as posters (64.7%) and pamphlets (52.9%), only a few selected person-to-person - from other people and from health worker.

Table 3. Preferred media (n = 295)

Preferred media*	No.	%
Television channels	276	93.6
Posters and notice boards	191	64.7
Health talk and discussions	173	58.6
Pamphlets and books	156	52.9
Radio	95	32.2
From other people	3	1
From health workers	2	0.7
Others	3	1

*Multiple responses

Most preferred health education media and channels

Among these media types, the most preferred media was TV (54.9%), followed by health talk (25.8%), posters and boards (8.1%), pamphlets and books (6.8%), radio (2.4%) and individual talk (2.03%). TV was chosen as the most preferred method because of TV spot and the movie casts and it was easy to watch and understand. They liked the talk in group or individually, as they could discuss with the professional presenter at the talk. Likewise, it was easy to understand and read even for the illiterates, they chose posters and the pamphlets as their preference. Though only seven respondents chose radio, their prime reason was it could easy to hear the topics given by the professionals and could reach everywhere.

Least preferred health education media and channels

On the other hand, 261 respondents selected their least preferred media, which were different from the most preferred media: pamphlets and books (32.9%), posters and boards (22.9%), TV (19.2%), radio (14.2%) and health talk (10.7%) respectively. Unable to reach every corner, having no time and less precision about the facts were given as the reasons for the least preference to pamphlets and posters. While about 9% said pamphlets could not be appropriate for the illiterate person, only 1.7% claimed for the posters. Majority did not like radio as it could not be watched. About 22% did not like health talk as they thought it lacked precision.

The effective health education media and channels

Among the various media, TV and health talk were ranked as the most effective media (47.5% and 31.1% respectively) because of easily accessible in terms of watching, discussion and reaching a wider target. On the other hand, radio and individual talk were selected as the least effective one (1.01% and 0.7% respectively) though these could be listened at any time.

Generally, TV, health talk, posters and pamphlets were chosen as the most preferable and the effective media. Easily accessible was the common reason for their choosing the effective media in terms of watching, discussion and reaching a wider target. On the contrary, inconsistent choices were reported concerning with the effective media vs. their least preferred media, for instance, TV was selected as the effective media, and however, it was chosen as their least preferred method.

Opinion on the sufficiency of anti-smoking activities

Out of 298 respondents, 295 (98.9%) gave their opinion on the sufficiency of anti-smoking activities of Myanmar. Among 295 respondents, 208 (70.5%) reported that such activities were not sufficient. Most (51.9%) argued that there were still smokers and betel chewers (Table 4). About 36% said the information was still in need where some people did not know about it very well and sometimes the activities did not reach to rural areas. A few (8.2%) pointed out that it was because of the tobacco production.

Table 4. Reasons for not sufficiency of anti-smoking activities (n = 208)

Reason	No.	%
Presence of smokers	109	51.9
Need more information	75	36.1
Presence of tobacco production	17	8.2
Not knowing about quitting method	3	1.4
Need tobacco law	1	0.5
Others	3	1.4

Forty-six respondents said it was enough because the necessary messages were already well distributed through various media and channels over the country. Only a few did not reveal their opinions.

All types of smokers and betel chewers had negative opinion that the anti-smoking activities were not enough, particularly males (69.7%).

DISCUSSION

Smoking is regarded as one of the threats to the study area for the fire safety and health hazards for the employees, accordingly, some anti-smoking activities had already implemented within the jurisdiction of No. (11) DI. Pamphlets and posters distributed by Tobacco Control Programme were displayed at assembly hall, dining hall, family line, unit hospital and health centre. There were also signboards of "Don't smoke while walking" within the industry compound. Health talks given by medical officer, health assistant and midwife were also seldom done.

Majority of respondents (99%) said they heard about health information relating to tobacco from one way or the other. Only three subjects were unaware of such information as they had no interest in it and all of them were non-smokers and non-betel chewers. They received more about health risk due to tobacco uses and avoidance of smoking in public areas.

In spite of these circumstances, about one-third of the respondents were still persisting using tobacco at the time of survey. This could be due to nature of working environment, which is associated with isolation, stress and strains of the assigned job. Additionally, some admitted that they could not avoid smoking at the public areas, near the pregnant women and the children, but most followed what they had known from the health messages. It was found that they applied all the messages not only for

themselves, but also for other people as much as they could for quitting, avoiding and helping other people. However, they could not resist smoking at public areas.

This revealed that, most of the study respondents were aware of tobacco-related health information and practised accordingly. Health talk was identified as the main source of information - either from TV, anti-smoking talk or from radio. It was followed by the printed materials such as poster and notice boards, pamphlets and books and newspaper. Only a very few respondents received it through person-to-person - from health worker or other person. This indicated the need to enhance the health workers as the health educators in tobacco control programme.

TV and health talk - in group or individual were placed at the top list for their most preferred and effective media. Posters and boards, pamphlets and books came next. It is interesting to note that although some claimed health talk as their most preference and effective media some selected it as the least option. Those who had positive view on talk explained that they could have opportunities to discuss during the talk, and it was easily understandable. Those with negative view on talk argued that the facts and information were lacked of precision. The findings revealed that easily accessible was the common reason to choose the effective media in terms of watching, discussion and reaching a wider target.

Since the messages relating to tobacco risks had already disseminated through various media and channels over the country, some had opinion that the activities were enough. On the other hand, the majority thought anti-smoking activities were still in need as long as there were smokers and betel chewers and everybody was not well informed about the activities. Above all, though the percentage was small, they pointed out that tobacco production was one of the factors for the insufficiency of the activities.

In conclusion, the findings could not be generalized to the whole country; however, the findings indicated that to some extent, anti-smoking activities had achieved its goal among the study subjects.

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Economic burden of TB patients attending Township TB Centre in Myanmar

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This study was conducted at Township TB Center in North Okkalapa Township to explore the economic burden of TB patients by estimating the direct and indirect costs incurred by TB patients. Face-to-face interview with 101 TB patients by using semi-structured questionnaires was conducted. About 47 respondents (46.6%) were in the 35-54 age groups. Male and female ratio was 3:1. Seventy-four respondents (73.3%) were low socio-economic status group. Total cost (direct and indirect costs) before taking anti-TB treatment at Township TB Centre ranged from 0 to 697,300 kyats (mean=104,000, medium=66,500). During anti-TB treatment, total cost ranged from 0 to 357,900 kyats (mean = 55,600, median=23,000). Before taking anti-TB treatment, 68 patients (67.6%) had economic burden among which majority of patients were low family income group and low socio-economic status group. During anti-TB treatment, 40 patients (39.6%) had economic burden. Wages loss due to illness and low family income were major factors for economic burden. Twenty-seven TB patients (26.7%) incurred cost before anti-TB treatment as more than 10% of annual household income. Treatment delay increased the cost and may lead to economic burden for TB patients and their families. Transportation cost and daily wages loss due to attending TB Centre to get free drugs were found to be possible factors for economic burden of TB patients. Effective strategy to reduce delay in seeking care of TB suspects should be developed.

INTRODUCTION

Tuberculosis (TB) disproportionately affects people in developing countries, where 95% of world TB cases and 98% of world TB deaths occurred [1]. TB causes 25% of all preventable deaths in the developing world [1]. The highest incidence rates are found in Africa (259/100,000) and South-East Asia (202/100,000). TB is a major public health problem in Myanmar. In the National Health Plan (NHP) 2006-2011, it is ranked as the third priority disease. The incidence among the general population was about 171 TB patients per 100,000 populations in 2006, and the annual risk of infection was 1.5 % [2].

TB takes a huge financial burden. Every year 8 million peoples around the world

contracted TB and the total budgets of National TB programme (NTPs) in high burden countries (HBC) amount to US\$ 1.8 billion in 2008, up from US\$ 0.5 billion in 2002. NTP budgets for the 90 countries with 91% of global TB cases reported total US\$ 2.3 billion in 2008. Budgets are typically equivalent to about US\$ 100-300 per patient treated. Funding for TB control has grown to US\$ 2.0 billion in high burden countries and US\$2.7 billion across the 90 reporting countries [2].

When the tuberculosis cases in the world are reviewed, 75% of those affected by TB are men and women in their productive age of 15 to 54 years [3]. People living in poor and over-crowded conditions with poor ventilation, and lacking sanitation are most likely to contract TB. Those having TB and

their families are more prone to fall into poverty and suffer from the economic consequences of the disease. Poor people who are already malnourished and live in environments with poor sanitation are more susceptible to TB infection. Thus, TB and poverty is a vicious cycle. Therefore, TB has a significant economic and social cost to individuals, families and countries. TB patients lost 3-4 months work loads in average and 20-30 percent of annual household income [3].

In Myanmar, after many years of drug shortages, and the sporadic provision of drugs by WHO, UNDP and other donors, a reliable drug supply had been ensured through the Global Fund for AIDS, TB and Malaria (GFATM). However, the GFATM terminated funding support for Myanmar in 2005. The three diseases fund was established in 2006. Although anti-TB drugs are free of charge at public sector, TB patients needed to pay for chest X-ray [4]. With the development of health economic system, health care cost is considered not only the sole responsibility of government but also the voluntary contribution from the community and Non-Governmental Organizations (NGOs). The government budget on current health expenditure is about 14361.8 million kyats with capital expenditure of 9816.8 million kyats, altogether 24178.6 million kyats for health care. The estimation of per capita health expenditure is 4278 kyats [5].

The impact of TB is most often measured as the direct cost of treatment to health service, which is, the cost of medicines, person, and facilities used. However, patients seek costly treatment from traditional healers or the private sector before an accurate diagnosis is made. The costs to patients and their families that can be quantified are principally in the form of lost earnings from loss of work due to illness or death. Additional costs come from food required while in hospital and the cost of travel to hospital or clinic for care. The socio-

economic burden of TB can highly influence the defaulter rate and multi drug resistant TB cases [6]. Thus, TB causes enormous socio-economic disruption and hampers the development of country. Economic evaluation is fundamentally about resource use and can serve an important role in health-care decision making.

Most of the studies conducted in Myanmar analyzed hospital cost and only a few studies explored cost borne by individual at households levels which was consumer cost. According to available literature, there is no study on economic burden of TB patients taking treatment at public TB centers in Myanmar after initiation of DOTS with the exception of two studies - one explored from social science aspects and another study conducted with TB patients who are under Short Course Chemotherapy (SCC) regimen [4, 7].

In Myanmar, most of the International NGOs plan to provide social and financial support for TB patients in order to reduce their economic burden. Thus, it is hoped that this study will contribute a valuable input for development of patient support system and also contribute as baseline information for planners and decision-makers for improvement of health care financing system in Myanmar.

General objective

To explore economic burden of TB patients taking treatment at Township TB Center in North Okkalapa Township.

Specific objectives

1. To determine the socio-economic profile of TB patients taking treatment at Township TB Centre
2. To estimate direct and indirect costs incurred by those TB patients before taking anti-TB treatment and during treatment
3. To describe economic burden of those TB patients

MATERIALS AND METHODS

It was a cross-sectional descriptive study. The study population was all registered TB cases taking treatment at least for one month and not more than 3 months in duration at Township TB Center. The study was conducted from July to September 2008 in North Okkalapa Township TB Centre, Yangon Division. All adult 101 TB patients who were registered at Township TB Centre during the data collection period were recruited regardless of their sputum results (positive, negative), types of TB (new case, relapse, defaulter) and treatment categories (category I, II, III).

Data collection

Face-to-face interview with TB patients was conducted by using structured and semi-structured pre-tested questionnaires.

Data management and analysis

Questionnaire was checked soon after the interview for completeness and internal consistency. Coding was done. Data were entered into SPSS (Statistical Package for Social Science) version 16.0. After cleaning of data, descriptive analysis was carried out by calculating frequency and percentage of socio-economic status of TB patients, direct and indirect costs. Economic burden was also described.

Socio-economic status calculation

The respondents were classified into three socio-economic status (SES) groups according to instruments developed by Myanmar Marketing Research Department (MMRD)¹. The SES calculation was based on the education level and occupation of main income earner (MIE) of household. In this SES calculation, there were five SES groups namely A, B, C, D and E. In this study, for analysis of association between SES and other variables, TB patients belonging to any of the two lowest SES (D and E) were categorized as “Lower SES”

and for those belonging to any of the two highest SES (A and B) were classified as “higher SES”. TB patients belonging to middle SES (C) was categorized as “Middle SES”.

Extrapolation of household cost

In economic evaluation, extrapolation model is used to estimate total cost where there is no primary measurement for the whole course of treatment [8]. In this study, TB patients who had taken treatment for at least one month but not more than three months were included. Thus, the data set included smear-positive new cases, relapse and extra-pulmonary cases. Duration of anti-TB treatment was also varied. Therefore, to estimate expenditure at household level for a whole TB treatment course, expenses need to be extrapolated based on the assumptions².

Economic burden

Economic burden was calculated by proportion of average monthly total direct and indirect cost during current illness to average household income. According to household income and expenditure survey in 2001 [9], percentage distribution of average household expenditure for non food was 28% for 5.37 household sizes and rest 72% were expensed for food. If cost of TB patients was more than 30% of their monthly household income it was assumed to have economic burden. The burden 30% was an extreme value. If the proportion was under 30%, there was no burden. If the proportion was 30-60%, there was low burden. If proportion was 60-90%, there was moderate burden. If proportion was more than 90%, there was high burden. Cost incurred by TB patients before and during anti-TB treatment was also mentioned as a percentage of annual household income. Total cost for whole course of anti-TB treatment (before diagnosed and completed treatment) was extrapolated based on assumptions.

¹ SES classification is available on request from the authors

² Assumptions for extrapolation of total cost are available on request from the authors

RESULTS

Background characteristics of TB patients

About 46.6 % of TB patients were in the 35-54 age groups which were working age groups. Male and female ratio was 3:1. Eighty-one respondents (80.6%) were income earners and 20 respondents (19.4 %) were not income earners (students, housewives, unemployed persons, retired persons and old age dependents). Forty-seven respondents (46.6%) had 5-8 family members. Fifty-one respondents (50.5%) were low income group earned monthly less than 100,000 kyats. Seventy-four respondents (73.3%) were low socio-economic status group. Among all patients, 80.2% of total cases were new cases, about 15.8% of cases were relapse cases and 4% of cases were treatment after default. About 80.2% patients were treated as category I; 17.8% were treated as category II; and 2% were category III respectively. Sixty-eight respondents (67.3%) lived less than 2 Km away from Township TB Center.

Treatment seeking pattern

Health facilities visited by TB patients before they were diagnosed were drug shop, General Practitioner (GP) clinic, public clinic, specialist clinic, traditional healer and hospital. About 29% to 32.7% visited two to three health facilities before reaching TB Center. Only one patient visited six health facilities. Three patients visited no health facility and they came directly to Township TB Center since symptoms started. Patients paid at least 1,500 kyats for one visit in private clinics. The duration of delay to TB Center ranged from 2 days to 182 days. The mean duration was 56 days, median duration was 35 days.

Direct costs

Direct cost before anti-TB treatment

Table 1 shows direct cost incurred by TB patients before taking anti-TB treatment. Seventy-one patients (70.3%) paid for consultation and drug cost together. Average cost per patient was 13,200 kyats.

The cost of hospitalization and cost of consultation and drug together were major costs for patients before taking anti-TB treatment. Total direct cost before taking anti-TB treatment was 4,606,050 kyats and average cost per patient was 45,604 kyats.

Table 1. Direct cost incurred by TB patients according to cost item before taking anti-TB treatment

Cost item	Number of cases with expenditure	% of total cases (n=101)	Total cost (Kyat)	Average cost per patient (Kyat) (n=101)
Consultant fee*	7	6.93	41,000	405.94
Consultant fee and drug cost **	71	70.30	935,750	9,264.85
Drug cost***	65	64.36	556,150	5,506.44
Investigation cost****	61	60.40	354,450	3,509.91
Transport cost	81	80.20	321,700	3,185.15
Hospital cost	27	26.73	2,397,000	23,732.67
Total cost			4,606,050	45604.46

* Patients who took treatment at specialist clinic answered consultation fees and drug cost separately.

**TB patients who took treatment at GP clinic paid consultation fee and drug cost together.

***Patients bought drugs from pharmacy and treated themselves to relief from their symptom.

****Examination cost was mainly for chest X ray cost which TB patients paid at private clinic.

Direct cost during anti-TB treatment

Twenty-one respondents (20.79%) paid for examination cost especially for chest X- ray during taking anti-TB treatment. Sputum examination was free of charge. Fifty-four respondents (53.48%) bought drugs (such as vitamins and cough suppressive drugs) from pharmacy to relief symptom although anti-TB drugs were free of charge. Respondents were incurred provider fee in GP clinics since they took symptomatic treatment and getting injection of streptomycin which was given by TB Center weekly. Initially, respondents visited TB Center at least for 3-4 times to consult with doctor and to do sputum examination. Then respondents were issued anti-TB drugs weekly. Respondents visited TB Center on foot or by trishaw or by bus. Mean total direct cost

was 8,290 kyats during anti-TB treatment within study period. Health facility fee for private clinics and transport cost were major reasons for high cost during anti-TB treatment.

Indirect costs

Indirect cost before anti-TB treatment

About 55% cases had wages loss before reaching Township TB Center. Mean total indirect cost before anti-TB treatment was 58,355 kyats which was about 56% of average total cost. Indirect cost was more than direct cost before anti-TB treatment. Indirect cost was mainly due to wages loss. About 80 % had less than 30 days (one month) in duration of wages loss. About 10 % had 31-60 days (one to two months) and 5.9 % cases had more than 90 days (more than three months) of wages loss.

Indirect cost during anti-TB treatment

Fifty-two respondents (51.49%) had wages loss during anti-TB treatment (Fig.1). Minimum duration of wages loss was 2 days and maximum was 85 days. TB patients suffering severe illness had more wages loss and a reason for cost of treatment relatively. Although they got anti-TB treatment free, initially they could not go to work due to debility. Minimum wages loss was 500 kyats and maximum wages loss was 7,000 kyats per day. Mean indirect cost was 47,323 kyats and medium was 10,000 kyats.

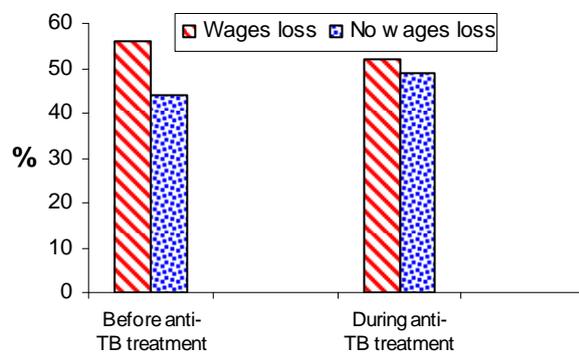


Fig. 1. TB patients who had wages loss before and during anti-TB treatment

Table 2 shows total costs before and during anti-TB treatment. Mean cost to household

before treatment was 103,959 kyats and mean cost during treatment up to time of interview was 55,613 kyats.

Table 2. Total cost before anti-TB treatment and during anti-TB treatment

	Before treatment		During treatment	
	Total cost (Kyat)	Mean cost (Kyat)	Total cost (Kyat)	Mean cost (Kyat)
Direct cost	4,606,050	45,604	837,280	8,290
Indirect cost	5,893,900	58,355	4,779,600	47,323
Total cost	10,499,950	103,959	5,616,880	55,613

Economic burden

Economic burden before reaching TB Center

Economic burden for household before reaching TB Center was expressed as proportion of average monthly family income. About 32.7% of total cases had no economic burden before anti-TB treatment. About 29.7% cases had low burden. About 19.8% cases had moderate burden and 17.8% had high burden before taking anti-TB treatment. About 70% of low income group had economic burden and about 72% of high burden group were low income group. About 22% of high burden group were middle income group. High income group had no burden. Low income group were mostly affected economic burden.

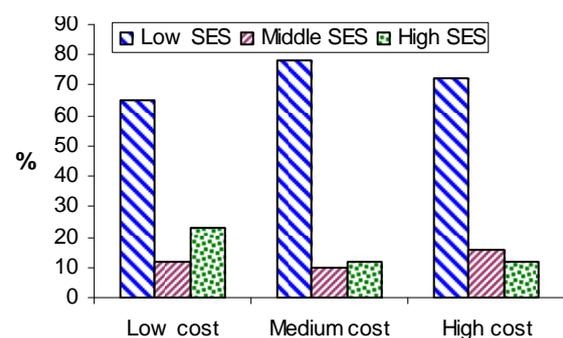


Fig. 2. Total cost of TB patients before anti-TB treatment according to SES group

About 65% of lower SES group had economic burden and about 89% of high economic burden group were in lower SES group. Only two patients (11%) of high economic burden group were in higher SES group. Lower SES group were mostly

affected economic burden. Figure 2 shows low SES group incurred high cost before anti-TB treatment.

Economic burden during anti-TB treatment.

During anti-TB treatment, 60.4% had no burden, 17.8% had low economic burden, 11.9% had moderate burden and 9.9% had high burden. TB patients who bore high economic burden were from low income group. These patients were incurred direct cost ranging from 400 kyats to 55,000 kyats and wages loss was ranging from 30,000 kyats to 340,000 kyats. This low income group of TB patients was unable to work and had more wages loss relatively due to illness during anti-TB treatment. Eighty percent of high burden group were from low income earners and 70 % of high burden group were from low SES group.

Coping mechanism for financial burden of the disease

TB patients sold or mortgaged their own assets such as gold, house, cloths, bicycle, trishaw, small machines and kitchen apparatus to cope with their household expenditure due to illness. Fifty-eight patients (57.43%) borrowed money to cover the cost. About 25.74% cases sold their own assets. Forty-one patients (40.59%) mortgaged their own assets to cover the cost. Four patients lost their job due to illness and four patients changed job to another job which was more comfortable but they got less salary. Family members of two patients stopped study to combat the household expenditure.

DISCUSSION

Seventy-four respondents (73.3%) were in low socio-economic status group. That finding was similar to finding from study conducted in SQH clinics operated by Population Services International (PSI) in 2005 reported that 68% cases were in low socio-economic status group [10]. About 29% to 32.7% visited two to three health facilities before reaching TB Center. This findings was similar to the findings from

the study conducted in 2003 in North Okkalapa Township found that two to five clinics have been visited by public TB patients [11]. The more health facilities visited by TB patients, it became high cost of treatment and a major factor caused economic burden before taking anti-TB treatment. The duration of delay to TB Center ranged from 2 days to 182 days. The mean duration was 56 days, median duration was 35 days. Study in six townships also showed medium delay from onset of symptoms to the commencement of treatment was 8 weeks [12]. Treatment seeking delay was a reason for the high cost of treatment before anti-TB treatment.

In this study, three main issues were explored to find out coping mechanisms of family to economic burden of TB namely, borrowing, selling own assets and mortgage. However, it is difficult to distinguish whether these mechanisms could be used as an indicator of economic burden since most TB patients already had low income and struggled for their daily living. Wages loss and low family income were major causes for economic burden. A study from Cambodia had reported that persons from households with initial debts due to high out-of-pocket payments could not repay their loan causing them to sell their land and subsequently become poor [13]. In this study we did not explore in-depth for consequences of economic burden by qualitative research methods. However, it pointed out there were economic burden of TB patients especially incurring more indirect costs although anti-TB drugs are provided free.

This study highlighted that there is considerable delay in seeking treatment at Township TB Centre and hence leads patients to incur more direct and indirect costs before diagnosed as TB. Treatment delay also caused patient' physical condition deteriorate and inability to work leading to wages loss and high hospital cost. Hence, it is recommended to find out effective strategy to reduce delay in seeking

care for TB such as effective Advocacy Communication and Social Mobilization (ACSM) strategies.

Transportation cost and daily wages losses due to attending TB centre to get free drugs were found to be possible factors for economic burden of TB patients. Therefore, it is necessary to ensure better access to health care services. It would be better if NGOs could provide patient's support or incentives such as transportation cost. TB patients incurred more indirect cost than direct cost indicating that patients still bear economic burden even though anti-TB drugs are provided free of charge. Thus, it is recommended to develop a strategy for financial protection of low income groups against the economic impact of disease.

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Sexual behaviour and reproductive health knowledge of unmarried adolescents in a peri-urban area of Yangon City

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The objectives of the study were to elicit among 15-24 year-old never married adolescents residing in Bo Tun Zan Ward in Dawbon Township involving 200 each of unmarried males and females regarding their sexual behavior and knowledge of adolescents on reproductive physiology, contraception and sexually transmitted infections, including HIV. Both quantitative and qualitative data collection methods were used. In this study, adolescents have substantial gaps in knowledge relating to reproductive anatomy and physiology. Contraceptive knowledge level could be considered not so low. Regarding prevention of HIV transmission, 68.9% and 12.5% of adolescents answered respectively to use condom and to be faithful to partner. Pre-marital sexual activity is common in the study area. In multivariate analysis, younger age group (15-19 years), males and those who have never attended school were more likely to have low knowledge score in sexual and reproductive health, including STI/HIV/AIDS (odds ratio 2.23, 2.87 and 5.25 respectively).

INTRODUCTION

Ministry of Health of Myanmar defines adolescents as those in the age group 15-24 years [1]. In Myanmar, adolescents constitute 19% of the total population. Adolescent is a transitional period from childhood to adulthood. It is a time of rapid and uneven development physically, socially, emotionally and intellectually. They encounter many challenges and one key challenge they face is reproductive health problems [2]. Many research and intervention programmes have been carried out on issues of reproductive health concerning family planning, contraception, prevention of HIV/STI but all these efforts were aimed at the older population [3]. Literatures identifying sexual and reproductive health issues of adolescents in depth are very few.

One qualitative study showed that knowledge on puberty and reproductive physiology among Myanmar youths was good [4]. However, the reverse situation was found in other Myanmar studies using qualitative methods [5,6]. It was observed in 2004 Family and Youth Health Survey of Myanmar that adolescents have sexual and reproductive health information and aware of the issues; however, correctness and accuracy of knowledge was said not to be warranted of a high standard [7]. Within the frame of strong cultural norms against premarital sex in Myanmar, there is evidence that it is being practiced among adolescents [4,5,8,9]. One qualitative study showed that age of first sex took place between 16-20 years [6]. There is a need to further conduct research studies on adolescents' sexual and reproductive issues in Myanmar. This study was conducted with objectives of eliciting sexual behaviour

among 15-24 year-old never married adolescents residing in a peri-urban area of Yangon City; and determining their knowledge on reproductive physiology and anatomy, contraception and sexually transmitted infections, including HIV.

MATERIALS AND METHODS

A community-based cross-sectional analytic study, using both quantitative and qualitative methods was conducted in Dawbon Township, a typical peri-urban area in Yangon City, during the period from 20th July 2008 till 10th August 2008. Study population was all never married 15-24 year-olds of both sexes residing in the township.

Sample size calculation for quantitative component was based on anticipated proportion of the study population with the knowledge level of three practices (abstinence, being faithful to one partner and using condom) as regards HIV prevention of never married 15-24 year-olds as 50%, i.e., $p = 0.5$. Thus, $q = (1-p) = 0.5$. The significant level $\alpha = 0.05$, so $Z\alpha = 1.96$. Precision of the proportion estimated $d = 0.05$. The calculated minimum required sample size, using the formula $N = Z\alpha^2 pq/d^2$, was 384. Taking into the refusal rate to participate as 4-5%, the sample size was set at 400. Out of this, 200 female youths and 200 male youths of the targeted age group were included in the study.

Multi-stage cluster sampling was applied for quantitative survey. One of the 14 wards in the township (Bo Tun Zan ward) was chosen randomly. In the ward chosen, random selection of households with young people of the targeted age group was made till the required sample sizes were obtained. Quantitative data were collected using pre-tested face-to-face interview questionnaire.

Response to each knowledge question was rated as "0" score for incorrect answer and "1" score for correct answer. A total score

was summed and categorized as low, moderate or high level using the cut-off point of 1st and 3rd quartile.

Univariate analyses and multiple logistic regression analyses were conducted to examine social and demographic factors associated with overall knowledge score. Statistical Package for Social Science (SPSS) software programme (version 12.0, Chicago, IL, USA) was used for analyzing quantitative data. Multivariate models included the respondent's age group, sex, education, employment, family composition and brought up. STATA software, version 7, was used for the multivariate analyses.

Dimensional sampling for FGD was made basing on the two dimensions: sex, female and male; and age group, 15-19 and 20-24 years making four different combinations (female, 15-19 group; female, 20-24 group; male, 15-19 group; and male, 20-24 group). Since two FGD sessions were required for each dimensional combination, there were 8 FGD sessions. There were 7 participants in each group. In each FGD session, two participatory techniques were incorporated: body mapping and participatory sex census [10].

For qualitative data, FGDs with adolescents were transcribed and organized on the basis of emerging themes and sub-themes. Investigator of the study read over the transcripts to identify themes before organizing data. Matrix analysis was performed according to main themes and sub-themes. Atlas-ti software was used for analysing qualitative data.

The proposal was approved by the Ethics Committee of Defence Services Medical Academy.

RESULTS

Background characteristics of survey samples

Table 1 shows that mean age of sample population is 18.09 years (SD: 2.73), about

Table 1. Background characteristics of adolescents interviewed

Characteristics of adolescents	(N = 400) No. (%)	Range (Mean, SD)
<i>Age group (years)</i>		15-24 (18.09, 2.73)
15-19	278(69.5)	
20-24	122(30.5)	
<i>Sex</i>		
Male	200(50.0)	
Female	200(50.0)	
<i>Education</i>		
<i>Schooling</i>		
Never attended school	12(3.0)	
Ever schooling	229(57.2)	
Current schooling	159(39.8)	
<i>Highest standard attained</i>		
No formal schooling	12(3.0)	
Primary school	42(10.5)	
Middle school	86(21.5)	
High school and above	260(65.0)	
<i>Employment</i>		
Never employed in paid work	103(25.8)	
Ever employed in paid work and not currently working	94(23.5)	
Currently employed	203(50.8)	7-23
Age at first employment (in years)		(15.5, 2.93)
<i>Religion</i>		
Buddhist	357(89.2)	
Christian	5(1.2)	
Muslim	17(4.2)	
Hindu	21(5.2)	
<i>Family composition</i>		
<i>Living status of parents</i>		
Both parents alive	299(74.8)	
Father alive, mother not	22(5.5)	
Mother alive, father not	63(15.8)	
Both parents dead	16(4.0)	
<i>Parents living together</i>		
Parents living together	263(65.8)	
Parents not living together	36(9.0)	
Not relevant	101(25.2)	
<i>Living with someone at home</i>		
Living alone	25(6.2)	
Living with father	20(5.0)	
Living with mother	77(19.2)	
Living with both mother and father	195(48.8)	
Living with others	83(20.8)	
<i>Upbringing during past 15 years</i>		
By father	9(2.2)	
By mother	61(15.2)	
By both parents	231(57.8)	
By others	99(24.8)	

39.8% are currently school going, 65% have reached high school and above, 50.8% are currently employed, 89.2% are Buddhists, about 48.8% are living with both parents and 57.8% were brought up by both parents.

Knowledge on reproductive anatomy and physiology

It can be found in Table 2 that only 43.2% of the adolescents could answer in which female organ pregnancy takes place and that more females could give correct answer (statistically significant at $P < 0.01$). Majority of both males and females could not answer correctly where ovum is present, where sperm is present and duration of periods. More females could answer correctly on three issues relating to occurrence of pregnancy (after having sex for the first time; after having sex for only once; and having sex midway between two periods). The knowledge differences between males and females are statistically significant. Qualitative findings supported the quantitative findings.

Knowledge on contraceptive methods

Both quantitative and qualitative data showed that majority (343/400, i.e., 85.82% in quantitative data) of adolescents interviewed were aware of contraceptives. Among those adolescents who were aware, 91.0%, 65.0% and 50.7% knew pills, injections and condom respectively. Other methods like withdrawal and safe period were mentioned in qualitative data.

“When sperms are about to come out, pull out one’s male organ and ejaculate them outside” (20-year-old male interviewee)

“If you make sex during one week after menstruation, you will not get pregnant” (20-year-old female interviewee)

Knowledge on HIV

Both quantitative and qualitative data show high awareness (392/400, i.e., 98.0% in quantitative data) of HIV/AIDS among the adolescents interviewed. Table 3 shows that among those who were aware, majority of adolescents (over 50%) could identify the three modes of transmission (sexual intercourse, blood transfusion and sharing contaminated instruments) but few (8.7%) only could identify mother to child

Table 2. Adolescents' knowledge on specific issues of reproductive anatomy and physiology

Knowledge on specific issues of reproductive anatomy and physiology	Male n = 200 (%)	Female n = 200 (%)	Total n = 400 (%)
<i>In which female organ does pregnancy take place?</i>			
Correctly answered	65 (32)	108 (54.0)*	173 (43.2)
Incorrectly answered	33 (16.5)	42 (21.0)	75 (18.8)
Answered did not know	102 (51)	50 (25.0)	152 (38.0)
<i>Where is the ovum present?</i>			
Correctly answered	24 (12.0)	24 (12.0)	48 (12.0)
Incorrectly answered	39 (19.5)	44 (22.0)	83 (20.8)
Answered did not know	137 (68.5)	132 (66.0)	269 (67.2)
<i>Where is the sperm present?</i>			
Correctly answered	31 (15.5)	29 (14.5)	60 (15.0)
Incorrectly answered	52 (26.0)	36 (18.0)	88 (22.0)
Answered did not know	117 (58.5)	135 (67.5)	252 (63.0)
<i>How long do periods last?</i>			
Answered days correctly	11 (5.5)	39 (19.5)*	50 (12.5)
Incorrectly answered	124 (62.0)	161 (80.5)	285 (71.2)
Don't know	65 (32.5)	0 (0.0)	65 (16.2)
<i>A woman can pregnant on the very first time that she has sexual intercourse</i>			
True	94 (47.0)	118 (59.0)*	212 (53.0)
False	64 (32.0)	64 (32.0)	128 (32.0)
Don't know	42 (21.0)	18 (9.0)	60 (15.0)
<i>A woman can get pregnant if she has sex only once</i>			
True	86 (43.0)	119 (59.5)*	205 (51.2)
False	73 (36.5)	55 (27.5)	128 (32.0)
Don't know	41 (20.5)	26 (13.0)	67 (16.8)
<i>A woman is most likely to get pregnant if she has sexual intercourse halfway between her periods</i>			
True	86 (43.0)	119 (59.5)*	205 (51.2)
False	61 (30.5)	44 (22.0)	105 (26.2)
Don't know	53 (26.5)	37 (18.5)	90 (22.5)

*P<0.01

transmission. Regarding main methods of prevention, 50.8% and 68.9% of adolescents could answer abstinence and using condom

respectively. Only 12.5%, 29.8% and 41.3% respectively could answer being faithful to partner, safe blood transfusion and using disposable or sterile instruments.

Table 3. Adolescents' knowledge on specific issues of HIV

Knowledge on specific issues of HIV	Male n = 196 (%)	Female n = 196 (%)	Total n = 392 (%)
<i>Modes of HIV transmission answered^a:</i>			
Sexual intercourse	180 (91.8)	170 (86.7)	350 (89.3)
Blood transfusion	107 (54.6)	126 (64.3)**	233 (59.4)
Sharing contaminated instruments	107 (54.6)	108 (55.1)	215 (54.8)
From infected mother to child	12 (6.1)	22 (11.2)**	34 (8.7)
<i>Main methods of preventing HIV transmission answered^a:</i>			
Abstinence	100 (51.0)	99 (50.5)	199 (50.8)
Being faithful to each other's partner	20 (10.2)	29 (14.8)	49 (12.5)
Using condom	151 (77.0)	119 (60.7)*	270 (68.9)
Blood transfusion after screening	38 (19.4)	79 (40.3)*	117 (29.8)
Using disposable or sterile instruments	70 (35.7)	92 (46.9)**	162 (41.3)
Answering YES to the question: "Can a healthy-lookin person have HIV?"	120 (61.2)	150 (76.5)**	270 (68.9)
Answering YES to the question: "Can a person get HIV from being bitten by a mosquito which had bitten an HIV infected person?"	113 (57.7)	107 (54.6)	220 (56.1)
Answering YES to the question: "can a person get HIV by sharing a meal with someone who is infected?"	31 (15.8)	25 (12.8)	56 (14.3)
<i>Correct answers given for the following statements:</i>			
It is possible to cure AIDS	31 (15.8)	38 (19.4)	69 (17.6)
A person with HIV always looks very thin or unhealthy	105 (53.6)	109 (55.6)	214 (54.6)
People can take a simple test to find out whether they have HIV	104 (53.1)	84 (42.9)**	188 (48.0)

^aMultiple responses *P<0.01 **P<0.05 level

Knowledge on STI

Both quantitative and qualitative data show low awareness of sexually transmitted diseases other than HIV among the adolescents interviewed (160/400, i.e., 40% in quantitative data). Among those who were aware, discharge from penis, pain

during urination and ulcers/sores in genital area as symptoms of STI in men could only be answered correctly by 14.4%, 33.1% and 45.6% of interviewees respectively. As for vaginal discharge, pain during urination and ulcers/sores in genital area as symptoms of STI in women could only be answered correctly by 10.6%, 28.1% and 30.0% of interviewees respectively. Similar situation of low knowledge in STI was found in qualitative data.

“As the name indicates ... kar-la-thar yaw-gar ... it is a disease of males” (18-year-old female interviewee)

“If a man ejaculates sperm outside after making sex, there will be no transmission of kar-la-thar yaw-gar” (20-year-old female interviewee)

Sexual behavior

In this study, sexual relationship was referred to penetrative sex only. Twenty per cent of males admitted that they ever had had sex and only 2% of females made the admission. Mean age of first sex for both sex groups was 18 (SD: 2.67; range: 12-24), for males was 18.1 (SD: 2.68; range: 12-24) and that for females was 17.5 (SD: 2.89; range: 15-20). Majority of first sexual partners were boy/girl friends for both sexes, and commercial sex workers constituted about 43% for males. About 48% of males said they used condom at first sex and none of the females used condom.

Among those sexually active adolescents, only 47.5% of males and 50% of females said that they had had sex during last 12 months. Male adolescents had had their last sex with either a girl friend or a commercial sex worker, and female adolescents had had their last sex with a boy friend. Majority of them said they used a condom during their last sex. When asked for the reasons for using condom, majority of male interviewees (80%) said it was for prevention of infection, and female interviewees (100%) said it was for prevention of pregnancy.

In qualitative data both the males and females admitted the existence of sexual practices among young females of their own age groups. Males said the first sex among young people in their environment began at ages ranging from 13-20 and females said to range from 14-16.

Multivariate analysis

In analyses controlling for social and demographic characteristics, younger age group (15-19 years), male and those who have never attended school were more likely to have low knowledge score in sexual and reproductive health, including STI/HIV/

Table 4. Association between selected characteristics of adolescents and having low overall knowledge score in sexual and reproductive health knowledge

Characteristics	OR (95% CI)	Adjusted OR (95% CI)
<i>Age group (years)</i>		
15-19	2.07(1.31-3.26)**	2.23 (1.35-3.58)**
20-24	1.00	1.00
<i>Sex</i>		
Male	2.82(1.86-.26)***	2.87(1.84-4.46) ***
Female	1.00	1.00
<i>Education</i>		
Never attended school	4.57(1.19-17.54)*	5.25(1.12-24.57)*
Ever schooling	1.04(0.69-1.57)	1.30(0.81- 2.07)
Current schooling	1.00	1.00
No formal schooling	5.04(1.33-19.07)*	
Primary school	1.53 (0.79-2.94)	
Middle school	1.39 (0.85-2.28)	
High school and above	1.00	
<i>Employment</i>		
Never worked	0.99 (0.62-1.61)	
Ever worked but currently not	0.77 (0.46-1.27)	
Currently working	1	
<i>Family composition</i>		
Living with father	2.10 (0.61-7.27)	
Living with mother	1.31 (0.49-3.54)	
Living with both parents	2.20 (0.88-5.52)	
Living with others	1.70 (0.64-4.51)	
Living alone	1	
<i>Brought up</i>		
By father	1.64 (0.43-6.26)	
By mother	0.85 (0.48-1.51)	
By others	0.75 (0.46-1.22)	
By both parents	1	

*p<0.05; **p<0.01; ***p<0.001

AIDS (adjusted odds ratio 2.23, 2.87 and 5.25 respectively - Table 4). Regarding family composition, those living with mother only were less likely to have low knowledge score (odds ratio 0.45 - Table 4).

DISCUSSION

The situation found in this study is that adolescents have substantial gaps in knowledge relating to reproductive anatomy and physiology. Majority of adolescents could not answer in which female organ pregnancy takes place, where ovum is present, where sperm is present and duration of periods. About 50% of them could not correctly answer whether a woman can pregnant on the very first time of sexual intercourse, if she has sex only once and whether she will get pregnant if sexual intercourse takes place half way between her periods.

A similar finding was found in a Ghanaian study [11] where only 17% of male and female adolescents could correctly indicate when during the menstrual cycle pregnancy is most likely to occur and one-third of them did not know that it is possible for a woman to get pregnant the first time she has sex. The findings also matched with the findings of another Myanmar study in which was shown that more than two-thirds of young people do not have correct knowledge about reproductive physiology [7].

It can be considered a natural process to observe older adolescents and adolescents with higher educational level having higher knowledge in sexual and reproductive health. However, it is quite interesting to observe females having higher knowledge level in these issues.

Contraceptive knowledge level could be considered not so low among adolescents in the study area. In a study in Ghana, nearly all respondents (95%) claimed awareness of at least one way to avoid pregnancy and

virtually all respondents (99%) stated they knew about condoms [11].

In this Dawbon study, like in the case of that for contraceptive, awareness of HIV is very high among 98% of adolescents interviewed and it is a good news. Similar finding has also been reported in an African study [12]. It is to be noted that awareness is a rough measure of knowledge as it provides no identification of depth of knowledge. The level of awareness may be high and at the same time actual knowledge may be superficial [13, 14].

Evidence from a study [12] shows that although awareness of HIV is very high among young adolescents (12-14 years), indepth knowledge about HIV transmission and prevention is very low. In case of Dawbon study, majority of the adolescents interviewed could mention sexual intercourse (89.3% of interviewees), blood transfusion (59.4%), and sharing contaminated instruments (54.8%) as modes of HIV transmission. Only few (8.7%) had knowledge of HIV spread through mother to child.

Regarding prevention of HIV transmission, 68.9% of adolescents answered to use condom. Very few (12.5%) answered to be faithful to partner. The findings also indicate that there are misconceptions among adolescents as regard HIV.

It is found in Dawbon study that only 40% of adolescents interviewed were aware of STIs other than HIV. The study findings indicate that widespread ignorance about STI needs to be addressed in the adolescent health programme of Myanmar, especially for those adolescents in peri-urban areas.

As an overall, adolescents in older age group and those in higher education group have statistically significantly higher levels of knowledge in sexual and reproductive health including STI and HIV. This points to focus more on younger adolescents and adolescents with lower education in

providing education on sexual and reproductive health, including STI and HIV. Both the qualitative and quantitative data depict a picture of a population in which pre-marital sexual activity is common in the study area. Although information on sexual practices is reportedly often difficult to obtain, some of the participants in this study appeared relatively open in their responses to sensitive questions.

In a study in Ghana, 52% of adolescents studied had ever had sexual intercourse and young women were more likely to than young men to be sexually experienced (56% vs. 48%) [11]. The same study indicated that nearly one-third of all respondents reported having had at least one sexual partner in the past 30 days and among them, about 60% said they used condom.

Sexual intercourse is commonly initiated during adolescence [15]. Early initiation of sexual intercourse has been linked to increased risk of STIs and pregnancy during adolescence [16]. Early initiation of sexual intercourse is often used as an indicator of risky sexual behavior, and many interventions are designed to delay sexual activity, such as programmes encouraging virginity pledges and delivering abstinence education [17, 18].

CONCLUSION

The integration of participatory research methods with conventional form of quantitative data collection in Dawbon study produced an interesting combination of complementary information regarding sexual and reproductive health knowledge and sexual practice among peri-urban adolescents. The data presented in the findings of this study highlight several general sexual and reproductive health issues facing adolescents in a peri-urban area of Yangon City. The key findings of this study point out that efforts are still needed to educate adolescents about reproductive anatomy and physiology, and

STIs and the modes of transmission and their signs and symptoms. Pre-marital sex is common among the peri-urban adolescents and initiation takes place early. High awareness of contraceptive and high levels of HIV knowledge are encouraging findings. However, safe sex practice could not be elucidated convincingly because of low reporting.

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**Risk factors for overweight and obese middle school children
in Dagon Township, Yangon Division**

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The school-based, cross-sectional study was conducted during July-October 2008, to identify risk factors associated with overweight and obesity among middle school children in Dagon Township, Yangon Division. Three hundred students (150 males and 150 females) from a randomly selected school participated in this study. About 77% of students were within normal BMI for age, 13.7% were overweight and 9.3% of these students were obese. By the binary logistic regression analysis, family history of obesity, low level of maternal education, eating snacks and others rather than rice and curry at lunch time, playing less than 3 days per week and playing less than 60 minutes per day were found to have statistically significant association with overweight/obesity.

INTRODUCTION

According to the World Health Organization (WHO), childhood obesity is one of the most serious public health challenges of 21st century. The problem is global and it is steadily affecting many low- and middle-income countries, particularly in urban settings. The prevalence has increased at alarming rate, and in 2007 an estimation was made that 22 million children under the age of 5 years were overweight throughout the world. More than 75 percent of overweight and obese children live in low- and middle-income countries. Moreover overweight have epidemic proportions on a world scale. The prevalence of overweight and obesity among adults is increasing in high-income, as well as in low- and intermediate-income countries [1].

Obesity is considered a global epidemic because its prevalence and severity in both adults and children are increasing worldwide at an alarming rate. This increase has been related to highly sedentary lifestyle with less physical activity as well as changing dietary habits, and it occurs not only in developed countries, but also in

developing countries and in countries with economic transition. Myanmar is also undergoing economic development leading to nutrition transition and rapid changes in dietary habits and lifestyle. It may result in creating opportunities for rising levels of childhood obesity. In one Myanmar study it was found that the prevalence of overweight and obesity in 10-19 years old school going adolescents in Yangon was 4.8% (2.1% in boys and 2.7% in girls) [2]. Studies related to obesity are scarcely reported in Myanmar and it has only a few data regarding obesity of its people. Moreover, most of the nutritional surveys were targeted to mothers and children whereas research for adolescents, especially for overweight and obesity was still limited.

The study was conducted with the objectives of identifying the proportion of overweight and obesity in middle school children and risk factors associated with overweight and obesity in those school children.

MATERIALS AND METHODS

A school-based cross-sectional study was conducted from July to October 2008.

To fulfill the objectives, sample size was calculated as follows:

Using the global prevalence of the adolescent obesity (20%), (p) = 0.2

Sample size was determined using formula $n = Z^2 (1-p)/d^2$

Where,

- n = the desire sample size
- z = the standard normal deviate, usually set at 1.96, which corresponds 95% CI
- p = proportion of expected overweight and obese children = 0.2
- q = 0.8 (1-0.2)
- d = absolute precision set at (0.05)²

Therefore,

$$n = (1.96)^2 \times (0.2) \times (0.8) / (0.05)^2$$

$$= 245.86$$

$$= 246$$

Taking into consideration of possible refusal rate of 20%, sample size of 300 (with 150 males and 150 females) was taken.

Multi stage sampling method was applied which involved as follows:

Out of the six downtown areas, Dagon was selected as judgmental sampling. Assuming it as a representative area of modernized urban setting, we can see significant changes in socioeconomic status and life styles of middle school children residing in it. Out of 3 high schools and 3 middle schools in Dagon Township, Basic Education Middle School No (1) was randomly selected.

The next sampling unit was a class. All classes were listed to get a sampling frame. Each class was given a number and fifteen classes were selected randomly. A final list of middle school students from the selected classes were made for next stage sampling. The school children from each chosen classes were listed to get a sampling frame. Each student was given a number and ten numbers of male students and ten numbers of female students were randomly selected using a table of random number to obtain 20 students from each of fifteen class. A consecutive of classes with middle school children was taken in all the classes until the required sample size was met.

Informed written consents were obtained from each selected students. Weight and height of the selected school children were measured by using the bath room weighing scale and stadiometer respectively by either a trained male or female measurer or by the investigator. Calculation of body mass index (Kg in body weight/m² in height) was carried out. Body mass index for age percentile for girls and boys were classified as normal, overweight and obese, according to the growth chart, developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000) [3].

To assess the associating factors, all of the selected children were interviewed and recorded using structured questionnaire. Family history of obesity, education of parents, routine dietary patterns and physical activities at home and school of participants were included in the structured questionnaire. The ages of the student were assessed by examining personal data taken from school enrollment.

RESULTS

Figure 1 shows that majority of the school children (77%) are found to be normal BMI for age ($\geq 3^{\text{rd}}$ -85th percentile). Students with overweight (>85th-95th percentile) are 13.7% and 9.3% of students are obese (>95th percentile).

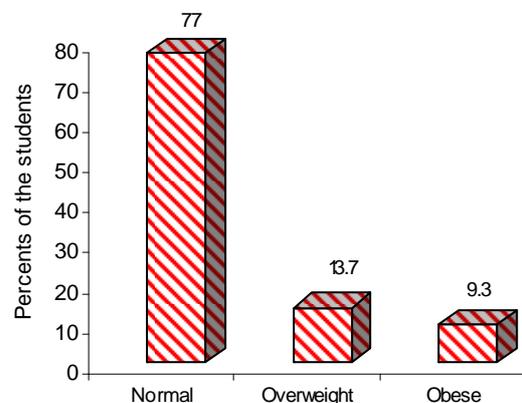


Fig 1. Distribution of BMI-for-age of the study population

Table 1 shows the associated risk factors for overweight and obesity of the study population. Family history of overweight and obesity are commoner in overweight/obese students than that of students with normal weight (26.8% vs 9.6% for overweight and 25.3% vs 4.4% for obesity, $p<0.01$). In the families of overweight/obese students, their parents are significantly obese than other relatives (31.8% vs 16.6%, $p<0.05$). Lower maternal education is found significantly in obese students than in students with normal weight (19.1% vs 7.5%. $p<0.05$).

Table 1. Associated risk factors for overweight and obesity of the study population

	BMI for age			Total No. (%)
	Normal No. (%)	Over weight No. (%)	Obese No. (%)	
Sex				
Male	113 (75.3)	22(14.7)	15 (10.0)	150 (100)
Female	118(78.7)	19(12.7)	14 (9.3)	150 (100)
History of obesity in family				
Yes	34(47.9)	19(26.8)	18 (25.3)	71 (100)*
No	197(86.0)	22(9.6)	10 (4.4)	229 (100)
Obese person in				
Parents	14(34.1)	14(34.1)	13 (31.8)	41(100)**
Relatives	20(66.7)	5(16.7)	5 (16.6)	30 (100)
Education of mother				
Low	31(66.0)	7(14.9)	9 (19.1)	47 (100)**
High	200(79.1)	34(13.4)	19 (7.5)	253 (100)
Lunch pattern				
Snack and others	59 (62.1)	22(23.2)	14 (14.7)	95 (100)*
Rice and curry	172(83.9)	19(9.3)	14(6.8)	205 (100)
Play at home per week				
<=3days	148(71.5)	36(17.4)	23 (11.1)	207 (100)*
>=4days	83(89.2)	5(5.4)	5(5.4)	93(100)
Duration of playing at home				
<60 mins	197(74.6)	40(15.2)	27(10.2)	264(100)**
=>60 mins	34(94.4)	1(2.8)	1(2.8)	36(100)
Duration of studying school lessons per day				
<60 mins	89(86.4)	9(8.7)	5(4.9)	103(100)**
=>60 mins	142(72.1)	32(16.2)	23(11.7)	197(100)

* $p<0.01$ ** $p<0.05$

Regarding the dietary habits, overweight and obese students had snacks and others rather than rice and curry than students with normal weight (23.2% vs 9.3% for overweight and 14.7% vs 6.8% for obesity, $p<0.05$). There are no significant differences between

having of oily meals, fast foods and free sugar of overweight/obese students and those of students with normal weight. Data are not shown.

Regarding the physical activities, the students who play ≤ 3 days per week and <60 minutes in most days of the weeks at home are significantly overweight and obese than those who had less playing times ($p<0.01$ and $p<0.05$, respectively). Overweight/obesity is significantly found in the students who study the school lessons one hour per day than those who studied shorter times. Durations of playing television or computer games and watching television are not significantly different between overweight/obese students and students with normal weight. Data are not shown.

Table 2. Odds ratios of associated risk factors for overweight/obesity of the study population

Risk factor (N = 300)	Odds Ratio (95% CI)	p level
Presence of obese person in family	5.768 (3.010-11.055)	0.000
Low level of maternal education	2.361 (1.052-5.295)	0.012
Eating fast foods and snacks rather than rice at lunch time	3.369 (1.769-6.417)	0.000
Low frequency of playing at home (less than 3 days per week)	5.749 (1.249-26.451)	0.002
Shorter duration of playing at home (less than 60 minutes)	3.233 (1.440-7.261)	0.015

According to binary logistic regression (Table 2), the students who have family history of obesity and eat fast food and snack rather than rice and curry at lunch times have 5.8 times and 3.4 times more likely to have overweight and obesity. There are 2.4, 5.7, and 3.2 times more likely to develop overweight and obesity in students who have lower maternal education, shorter duration of playing at home.

DISCUSSION

Studies on overweight and obesity are important not only for prevention of diseases but also for promotion of good

health. Developing healthy life styles by having sound nutritional knowledge among school-age children will raise the physical growth and mental well-being and it is more likely that these habits will be maintained for whole life.

Out of 300 students, 77% of students were normal BMI-for-age, 13.7% of students were overweight (more than 85th percentiles for age) and 9.3% were obese (more than 95th percentiles for age). The findings are similar to the findings of studies performed elsewhere [4, 5]. A study in Canada among school children revealed that 16.65% were overweight and 11.8% were obese [4] and a study in Myanmar found that prevalence of overweight and obesity was 14.7% and 10.3% respectively among school children [3]. Our result is comparable to that of Thailand where the prevalence of obesity was 12.2% in 1991 to 15.6% in 1993 [3].

In this study, there is no association between sex and overweight/obesity of the children. This finding is similar with that of studies in Canada and Italy [6, 7]. However, a study in Brazil showed that the prevalence of overweight and obesity in girls was higher than that in boys (22.9% vs 21.1% respectively) [8].

Association had been found between family history of obesity and overweight/obesity of children in our study and is similar with that of a study in Kuwait [9]. Our finding of association of low level of maternal education with overweight/obesity of the children is similar to that of studies done in Brazil [8] and in Mexico [10].

In our study statistically significant association is found between lunch pattern and overweight/obesity. In a study in Thailand it was found that higher frequency of meals, higher frequency of consume snack and higher frequency of fried food consumption had statistically significant association with obesity status [11] for prevention of overweight/ obesity.

Physical activity is one of the influencing factors for development of obesity. American

Medical Association recommended at least 30 minutes for adults and 60 minutes for children of moderate physical activity in most days of week and to reduce the amount of time spent in sedentary activities to less than 2 hours a day status [12].

Regarding the physical activity, a significant association was found between habit of playing and duration of playing with overweight/obesity in children. This finding is similar to the finding of a study in Canada status [13]. However, the study in Kuwait showed no association with physical activity of 6-13 years children with overweight/ obesity status [9].

We conclude that the findings in our study regarding presence of family history of obesity, low level of maternal education, eating snacks and others rather than rice at lunch time, playing less than 3 days per week and playing less than 60 minutes at home as risk factors for overweight and obesity among school children are to be considered as areas for interventions to be undertaken to prevent obesity among school children.

It is important that, the actions undertaken should be intensified at all levels. Improvement in education levels of parents may promote the nutritional knowledge of their children. Children and adolescents also need information, skills, access to health services, safe and supportive environment to get normal growth. Their nutritional knowledge, perception and eating pattern may stand on one point for possession of healthy life. Childcare providers, especially parents and teachers should review and apply methods to create healthy life styles of children. Therefore, parents, teachers and health authorities should interact to communicate and collaborate to reduce prevalence of obesity and its health problems.

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SHORT REPORT

**Participatory assessment of risk behaviours for avian influenza
in a rural community**

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The World Health Organization (WHO) considers the avian influenza A/H5N1 virus a public health risk with pandemic potential. Since the first documented outbreak in humans in Hong Kong in 1997, the numbers of both affected countries and confirmed cases of influenza A (H5N1) virus infection have increased. The rationale for particular concern about the H5N1 pandemic is not its inevitability, but its potential severity, one which would have high human health impact posing a predicament for public health [1].

Studies done to reveal evidence of risk factors/ behaviours influencing transmission of influenza A H5N1 suggest that handling diseased poultry is an important risk factor and some animal handling practices may modify the risk for transmission [2,3,4] highlighting the value for identifying risk factors as regards poultry farming behaviours.

A participatory assessment of risk behaviours for avian influenza was performed at WaNetChaung village in Hmawbi Township, Yangon Division during April 2008. The village was chosen because of existence of poultry farms, both large and small scales. This is a preliminary report of the qualitative component of the pre-test for performing a larger scale study in a similar setting somewhere else in Myanmar. The methodology used was as follows.

#Hlaing Myat Thu and #Ohnmar contributed equally to this study and are joint first authors.

Social mapping

This technique was incorporated in the informal group interview. Participants of each informal group interview participated in drawing a social map of their village and in each map they identified poultry farms that existed in their village.

Focus Group Discussion (FGD)

Two FGD sessions were conducted with villagers who possessed poultry farms in each village. There were 8 participants in each FGD session. The issues for inquiry included keeping and caring poultry farms; slaughtering/ eating/ selling poultries; and perceptions on acquiring infections from poultries.

Unstructured observation of poultry farms

Findings indicated that majority of households breed poultry, from small scale (i.e., 1-2) to large scale (i.e., in thousands). All the small scale owners (backyard poultry raising) allowed free movement of the poultry, even into their houses. Larger scale owners confined their poultry in cages. Some families did not breed chicken but kept poultry, purchased from different sources of owners, overnight in their houses for sale the next day. These poultry, after being tied in bunches of 10-12, were carried to the market either by bicycles or by public transport, without any protection.

Slaughtering, either for commercial purpose or for serving guests, took place at houses

within the village. No personal protective measures (for example, wearing of masks or gloves) were made during the process of slaughtering. The chopping wood was not washed after each individual slaughtering.

When poultry was found to be sick, disposal of it was made either by selling it quickly or by eating it. After slaughtering and de-feathering, all the feathers were thrown into a stream near the village which is dried-up during the hot season. Thus, feathers were easily carried by wind from the stream to many parts of the village. Among the large farms, it was observed that dead chickens were buried in a designated place. But, even in those large commercial farms, the process of handling dead chickens was without any personal protection.

Commercial scale owners sold chicken manure for use as fertilizer. In this endeavour, large masses of chicken manure were packed in bags for selling and during this process there was no personal protection of any kind. Local villagers were aware of avian influenza because of the

news they heard about its outbreak at a locality within their township where mass killing of poultry was performed. However, they lacked details of the knowledge as regards details of prevention of transmission. They perceived that any disease occurring in pigs would only affect pigs and as such for chicken. Thus, mixed breeding of chickens and pigs was not uncommon.

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SHORT REPORT

Social mapping: a participatory tool to target vulnerable groups for prevention of malaria transmission

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Visual representation of the residential area showing locations of housing settlements and social infrastructures like roads, schools, health centers, worshipping places, etc, is referred to as a social map [1, 2]. It is one of the participatory learning and action tools which are most commonly used with the aim of empowering people and addressing equity issues through community development projects.

Through effective facilitation by a researcher-cum-facilitator, social mapping provides researchers with information about the physical characteristics of the community, the socioeconomic conditions and the perceptions of participants towards their community. The maps are drawn by a group of villagers either on the ground using chalk or on a large sheet of paper. The final map is then recorded by the research team to use in subsequent discussions. Although social mapping is not an uncommon technique used in participatory research, its use by Myanmar researchers is quite limited.

In one Myanmar research, social mapping was applied to identify households possessing tube wells and sanitary pit latrines [3]. There was only one house having a tube well and a sanitary pit latrine. There was one house having a tube well, and two houses having sanitary pit latrines. The primary school had no latrine and no safe water supply. There were one sanitary pit latrine and one tube well at the monas-

tery. This social map was kept at the monastery and used as a motivational tool by indicating in social maps drawn in later years showing how the latrine and tube well situations improved in the village following a development project implemented by an NGO. In this study, social mapping was used as a monitoring tool and at the same time a motivational tool for the villagers.

Another Myanmar study used social map to identify social groups in a village [4]. The social grouping (there were three) was based on the job categories categorized by the villagers. Then, local people were requested to select participants for Focus Group Discussion (FGD) from households that fall into lower social group identified in the map. Researchers made sure that the participants were chosen from all the different corners of the village.

In another Myanmar research, social mapping was used in identifying loopholes in geographical accessibility of Red Cross Volunteers in providing health education relating to three major diseases (HIV/AIDS, malaria and TB) [5]. Following identification, discussions were made among local stakeholders as regards further improvement of the services being provided by the volunteers.

In our case study on targeting vulnerable groups for prevention of malaria transmission, we first selected In-Thar village in PyinOoLwin Township where there is no malaria transmission. However, according

to data of a local health center, there are malaria cases coming from the village. In the west about 2 miles from the village, there exists a forest where malaria transmission takes place among villagers who stayed overnight there. After visiting the village, we performed informal group discussion with representatives of local people, involving both men and women, on identification of social groups basing on different job categories.

Three social groups were categorized by local people: lower, middle and higher. The main job of the villagers was related to flower gardening, particularly gladiolus (*thit-sar* flower) and aster (*may-myo* flower). Those who owned larger acres of gardens (5 acres and above) belong to higher social group. Some of these families own resident-cum-shops and some own buying centers of flowers. Families in lower social group own no garden and most of their family members work as daily wage earners at the flower gardens owned by other social groups. Some of the villagers went to the forest nearby staying there overnight and engaging in nurturing gladiolus plantations, making charcoal or cutting bamboo. They stayed at temporary huts during these night halts.

Then, the participants were requested to draw a social map of their village. On completion of the social map, the participants were requested to indicate households where families of lower social group resided encircling them with a red soft pen. Out of a total of 75 households, 11 belonged to lower social group, 55 belonged to middle social group and 9 belonged to higher social group. Then the participants were told to give cross (X) markings on households where family members engaged in going to forests and staying there overnight.

The final social map (Fig. 1) shows households to be targeted reduction of malaria risks. The social map indicates that majority

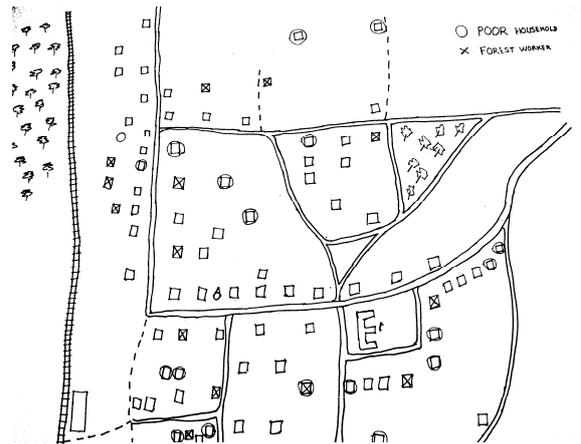


Fig. 1. Social map showing households with risks of acquiring malaria

Note: Households circled belong to families from lower social group. Households with cross (X) marks belong to families that go and work in the forest and stay there overnight.

of the families of middle social group and to a lesser extent of those from lower social group were engaged in activities which necessitated them to stay overnight in the forests. Those from middle social group, owning less acre of fertile land for nurturing gladiolus, had to depend on the nearby forest for this purpose after clearing some trees. Families from this group were involved in making charcoals in the forest. Some of them owned bullock carts and cows to carry bamboos after cutting in the forest and were thus involved in bamboo cutting on a large scale. Few of the family members from lower social group might work as wage earners in these economic activities in the forest but all might not stay overnights.

The participants were then asked to identify factors that made their villagers suffer from malaria. Whatever they answered was noted. Then, the way they could acquire malaria was explained emphasizing on mosquito bite that could take place during night times when they

slept without any protection. Next, the participants were asked to indicate in the social map the households whose members were vulnerable to malaria transmission in the forests. The participants were explained that these were the households for distributing insecticide treated bed nets for preventing malaria transmission in the forest.

This is a preliminary report of social mapping component of the pre-test made for a case study, using participatory learning and action (PLA) approaches, to be conducted on a larger scale by Department of Medical Research (Upper Myanmar).

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