Health Behavior and Health Status of Adults in Rural Areas of Sumbawa Prefecture, West Nusa Tenggara Province, Indonesia

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The aim of the current study was to clarify the general situation of health behavior and health status of adults in rural areas of Sumbawa Prefecture, West Nusa Tenggara Province, Indonesia, and to assess the indirect influence of development assistance. The participants consisted of 200 inhabitants from two villages, with a total of 100 men and 100 women. One village, Maronge, had benefited from a development assistance project and the other, Lesen, served as the control area. A structured interview survey was carried out. The questionnaire included 61 items such as demography, economic status, health-related lifestyle, sanitary conditions, involvement of health-related community activities, health care-seeking behavior, dietary habits, and health status. Forty seven of these were analysed for the study.

Adults in rural areas may have a healthy lifestyle. For example, they may exercise regularly, eat breakfast every day, and have a normal body weight. However, they might have diseases that do not appear in health statistics, such as silu. Significant differences were observed in economic status, physical exercise, smoking, dietary habit, obesity, and care-seeking behavior between the two villages. In Maronge, economic status was higher, more cigarette were smoked, and body mass index (BMI) was higher. Diabetes mellitus and hypertension were also seen. In Lesen, frequency of fish or meat intake was lower and fewer women had regular exercises habit. The current study suggests that development assistance influenced health behavior and health status through income generation.

Key words : health behavior, adults, Indonesia, development, questionnaire

I Introduction

Development assistance often brings about a rapid change in the economic status of benefited areas, and it tends to cause lifestyle changes in the inhabitants. From an anthropological point of view, development assistance functions as an ex-

ternal pressure to accelerate change in indigenous cultures (Kikuchi, 1998). The World Bank (1994) reported that development assistance improves the quality of life in benefited areas. Development assistance is therefore likely to affect health behavior through improvements in income generation and health status. Such an indi-

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rect influence of development assistance has not been considered because it is difficult to determine (Sato H, 1996).

The previous studies on health behavior and health status in developing countries targeted the control of infectious diseases, and maternal and child health programs or users of medical services in urban areas. In Indonesia, studies on health behavior and health status involved infants, children and women of reproductive age (Strisna et al., 1993; Sularyo, 1996; Persson et al., 2001; Launer and Habichit, 1989), patients with infectious diseases (Sudomo et al., 1993; Toma et al., 1999; Karyadi et al., 2000; Roosherimate et al., 2000; Saw et al., 2001), and inhabitants in urban areas (Darmojo, 1993; Kaye and Novell, 1994; Juguan et al., 1999; Wakai et al., 2000).

The current study has two aims: to clarify health behavior and health status in rural areas, and to assess the indirect influence of development assistance on improving health behavior and status.

II Subjects and Methods

The study was conducted in Sumbawa Prefecture, West Nusa Tenggara Province, Indonesia (Map 1) from June 20 to July 13, 2001. The target areas were selected from the rural regions.

Maronge was selected from the benefited areas of the small-scale irrigation management project, and Lesen was selected as the control area. The project has been implemented by Japanese official development assistance since 1990 for agricultural and rural development in dry areas in eastern Indonesia. The project components included water resources development, irrigation facilities construction and on-farm training to stabilize the rice harvest. Most of the inhabitants in both villages were Sumbawans who were Muslims.

The main industry of both villages was agriculture, specifically paddy and mung bean cultivations. Maronge is located 40 kilometers away from Sumbawa Besar, the capital of the Sumbawa Prefecture. The journey takes about 1.5 hours by public transportation. Maronge consists of three "dusun" or sub-villages whose population totaled 4,468. The population was made up of 1,131 households (Badan Pusat Statistik Kabupaten Sumbawa, 1999). Most of farmers in Maronge started double cropping of rice and some of them began vegetable culture in 1997 when irrigation water from the Tieu Kulit Dam, which constructed in 1994 as one of the components of the project, was started to supply. Lesen is located 15 kilometers away from Sumbawa Besar, but

Map 1 Maronge and Lesen Villages in Sumbawa Island, Indonesia

it took about 1.5 hours by public transportation because of rough roads. Lesen consisted of 5 dusun, 590 households, and a population of 2,356 (Badan Pusat Statistik Kabupaten Sumbawa, 2000). Most of the farmers in Lesen could harvest rice only once a year, and mung bean growing was unstable because of water shortages.

Participants consisted of 100 inhabitants (50 men and 50 women) from each village, 20 to 70 years old. One interviewer conducted the survey. The interviewer visited inhabitants' homes randomly and asked for their participation after explaining the purpose of the current study and

the rights of the participants. Only the inhabitants who consented to cooperate were chosen to participate. In some case, both man and woman in the same household were interviewed. The interviews were carried out with a questionnaire written in Indonesian.

The questionnaire consisted of demography (6 items), economic status (3 items), health-related lifestyle (14 items), sanitary conditions (4 items), care-seeking behavior (4 items), involvement in health related community activities (5 items), dietary habit (2 items), and health status (23 items). Basic queries were referred to the questionnaire

Fig. 1 Distribution of Body Mass Index (BMI)

Mean $\pm$ SD (Standard Deviation) of BMI were 22.5 ± 3.0 kg/m² for men and 23.6 ± 3.5 kg/m² for women in Maronge, and 20.8 ± 2.7 kg/m² for men and 22.1 ± 3.1 kg/m² for women in Lesen (men $p=0.003$, women $p=0.029$).

used for the Indonesia Demographic and Health Survey 1997 (Badan Pusat Statistik, et al., 1998). Queries regarding demography consisted of sex, age, education, occupation, religion and place of birth. Economic status was described for annual income, number of times of paddy harvest per year, and opinion about income in these five years. Health-related lifestyle referred to the seven lifestyle habits of Breslow (Berkman and Breslow L, 1983). The habits are physical exercise, smoking behavior, obesity, alcohol drinking behavior, hours of sleeping, eating breakfast and eating between meals. Obesity was calculated from the body mass index (BMI) (kg/m^2), which was calculated from body weights and heights. The interviewer measured body weight in 500 g units using a digital scale on a flat floor and height in centimeters. Body height was measured using a tape measure lengthened from heel to pileum of the participant standing on a flat floor by the wall. Sanitary conditions were judged by the presence of rest rooms and sources of clean drinking water. Involvement in health-related community activities was described from current involvement, involvement period, kind of activities and acquirement of knowledge on health. Care-seeking behavior was described for the following four cases: assumptions in slight sickness and serious sickness, actual behavior in past sickness, and toothache. Queries regarding dietary habits consisted of the frequency of intake of rice, meat or fish, eggs, milk, soybean products (tahu- like Japanese tahu/ tempe- like Japanese natto), vegetables and fruits, which are recommended in a guideline of the Ministry of Health (Departemen Kesehatan, 1995). Queries on health status consisted of subjective health status, basic physical condition, and experience of serious sickness. At the end of interview, blood pressure was measured

once using a wrist type automated sphygmomanometer by the interviewer. Queries on basic physical condition were prepared based on primary patient diagnosis (Tamura, 1996). The questionnaire was finalized using the results of a preliminary interview done in November 2000. The Indonesian version was edited by native Indonesians and re-translated to Japanese to insure that there was no difference between the Japanese and Indonesian versions.

Forty seven items on demography, economic status, health-related lifestyle, care-seeking behavior, dietary habits and health status were analysed. We used a chi-square test or Fisher's exact test for comparison of categorical variables and the Student's t-test for differences of the means of continuous variables. A value of $p < 0.05$ was considered statistically significant; all tests were conducted by two-sided. Statistical analyses except Fisher's exact test were performed with the statistical package SPSS 10.0J for Windows. Fisher's exact tests were performed with the Statistical Analyses System (SAS).

III Results

There were no significant differences in mean age. More women in Maronge (5 people) did housekeeping work exclusively than in Lesen (1 person). Educational background of men in Maronge tended to be higher than men in Lesen (Table 1). The income in Maronge was significantly higher than in Lesen (men $p < 0.001$, women $p < 0.001$). In Maronge, 92.0% of men and 84.0% of women harvested paddies twice a year. Ninety percent of men and 75.5% of women felt their income had been increased in the last five years. By contrast, income in Lesen was lower. Seventy eight percent of men and 84.0% of women stated that their income had decreased

Table 1 Age, educational background, and occupation of the participants

	Maronge		Lesen		p value ¹⁾	
	Men (n = 50)	Women (n = 50)	Men (n = 50)	Women (n = 50)	Men	Women
Age (year)						
mean $\pm$ SD ²⁾	40.6 $\pm$ 10.2	40.3 $\pm$ 11.6	38.4 $\pm$ 11.7	37.1 $\pm$ 10.2	0.328	0.086
Educational background ³⁾					<0.001 *	0.660
• no school/elementary drop out	3 (6.0%)	11 (22.0%)	9 (18.0%)	15 (30.0%)		
• elementary	17 (34.0%)	17 (34.0%)	35 (70.0%)	30 (60.0%)		
• secondary	7 (14.0%)	4 (8.0%)	3 (6.0%)	2 (4.0%)		
• high school/higher	23 (46.0%)	18 (36.0%)	3 (6.0%)	3 (6.0%)		
Occupation					0.436	0.031 *
• farmer	45 (90.0%)	42 (84.0%)	48 (96.0%)	49 (98.0%)		
• others ⁴⁾	5 (10.0%)	8 (16.0%)	2 (4.0%)	1 (2.0%)		

* : p<0.05

¹⁾ Differences in the means of age were tested by the Student's t-test.

Comparison of educational background was tested by a chi-square test.

Comparison of occupation was tested by the Fisher's exact test.

²⁾ Standard Deviation³⁾ Educational system in Indonesia is basically 6 years in elementary school (compulsory) , 3 years in junior high school, 3 years in high school, and various higher education including vocational school, college, and university.⁴⁾ "Others" including official, employee, retailer, housewife and no job.**Table 2** Comparison of economic status (annual household income, annual crop of paddy and opinion of difference in income in these five years)

	Maronge		Lesen		p value ¹⁾	
	Men (n = 50)	Women (n = 50)	Men (n = 50)	Women (n = 50)	Men	Women
Annual household income (million Rp.)					<0.001 *	<0.001 *
mean $\pm$ SD ²⁾	11.38 $\pm$ 9.92	10.57 $\pm$ 11.49	2.70 $\pm$ 2.84	2.20 $\pm$ 1.93		
median	9.10	9.08	2.20	1.75		
Annual crop of paddy					<0.001 *	<0.001 *
• twice	46 (92.0%)	42 (84.0%)	0 (0.0%)	0 (0.0%)		
• once	0 (0.0%)	3 (6.0%)	47 (95.9%)	49 (98.0%)		
• no	4 (8.0%)	5 (10.0%)	2 (4.1%)	1 (2.0%)		
Household income in these five years has been ;					<0.001 *	<0.001 *
• increased	45 (90.0%)	37 (75.5%)	4 (8.0%)	2 (4.0%)		
• decreased	1 (2.0%)	3 (6.1%)	39 (78.0%)	42 (84.0%)		
• same	4 (8.0%)	9 (18.4%)	7 (14.0%)	6 (12.0%)		

* : p<0.05

¹⁾ Differences in the means of annual income were tested by the Student's t-test.

Comparison of annual crop of paddy and opinion of differences in income in these five years were tested by Fisher's exact test.

²⁾ Standard Deviation

in these same five years (Table 2).

Table 3 shows a comparison of health-related lifestyle in the two villages. Fifty-two percent of men and 40.0% of women in Maronge and 56.0%

of men in Lesen exercised regularly, while only 18.0% of women in Lesen did (p = 0.015). Smoking habits of men differed significantly between the two villages. More men in Maronge smoked

more than 1 case of cigarettes (20/case) per day. Men in Lesen tended to smoke a few hand-made cigars named "lontar". A few single men in Maronge drank wine or beer once a week or once a month regularly. Hours of sleeping in both villages were under seven hours and they

were supplemented by napping. There were fewer men who napped regularly in Lesen than in Maronge ($p=0.016$). Ninety-six percent of both men and women in Maronge and 94.0% of men and 96.0% of women in Lesen ate breakfast every day. More women in Maronge ate be-

Table 3 Comparison of practice of health-related lifestyle (physical exercises, smoking, alcohol drinking, hours of sleeping, eating breakfast and eating between-meal)

	Maronge		Lesen		p value ¹⁾	
	Men	Women	Men	Women	Men	Women
Physical exercise					0.688	0.015*
· yes	26 (52.0%)	20 (40.0%)	28 (56.0%)	9 (18.0%)		
· no	24 (48.0%)	30 (60.0%)	22 (44.0%)	41 (82.0%)		
Smoking					0.334	—
· yes	41 (82.0%)	0 (0.0%)	37 (76.0%)	1 (2.0%)		
· no	9 (18.0%)	50 (100.0%)	13 (24.0%)	49 (98.0%)		
Quantity of smoking per day					<0.001*	—
· under 20 nos.	11 (22.0%)	0 (0.0%)	30 (60.0%)	1 (2.0%)		
· 20 nos. ~	30 (60.0%)	0 (0.0%)	7 (14.0%)	0 (0.0%)		
Kind of tobacco					0.003*	—
· lontar/sirit ²⁾	7 (14.0%)	0 (0.0%)	20 (40.0%)	1 (2.0%)		
· cigarette	28 (56.0%)	0 (0.0%)	14 (28.0%)	0 (0.0%)		
· other ³⁾	6 (12.0%)	0 (0.0%)	3 (6.0%)	0 (0.0%)		
Alcohol drinking					0.242	—
· yes	3 (6.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
· no	47 (94.0%)	50 (100.0%)	50 (100.0%)	50 (100.0%)		
Hours of sleeping (hours)						
mean $\pm$ SD ⁴⁾	6.57 $\pm$ 1.42	6.53 $\pm$ 1.11	6.84 $\pm$ 1.41	6.75 $\pm$ 1.60	0.342	0.426
Nap ⁵⁾					0.016*	0.105
· yes	33 (66.0%)	33 (66.0%)	21 (42.0%)	25 (50.0%)		
· no	17 (34.0%)	17 (34.0%)	29 (58.0%)	25 (50.0%)		
Eating breakfast everyday ⁶⁾					1.000	1.000
· yes	48 (96.0%)	48 (96.0%)	47 (94.0%)	48 (96.0%)		
· no	2 (4.0%)	2 (4.0%)	3 (6.0%)	2 (4.0%)		
Eating between-meal everyday ⁷⁾						
· yes	17 (34.0%)	31 (62.0%)	17 (34.0%)	15 (30.0%)	1.000	0.001*
· no	33 (66.0%)	19 (38.0%)	33 (66.0%)	35 (70.0%)		

* : $p < 0.05$

¹⁾ Differences in the means of hours of sleeping were tested by the Student's t-test.

Comparison of the alcohol drinking of men and eating breakfast everyday were tested by Fisher's exact test.

Comparison of the other items were tested by a chi-square test.

²⁾ Lontar is a kind of cigars made of dried tobacco leaves wrapped by dried lontar leaves.

Sirit is a kind of eating tobacco for elder women.

³⁾ "others" means the participants who smoked both lontar and cigarettes.

⁴⁾ Standard Deviation.

⁵⁾ Nap is brief sleep in the afternoon ; usually they sleep half or an hour after lunch.

⁶⁾ Inhabitants in the studied areas, in general, ate meals three times per day, i.e., breakfast at around 5 : 00 to 6 : 00, lunch at noon and dinner at around 19 : 00.

⁷⁾ Inhabitants in the studied areas, in general, ate between-meal between lunch and dinner, if they want.

tween meals every day than in Lesen ($p=0.001$). In Maronge, 47.9% of participants tended to prefer commercial foods such as fried snacks and sweet breads to traditional snacks, whereas 9.1% of participants in Lesen did ($p<0.001$).

Mean values of BMI were 22.5 ± 3.0 kg/m² for men and 23.6 ± 3.5 kg/m² for women in Maronge, and 20.8 ± 2.7 kg/m² for men and 22.1 ± 3.1 kg/m² for women in Lesen (men $p = 0.003$, women $p = 0.029$). In Maronge, 10 men and 17 women were

distributed over 25.0, while 5 men and 8 women in Lesen were (Figure 1).

Frequency of intake of seven foods is shown in Table 4. People in the study usually ate meals three times a day, i. e., breakfast, lunch and dinner, and they sometimes ate between meals in the afternoon. The daily diet in Maronge consists of rice, fish and vegetables. In Lesen, the daily diet consists of rice and one dish, usually fish or eggs. Ninety-six percent of men and 94.0% of

Table 4 Comparison of intake of seven foods recommended by the Ministry of Health of Indonesia (rice, fish or meat, eggs, milk, tempe or tahu, vegetables and fruits)

	Maronge		Lesen		p value ¹⁾	
	Men	Women	Men	Women	Men	Women
Rice					—	—
• every day ²⁾	50 (100.0%)	50 (100.0%)	50 (100.0%)	50 (100.0%)		
• 1 ~ 2times/week	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
• 1 ~ 2times/month or rarely	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
Fish/meat					<0.001*	<0.001*
• every day ²⁾	48 (96.0%)	47 (94.0%)	11 (22.0%)	13 (26.0%)		
• 1 ~ 2times/week	2 (4.0%)	1 (2.0%)	38 (76.0%)	36 (72.0%)		
• 1 ~ 2times/month or rarely	0 (0.0%)	2 (4.0%)	1 (2.0%)	1 (2.0%)		
Eggs					0.149	0.063
• every day ²⁾	4 (8.0%)	5 (10.0%)	0 (0.0%)	0 (0.0%)		
• 1 ~ 2times/week	32 (64.0%)	31 (62.0%)	36 (72.0%)	37 (74.0%)		
• 1 ~ 2times/month or rarely	14 (28.0%)	14 (28.0%)	14 (28.0%)	13 (26.0%)		
Milk					0.002*	<0.001*
• every day ²⁾	1 (2.0%)	5 (10.0%)	0 (0.0%)	0 (0.0%)		
• 1 ~ 2times/week	11 (22.0%)	11 (22.0%)	1 (2.0%)	0 (0.0%)		
• 1 ~ 2times/month or rarely	38 (76.0%)	34 (68.0%)	49 (98.0%)	50 (100.0%)		
Tahu/Tempe ³⁾					0.413	0.068
• every day ²⁾	2 (4.0%)	5 (10.0%)	1 (2.0%)	2 (2.0%)		
• 1 ~ 2times/week	26 (52.0%)	30 (60.0%)	20 (40.0%)	24 (48.0%)		
• 1 ~ 2times/month or rarely	22 (44.0%)	15 (30.0%)	29 (58.0%)	25 (50.0%)		
Vegetables					0.112	0.021*
• every day ²⁾	32 (64.0%)	37 (74.0%)	21 (42.0%)	25 (50.0%)		
• 1 ~ 2times/week	16 (32.0%)	13 (26.0%)	26 (52.0%)	23 (46.0%)		
• 1 ~ 2times/month or rarely	2 (4.0%)	0 (0.0%)	3 (6.0%)	2 (4.0%)		
Fruits					<0.001*	0.002*
• every day ²⁾	4 (8.0%)	5 (10.0%)	0 (0.0%)	0 (0.0%)		
• 1 ~ 2times/week	19 (38.0%)	11 (22.0%)	3 (6.0%)	3 (6.0%)		
• 1 ~ 2times/month or rarely	27 (54.0%)	34 (68.0%)	47 (94.0%)	47 (94.0%)		

* : $p<0.05$

¹⁾ Comparison of intake of each food except rice were tested by Fisher's exact test.

²⁾ "everyday" includes participants who ate once to three times per day.

³⁾ "Tahu" is soybean crud and similar to Japanese "tofu". "Tempe" is fermented soybean cake.

women in Maronge ate fish every day while in Lesen, 76.0% of men and 72.0% of women ate fish once or twice a week (men $p < 0.001$, women $p < 0.001$). In Maronge, more men and women drank milk regularly while many in Lesen had never consumed milk. Intake of eggs and soy-bean products (Tahu/ Tempe) did not differ significantly between the two villages. Vegetables

and fruits were consumed more frequently in Maronge than in Lesen.

Care-seeking behavior is shown in Figure 2. In Maronge, people would go to a private clinic or hospital for serious cases. In Lesen, people tended to go to a sub-health center or traditional healer (dukun) for any case.

No significant difference was indicated in the

Fig. 2 Comparison of care-seeking behavior in case of slight sickness, serious sickness, past case and toothache

- Multiple answer for each query. P-values from Fisher's exact test are as follows; slight sickness (men: < 0.001 , women: < 0.001), serious sickness (men: < 0.001 , women: < 0.001), past case (men: < 0.001 , women: 0.044), toothache (men: 0.002, women: 0.001)
- A vertical axis of the graph expresses four cases in the questionnaire, i.e., slight sickness, serious sickness, past illness, and toothache.
- A horizontal axis of the graph express number of answers.
- Public hospital was located at Sumbawa Besar, the capital of the prefecture.
- It took about an hour by public transportation from Maronge to the nearest health center in Plampang, and 1.5 hours from Lesen to the nearest health center in Sumbawa Besar.
- There were a sub-health center and midwives each in Maronge and Lesen. A co-medical staff worked in a sub-health center.
- Dukun is a kind of transitional healers using herbs and incantation to cure.

subjective health status of the participants (Table 5). "Silu," arthralgia or arthritis similar to rheumatism, was the most common health problem in both villages. Some of the participants in Maronge had suffered from stroke, diabetes mellitus and hypertension. More women in Lesen were categorized in the hypertension group.

IV Discussion

Epidemiological transition has been occurring in developing countries. The burden of non-infectious diseases including chronic diseases has been increasing (Murray, 1997). Previous studies have shown an association of changes in health behavior and increases in obesity and chronic disease in developing countries surrounding Indonesia (Lewis and Rapaport, 1995; Sakamoto et al., 1997; Sakamoto et al., 2001; Ram et al., 1996).

In Indonesia, life expectancy has improved during this decade, from 59.8 years in 1986 to 64.2 years in 1997 (men and women). The primary cause of death changed from diarrhea in 1982 to cardiovascular disease in 1997 (Badan Pusat Statistik et al., 1998; Badan Pusat Statistik et al., 1995). Sutanegara et al. (2000) reported that diabetes mellitus and obesity have increased in Jakarta and in some urban areas in Indonesia. The Japan International Cooperation Agency (1998) reported that chronic diseases increase gradually with epidemiological transition. Under such a situation, improvement of health behavior is becoming more important in health promotion and disease prevention (Departemen Kesehatan, 1999; Darmojo et al., 1990).

According to the results of the Alameda County Study, regular physical activities, not smok-

Table 5 Comparison of health status (subjective health status, health problem, experience of serious sickness and blood pressure)

	Maronge		Lesen		p value ¹⁾	
	Men	Women	Men	Women	Men	Women
Subjective health status					0.436	0.511
• very healthy	2 (4.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
• healthy	34 (68.0%)	35 (70.0%)	39 (78.0%)	38 (76.0%)		
• not very healthy	11 (22.0%)	8 (16.0%)	10 (20.0%)	9 (18.0%)		
• not healthy	3 (6.0%)	7 (14.0%)	1 (2.0%)	3 (6.0%)		
Health problem (multiple answer)					0.143	0.024
• silu ²⁾ /arthralgia	32	27	31	17		
• stomach ache	5	7	4	7		
• general complaint	4	9	5	7		
• lifestyle-related diseases ³⁾	4	4	0	1		
• others ⁴⁾	8	17	18	11		
Experience of serious sickness	24 (48.0%)	15 (30.0%)	22 (44.0%)	11 (22.0%)	0.688	0.260
Systolic blood pressure					0.978	0.010 *
• low (~119)	22 (44.0%)	24 (48.0%)	23 (46.0%)	21 (42.0%)		
• normal (120 ~139)	22 (44.0%)	21 (42.0%)	21 (42.0%)	12 (24.0%)		
• high (140 ~)	6 (12.0%)	5 (10.0%)	6 (12.0%)	17 (34.0%)		

* : $p < 0.05$

¹⁾ Comparison of subjective health status and health problems were tested by Fisher's exact test.

Comparison of experience of serious sickness and systolic blood pressure were tested by a chi-square test.

²⁾ Silu is arthralgia or arthritis similar to rheumatism.

³⁾ lifestyle-related diseases include, hypertension, stroke and diabetes.

⁴⁾ others include headache, low back pain, etc.

ing, appropriate alcohol drinking, sleeping 7-8 hours per night, eating breakfast daily, not eating between meals and appropriate body weight contribute to future health status (Belloc and Breslow L, 1972; Belloc, 1973; Willey and Camacho, 1980; Berkman and Breslow L, 1983; Breslow L and Breslow N, 1993). Most participants in the current study participated in regular physical exercises, ate breakfast daily, did not eat between meals and were not overweight. Although the mean hours of sleeping per night were under 7 hours, they supplemented their sleep by napping. Only a few participants drank alcohol regularly, and they did not drink too much or too frequently. Compared with the previous studies in urban areas such as Jakarta (Darmawan, 1992), the number of participants who exercised regularly was higher, except among Lesen women. People in the studied areas usually go to the workplace twice a day, in the morning and in the afternoon. Moreover, men in rural areas usually gather to play soccer or volleyball in the evening. These facts might explain why the prevalence of regular physical exercise in rural areas was higher than in urban areas.

However, there were many patients who suffered from rheumatism-like symptoms named "silu." Most of them were over 35 years old but some were young men in their 20's. They were observed to have swelling of knee or ankle with pain and some of them could not walk or bend their knee by especially severe swelling. According to a nurse of sub-health center in Maronge, silu is one of popular symptoms in farmers caused by chill in leg or lumbar in paddy field. These symptoms, along with their severity, have not been reported in health statistics. This is because most patients would not use medical services but preferred traditional medicine such as herb poultice as Darmawan et al (1992) reported

about rheumatism patients, and health statistics in Indonesia are generally prepared using data from medical facilities.

In comparing the two villages, the current study suggests that development assistance may have affected the income levels in Maronge. Participants in Maronge have experienced income increases since irrigation water was started to supply in 1997. By contrast, income in Lesen decreased because of the damage to agriculture caused by a water shortage in 2000. The current study also demonstrates the differences in health behavior between the two villages and suggests that some of the differences are affected by economic status. As Sato Y et al. (1999) and Watanabe et al. (2000) reported, in Indonesia, economic crisis in 1997 and drought in 1998 have impacted negatively on access to food and nutritional and health status accordingly. In Sumbawa Prefecture, the crisis still had a negative impact on household economy and health development. (Dinas Kesehatan Kabupaten Sumbawa, 2000) Considering these situation, the studied areas also might have been affected. While, Sumarto et al (1999) reported that the impact of economic crisis on rural areas except Java have been milder than urban areas. The current study could not found clear impacts of economic crisis in 1997 and drought in 1998 in the studied areas.

Women in Lesen did not have enough time to exercise, as shown in Table 3. They were busy working both at home and in the fields. Every day, women in Lesen walked 5-10 minutes from their homes to the fields. In Maronge, many farmers hired field laborers. Men went to the fields every day, mainly to supervise, and women went twice or three times per week. Field areas in Maronge were located approximately 2 km from the residential areas, so that participants in Maronge considered walking to

the fields as exercise. Few men in Lesen napped (Table 3) because they worked at side jobs. People in Maronge tended to spend more cash on cigarettes and on between-meal snacks. Lewis and Rapaport (1995) reported that there had been a shift in diet from traditional foods to imported foods in the Pacific region. The current study indicates that the shift also occurred in Maronge. Mean values of BMI were higher in Maronge than in Lesen. This finding agrees with the Sobal and Stunkard study (1989), which showed that improvement of socio-economic situation led to increased obesity in developing countries.

Daily diet also differed between the two villages (Table 4). In Maronge, participants tended to eat more vegetables, fruits and milk, and to have animal protein every day. After the project, vegetables began to be grown in the village, making it easier for the inhabitants to purchase and eat more vegetables. Access to vegetables was therefore improved by the project.

People in Maronge tended to spend more money on medical services to treat disease. This finding agrees with the previous study indicating that income and availability are important determinants of care-seeking behavior (Chernichovsky and Meesook, 1986). It is more likely that they obtained the appropriate diagnoses and medical treatment. The reason more women in Lesen were diagnosed with hypertension was not clear in the current study. However, less-frequent exercise among women in Lesen was supposed as a possible predictive factor because it differed from those of the men in Lesen and both the men and women in Maronge.

Health status in Southeast Asia has been improving in accordance with economic growth (Hertzman and Siddiqi, 2000). Although a significant difference in health status was not found in

the current study, there were a few patients suffering from chronic diseases such as diabetes mellitus, hypertension, and stroke in Maronge. As Thiede (1997) reported that personal health status was associated with personal economic status, health status in Maronge may change in the future due to the recent increase in income.

The current study has several limitations. First, some queries were applied on health-related lifestyles that were based on a previous study conducted in the United States, because we could not find any generalized questionnaires on health-related lifestyle in the studied areas. Some items were therefore not considered to be applicable to the cultural background of the current study participants. Alcohol drinking, in particular, was a sensitive matter for Muslims. Further studies should focus on the development of a generalized questionnaire on health behavior and health status that would be applicable anywhere.

Second, sample size could not be decided in the planning stage because the current study was exploratory research and did not hold any particular causal association to analyze relative risks. According to Schlessman (1974) and Armitage and Berry (1994), chance for β error would be less than 20% if the differences in odds ratios were more than 0.25. It was considered, therefore, that in the current study the sample size might be enough to compare a specific difference of health behavior.

Third, the baseline data of economic and health status of both villages were unavailable, and thus they might have been different even before the project began. In addition, the indirect influence of development assistance on health behavior and health status was difficult to determine. In the current study, we focused on the opinions of some inhabitants in Maronge that

there were changes in utilization of medical services, smoking behavior, daily diet and household economy after the project. Further study should focus on the development of a study method to clarify the indirect influence of development assistance.

V Conclusion

The current study indicates that rural inhabitants in Sumbawa prefecture have a healthy lifestyle. However, "silu" is not identified in the health statistics. In comparing the two villages, differences were observed in both health behaviors and economic status. The current study suggests that development assistance might have affected health behavior through income generation.

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