SHORT REPORT

ENHANCING KNOWLEDGE AND AWARENESS OF DENGUE DURING A PROSPECTIVE STUDY OF DENGUE FEVER

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Abstract. In 1992, the Indonesian CDC implemented strategies to control and prevent dengue fever (DF) by including community involvement to reduce larva breeding sites and a mass health education program. To contribute to this effort, we incorporated an educational component into a prospective study of DF conducted at two textile factories in Bandung. This education provided: a lecture on the signs and symptoms of dengue and ways to prevent the disease, posters in the health clinic at each factory and handouts given to each volunteer with an explanation of symptoms. Upon enrollment, each participant completed a questionnaire to gather demographic information. Additionally they were given a brief (non-standardized) test (PRE-test) of their dengue knowledge, which was verbally administered by the study physicians. Five questions (15 point system) were designed to assess the participant's ability to recognize and describe aspects of dengue in lay terms. The subject material included: the symptoms of acute DF, transmission of dengue virus, and basic steps for disease prevention. The same questionnaire was re-administered 18 months later (POST-test), and the results were compared. A total of 2,340 participants completed both the PRE- and POST-tests; there were 1,373 males and 967 females, median age 36 years (range 18-59). Only 0.3% of participants scored EXCELLENT (15-14 points) on the PRE-test whereas 8.4% scored EXCELLENT on the POST-test. Fewer participants scored VERY BAD (2-0 points) on the POST-test compared to the PRE-test (1.4% *vs* 4.0%). The average raw scores for the PRE- and POST-tests were 7.8 and 10.1, respectively. Improvement of individual scores correlated highly with educational level. No significant correlation was identified for gender, age, factory location or a diagnosis of dengue during the study. These findings demonstrate that our prospective study enhanced knowledge and awareness of dengue in the volunteers.

INTRODUCTION

Dengue fever (DF) and dengue hemorrhagic fever (DHF) continue to cause thousands of deaths and morbidity annually. In many Asian countries, severe disease affects children the greatest while milder cases typically occur among adults. Although dengue illness in adults is often mild or unapparent, the disease burden may significantly impact economic growth and productivity. The average dengue illness may require up to 7-10 days of convalescence prior to the individual's returning to work. Many cases can cause even more prolonged illness requiring several weeks convalescence. During epidemic years, the financial impact can be quite substantial, especially in developing countries such as Indonesia.

The role of community education programs is well recognized by health officials as an important factor in efforts to control and prevent dengue illness. The Indonesian Ministry of Health Communicable Diseases Center (CDC), in conjunction with the WHO, has established a mass health education campaign along with programs to reduce larva-breeding sites. The campaign pri-

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marily conveys messages to cover, empty/clean water containers ('*3M's*' in Indonesian language) or discard unused containers or other items that may fill with water, which may become selective breeding sites for *Aedes* mosquito larvae. Few evaluations of the impact of health education or community messages have been conducted in Indonesia. Public health education programs in other countries have clearly demonstrated success in increasing awareness of the disease and its transmission (Llyod *et al*, 1992; Espinoza-Gomez *et al*, 2002; Madeira *et al*, 2002). To contribute to the Indonesian CDC's program of increasing awareness to combat and prevent dengue infection, we incorporated an educational component into our prospective study of DF and DHF among adults at two textile factories in Bandung, West Java. Although our study budget did not allow for a comprehensive public health educational program, we desired to provide this benefit to the participants while accomplishing the primary objective of improving our understanding of dengue infections among adults. This report briefly summarizes the findings of our efforts.

MATERIALS AND METHODS

In August 2000, a prospective study of DF and DHF in adults was initiated at two textile factories (Grandtex and Naintex) in Bandung, a large urban city on the island of Java, Indonesia. During enrollment, demographic information was collected from all participants (n=2,536) and a verbal PRE-test (non-standardized) of dengue knowledge was administered in the Indonesian language (Fig 1). The study investigators designed this brief dengue knowledge assessment test in lay terms consisting of five questions to assess each participant's basic knowledge of symptoms of dengue infection, transmission of dengue virus, and methods for the prevention of dengue illness. An arbitrary scoring system (maximum 15 points) was designed to provide grades as shown in Fig 1. Shortly thereafter, a baseline edu-

Dengue knowledge

Symptoms (Max point 5)

1. What are the symptoms of patients who suffer from dengue hemorrhagic fever?
   - fever 1 point
   - body aches/headache 1 point
   - red spot on the skin 1 point
   - bleeding from nose or gum etc 1 point
   - other symptoms (see below)[a] 1 point

Transmission (Max point 5)

2. How is this disease transmitted?[b]
   1. by *Aedes* mosquito(2) 2. by Mosquito(1) 3. No idea(0)
3. When does this mosquito usually bite?
   1. in the morning and afternoon(2) 2. in the morning(1)
   3. in the afternoon(1) 5. at night(0) 4. no idea(0)
4. Where is the mosquito's breeding place?
   1. clear water(1) 2. dirty water(0) 3. rice terrace(0) 4. no idea(0)

Prevention (Max point 5)

5. What prevention steps need to be taken to avoid this disease?
   - Spray the mosquitos (fogging) 1 point
   - Put abate powder in the water 1 point
   - Bury unused cans, etc 1 point
   - Wash water containers 1 point
   - Close water containers 1 point

[a]acceptable answers : stomachache, fatigue, nausea, vomiting, shock
[b]only answer # 1 or 2 is correct

Grading system

Grade	Score
Excellent	15-14
Very Good	13-12
Good	11-9
Fair	8-6
Bad	5-3
Very Bad	2-0

Fig 1–Dengue knowledge assessment test.

cational program was developed to provide general dengue information to the cohort. This included a didactic lecture taught by the study physicians, printed informational handouts, and posters printed by the Indonesian CDC which were displayed at or near each factory occupational health clinic throughout the duration of the prospective study. The same verbal dengue knowledge assessment test (POST-test) was re-administered 18 months later (February 2002) and compared with the results of the PRE-test. Data were evaluated descriptively and analyzed using non-parametric statistical analyses.

The Institutional Review Boards of the US NAMRU-2 and the Indonesian National Institute of Health Research and Development approved the prospective study and verbal questionnaires (DoD#30855). All participants granted informed, written consent prior to their enrollment.

RESULTS

A total of 2,340 participants in the cohort completed both the PRE and POST dengue knowledge assessment tests. There were 1,373 males and 967 females at the two factories combined; the mean age of workers was 36.2 years (range 18-59). A summary of responses is shown in Fig 2. The average raw scores for the PRE and POST-tests were 7.8 and 10.1, respectively. The majority scored FAIR (39.9%) or GOOD (38.4%) on the PRE-tests. However, the average grade shifted to GOOD (42.5%) or VERY GOOD (23.8%) for the POST-testing. Only 0.3% of participants scored EXCELLENT (15-14 points) on the PRE-test whereas 8.4% scored EXCELLENT on the POST-test. Fewer participants scored VERY BAD (2-0 points) on the POST-test compared to the PRE-test (1.4% *vs* 4.0%). Improvement of individual scores correlated highly with educational level (Pearson rank correlation=0.389, significant at 0.01 level, 2-tailed). Factory workers with college education scored higher on average than those with high school, secondary and primary school education (Table 1). No significant correlation was identified for gender, age, factory location or a diagnosis of dengue during the prospective study.

In question-specific analysis, interesting trends were found. At PRE- and POST-testing, most workers knew that fever and petechiae were symptoms of dengue illness (85.4%, 96.2%, re-

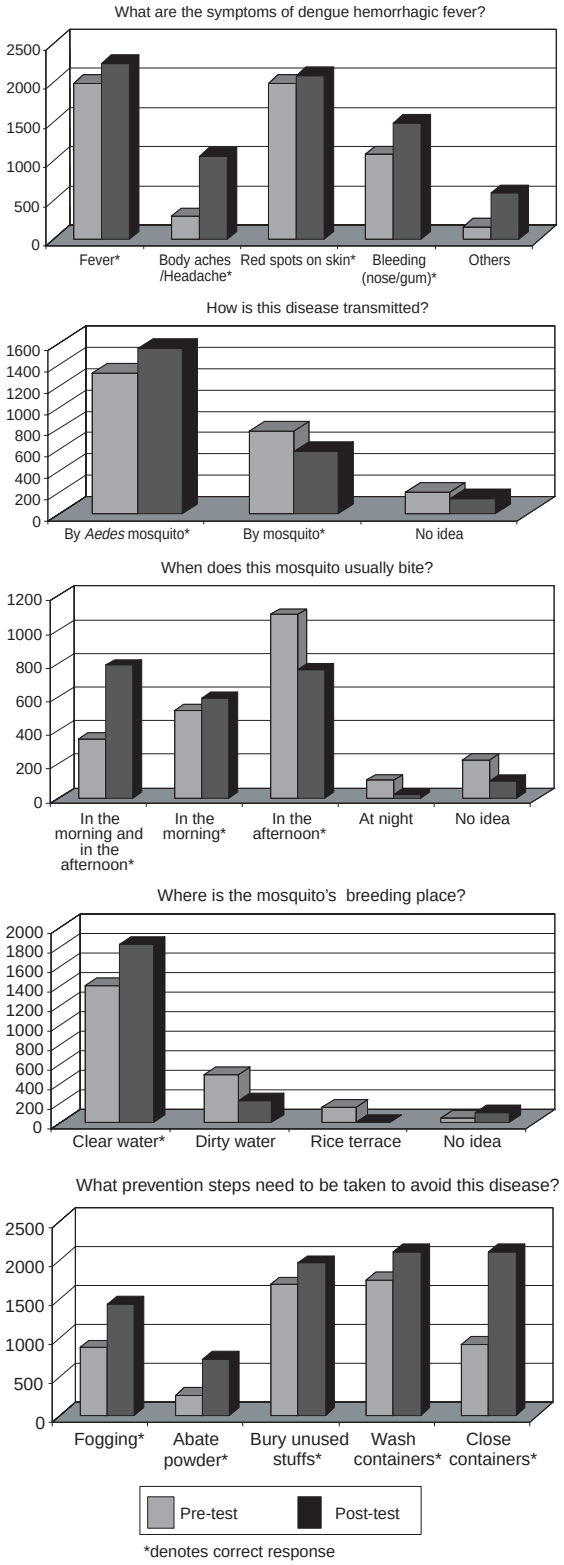

Fig 2–Results of dengue knowledge assessment test.

Table 1
Comparison of dengue knowledge assessment test scores (pre and post) versus educational level.

	Mean raw scores		p-value
	PRE-test	POST-test	
Primary	6.27	8.90	<0.001
Secondary	7.38	9.67	<0.001
High	8.30	10.51	<0.001
College	8.96	11.35	<0.001
Total	7.77	10.08	<0.001

spectively), but very few (12.6%, 295) related body aches/headache as a symptom on the PRE-test compared to 45.6% (1,066) on the POST-test. Bleeding from the nose or gums was also not a well-known symptom at baseline (46.6%). During both the PRE/POST-tests, the preferred answer for the method of disease transmission was by '*Aedes* mosquito' versus 'mosquito'. Only 4.6% (108) answered incorrectly that *Aedes aegypti* bite at night while most (78%, 1,831) answered correctly that the mosquito's breeding place is in clear water. The final question relating to vector control measures included 5 theoretically correct sub-answers of which three are contained in the *3M* educational messages: bury, wash, and close containers. Responses were evenly distributed among these three answers. Surprisingly at PRE-testing, the use of Abate® powder and fogging were not thought to be adequate prevention techniques even though many communities are made aware of the use of these methods to control outbreaks via the publicity it raises. These findings demonstrate that our prospective study enhanced knowledge and awareness of dengue in the study participants.

DISCUSSION

The educational program provided during our prospective study appeared to enhance the knowledge and awareness of dengue among the study participants, as assessed by our verbal knowledge test. The most notable finding was that test performance correlated highly with educational level, albeit there was significant POST-test improvement at all educational levels. No significant correlation was identified between test scores and age, factory location or gender.

In a prior study, gender and age differences had been recognized as a determinant factor on knowledge of DF and DHF, for example housewives tended to have a better baseline dengue knowledge and elderly individuals tended to be less knowledgeable (van Benth *et al*, 2002). Perhaps this was not observed in our cohort since the women surveyed were in the workforce versus being homemakers, and the extreme elderly were not surveyed (maximum age, 59 years). Admittedly, our assessment methods may have been limited and were not intended to provide a stringent assessment of the Indonesia CDC's overall mass health education program for the country. However, our cohort of textile workers provides a representative sampling of a segment of the population in the city of Bandung. Baseline educational skills and targeted health education should be considered key factors in developing knowledge and awareness of dengue and possibly other vector-borne diseases.

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