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A Program for Thai Rubber Tappers to Improve the Cost of Occupational Health and Safety

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Abstract: The purposes of this research were to determine the cost of occupational health and safety and work-related health problems, accidents, injuries and illnesses in rubber tappers by implementing a program in which rubber tappers were provided training on self-care in order to reduce and prevent work-related accidents, injuries and illnesses. Data on costs for healthcare, the prevention and the treatment of work-related accidents, injuries and illnesses were collected by interview using a questionnaire. The findings revealed that there was no relationship between what was spent on healthcare and the prevention of work-related accidents, injuries and illnesses and that spent on the treatment of work-related accidents, injuries and illnesses. The proportion of the injured subjects after the program implementation was significantly less than that before the program implementation ($p<0.001$). The level of pain after the program implementation was significantly less than that before the program implementation ($p<0.05$). The treatment costs incurred after the program implementation were significantly less than those incurred before the program implementation ($p<0.001$). It was demonstrated that this program raised the health awareness of rubber tappers. It strongly empowered the leadership in health promotion for the community.

Key words: Rubber tapper, Health promotion, Cost of occupational health, Work-related accident

Introduction

Rubber plantation enterprises have been underpinning the socio-economic security for Thailand for a century. Thailand is among the top rubber producers in the world, with production at approximately 2.5 million tons per year. The exportation of rubber and rubber products undertaken by Thai rubber industries account for more than 1 trillion baht, and employ more than 6 million rubber farmers. At the present, there are more than 5 million acres of rubber plantations. It is anticipated that in the next 20 yr, the rubber consumption of the world will double[1]. In 2006, the world rubber demand was predicted to increase 2.1%, and Thailand as a number one exporter was expected to export rubber products at the value of US$ 5.2 billion in the same year, or the equivalent of a 40.18% rise[2]. The rubber tappers are a workforce from the informal employment sector. The "quality of life" for these workers is a hot issue at the present internationally, as highlighted by the International Labor Organization, which is focusing on developing opportunities for all labor workers to have fair and ethical employment as well as social protection[3]. In accordance with many other countries, strategy no. 3 of the Ministry of Labor of Thailand (2005–2008) was created to provide protection to the workforce from both the formal sector and the informal sector, good quality of life at workplace and life assurance[4]. At the present, there are many organizations developing a database on the workforce from the informal sector. However, there is none acting as a focal point, and thereby, there is no organization in a position to provide a standard definition of "workforce for the informal sector". This is a result of the workforce from

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the informal sector now being under the supervision of many agencies, such as the Department of Labor Protection and Welfare, and the Social Security Office. As a result, this workforce is still short of life assurance, the opportunity for health promotion, and vulnerable to work-related health problems, chemical hazards, and accidents from using equipment. In additions, because this workforce has working patterns and working hours that are irregular, the livelihood of the workforce is wide-ranging. The care and attention that is given to the informal sector should not be denied in order to enable the informal workforce, who has no work security, to live in the society, with the values and dignity that are due to each human-being, values and dignity which cannot be measured or priced. This is a crucial concept, which has much influence on social stability and security. Therefore, this is the rationale that directed this research on the costs spent by rubber tappers for healthcare and the prevention of work-related accidents, injuries and illnesses in order to develop a feasible health promotion program for rubber tappers. The program is expected to solve identified work-related health problems and reduce the work-related accidents, injuries and illnesses found in the group of rubber tappers effectively.

Method

This quasi-experimental study aimed to determine the cost of occupational health and safety and work-related health problems, accidents, injuries and illnesses in rubber tappers before and after implementing health promotion program.

Subjects

Target population was 49 rubber tappers who voluntarily participated in this study. The sample group was one group of rubber tappers who lived in Jana District, Songkla province that the whole members became subjects.

Data was collected by interview questionnaire from January to September, 2007.

Questionnaire

The questionnaire was developed, based on the data collected and the review of literatures and other relevant journals. Thereafter, the questionnaire was tried out in other groups of informal workers. Having been tried out, the questionnaire was revised for use in this research sample group. The questionnaires can be divided into 4 parts:

Part 1 Personal factors covering general details including age, sex, number of average daily working hours, number of sleeping hours and number years as a rubber tapper

Part 2 Costs for healthcare and the prevention of work-related accidents, injuries and illnesses

Part 3 Costs for treatment of work-related accidents, injuries and illnesses

Program implementation

The self-care program, in order to reduce and prevent work-related accidents, injuries and illnesses was implemented among subjects. All the subjects volunteered to participate this project. The subjects were invited to share their experiences regarding work-related accidents and injuries with their group members and train them to analyze causes and corrective action taken to prevent the recurrence of the accidents. The sample group was divided into 8 small groups of 4–10 members, based on where their houses were located in order to facilitate gathering of information. Group leaders were appointed, and the group members were allowed to apply their newly gained knowledge for 4 months under the supervision of the group leaders.

The main duty of the group leaders was to call a meeting at least once a month to conduct the following activities:

- Asking the group members about work-related health problems, illness, as well as self-care.
- Requesting group members to share experiences regarding work-related accidents or injuries with other members and do brainstorming on causes and corrective action for the problems. Record the data of work-related injuries or accidents.

During the 4 months in which the health promotion program for rubber tappers was being implemented, follow-up activities were performed by having random interviews with one member of each group and with the group leader of each group, once a month, for a total of 3 interviews.

Data collection

The sample groups were called for a group meeting in order to have an interview using the questionnaire before and after the program had completely been implemented for 4 months. The interviews took place from June–September, 2007 and were analyzed to obtain the research findings. The costs during January–April 2007 which was the period before the implementation of the health promotion program and the costs incurred during June–September 2007 which was the period after the program implementation were collected.

Data analysis

Personal factors contributing to work-related health problems, accidents, injuries and illnesses were analyzed by Descriptive Statistics. The relationship between the

costs for healthcare and the prevention of work-related accidents, injuries and illnesses and the costs for treatment when having work-related accidents, injuries and illnesses before and after the implemented health promotion program for rubber tappers was analyzed by Spearman Correlation in order to study the correlation in nonparametric of two independent data sets. The difference of the costs for treatment when having work-related accidents, injuries and illnesses before and after the health promotion program implementation was tested by the Wilcoxon Signed Ranks test in order to analyze the relationship for one sample that the data set was nonparametric.

Results

Section 1 General information of the sample group

Of 49 workers, 40 were female (81.6%) and 9 were male (18.4%). Subjects were in the range of 22–72 yr of age, and the average age was 50.2 yr. A majority of subjects were aged between 41–50 yr of age (30.6%). Their length of work experience ranged from 1–55 yr and 28.1 yr on average. The daily working hours were between 2–12 h and 6.7 h on average. The number of working days per week were at 3–7 d and 5.3 d on average. Most subjects worked 5 d a week. The number of sleeping hours were from 4–9 h and 5.9 h on average. Most subjects slept around 5–6 h. As for the survey on daily income during January–April 2007, it was found that their daily income was about 80–1,500 baht and 379.2 baht on average. A majority of subjects earned 201–500 baht per day. Meanwhile, for the income survey during June–September 2007, it was shown that their daily income was 100–2,000 baht and 529.7 baht on average. Most of the subjects earned 201–500 baht per day. The aforementioned general information data is tabulated in Table 1.

Section 2 Data of the cost spent for healthcare and prevention of work-related accidents, injuries and illnesses

Table 2 reveals data of the cost spent for healthcare and prevention of work-related accident, injuries and illnesses which can be elaborated as follows:

Training

The average training costs for subjects were at 300.0 baht and 323.6 baht, and the standard deviations were at 604.2 and 152.0 before and after the implementation respectively.

The standard deviation was high because income loss of the subjects was included. The standard deviation of the income was relatively high, and the number of training courses the subjects attended were not the same. For

Table 1. Number and percentage of the sample group sorted by personal characteristics

Data (n=49)	n	%
Sex		
Male	9	18.4
Female	40	81.6
Age (yr)		
≤30	5	10.2
31–40	6	12.2
41–50	15	30.6
51–60	10	20.4
61–70	11	22.5
> 70	2	4.1
Mean (SD)	50.2 (13.1)	
Min–Max	22–72	
Length of work experience (yr)		
≤10	7	14.3
11–20	10	20.4
21–30	12	24.5
31–40	12	24.5
41–50	4	8.2
>50	4	8.2
Mean (SD)	28.1 (14.7)	
Min–Max	1–55	
Daily working hours		
≤2	2	4.1
3–5	18	36.7
6–8	18	36.7
>8	11	22.5
Mean (SD)	6.7 (2.7)	
Min–Max	2–12	
Weekly working days		
3	3	6.1
4	2	4.1
5	29	59.2
6	5	10.2
7	10	20.4
Mean (SD)	5.3 (1.1)	
Min–Max	3–7	
Sleeping hours		
≤4	9	18.4
5–6	22	44.9
7–8	16	32.7
>8	2	4.1
Mean (SD)	5.9 (1.4)	
Min–Max	4–9	
Daily income (From January–April 2007)		
≤200	18	36.7
201–500	21	43.0
501–800	7	14.3
801–1,100	1	2.0
1,101–,1400	1	2.0
1,401–1,700	1	2.0
Mean (SD)	379.2 (304.1)	
Min–Max	80–1,500	
Daily income (From June–September 2007)		
≤200	10	20.4
201–500	27	55.1
501–800	2	4.1
801–1,100	7	14.3
1,101–1,400	1	2.0
1,401–1,700	1	2.0
1,701–2,000	1	2.0
Mean (SD)	529.7 (390.5)	
Min–Max	100–2,000	

Table 2. The cost spent for healthcare and prevention of work-related accidents, injuries and illnesses before and after implementation of the health promotion program for rubber tappers sorted by the frequency

Data	Before		After	
	n	%	n	%
Training (Baht) (n=49)				
≤500	39	79.6	39	79.6
501–1,000	6	12.3	10	20.4
1,001–1,500	1	2.0	0	0.0
1,501–2,000	2	4.1	0	0.0
2,001–2,500	0	0.0	0	0.0
>2,500	1	2.0	0	0.0
Mean (SD)	300.0 (604.2)		323.6 (152.0)	
Min–Max	0–2,600		174–884	
PPE(Baht) (n=49)				
≤10	4	8.1	3	6.1
11–30	35	71.4	37	75.5
31–50	6	12.3	6	12.3
51–70	2	4.1	1	2.0
71–90	2	4.1	2	4.1
Mean (SD)	26.0 (17.9)		25.8 (16.9)	
Min–Max	9–90		10–90	
Exercise (Baht) (n_1=17, n_2=48)				
≤100	1	5.9	14	29.2
101–500	9	53.0	29	60.5
501–900	3	17.6	2	4.1
901–1,200	3	17.6	2	4.1
1,201–1,500	–	–	–	–
1,501–1,800	–	–	–	–
1,801–2,100	1	5.9	1	2.1
Mean (SD)	588.0 (490.0)		262.5 (352.3)	
Min–Max	89–1,867		14–2,100	
Supplementary food and herb (Baht) (n_1=7, n_2=7)				
≤3,000	1	14.3	1	14.3
3,001–3,500	–	–	–	–
3,501–4,000	–	–	1	14.3
4,001–4,500	3	42.8	1	14.3
4,501–5,000	–	–	1	14.3
5,001–5,500	1	14.3	1	14.3
5,501–6,000	1	14.3	1	14.3
>6,000	1	14.3	1	14.3
Mean (SD)	4,507 (1,739)		4,467 (1,772)	
Min–Max	950–6,300		950–6,300	
Annual medical checkup (Baht) (n_1=5, n_2=13)				
50	1	20.0	–	–
200	2	40.0	6	46.2
300	1	20.0	4	30.7
400	1	20.0	2	15.4
500	–	–	1	7.7
Mean (SD)	230 (130.4)		284.6 (98.7)	
Min–Max	50–400		200–500	

n_1: means number of subjects before program implementation, n_2: means number of subjects after program implementation.

example, a certain number of subjects at 28.6% used to take the training course, Safety Officer Training for Supervisors for 12 h, resulting in loss of income during the training and training costs that had a wide range.

Personal protective equipment

The cost of Personal Protective Equipment had means at 26.0 baht and 25.8 baht before and after the program implementation, respectively. A majority of the subjects had the PPE cost at 11–30 baht at 71.4% and 75.5% before and after the program implementation, respectively.

Exercise

The average costs of exercise for subjects were 588.0 baht and 262.5 baht and the standard deviations at 490.0 and 352.3 before and after the program implementation respectively. Their exercise costs were mostly at 101–500 Baht, equivalent to 53.0% and 60.5% before and after the program implementation, respectively.

Supplementary food and herbs

Means of the cost for supplementary food and herbs were at 4,507 baht and 4,467 baht, and the standard deviations were equal to 1,730 and 1,772 before and after the program implementation, respectively.

Annual health checkup

Means of the costs of annual health checkup were at 230 baht and 284.6 baht before and after the program implementation, respectively. Most of the subjects at 40.0%, and 46.2% spent 200 baht both before and after the program implementation.

Table 3 presents the total costs during the whole period of the study. The total expenditure accounted for 123,410 Baht, of which 50.9% was spent for supplementary food and herbs. Second in number, the costs of training, exercise, annual health checkup, and PPE was at 24.7%, 18.4%, 3.9% and 2.1% respectively.

Section 3 Data on the costs for the treatment of work-related accidents, injuries and illnesses

Table 4 describes the data of the costs for the treatment of work-related accidents, injuries and illnesses before and after the implementation of the health promotion program. It was shown that the total cost of treatment after the program implementation was less than that before the implementation.

Before the implementation, most of the cost was for treatment of work-related accidents and injuries at 68.6%; meanwhile, 18.0% and 13.4% were spent for pain in body parts and peptic ulcers, respectively. In addition, in the case of accidents and injuries, most of the treatment costs were incurred by motorcycle accidents at 83.3%.

Table 3. The costs for healthcare and prevention of work-related accidents, injuries and illnesses before and after the implementation of the health promotion program for rubber tappers sorted by type of expenditure

Data	Before	After	Total	
	Amount (Baht)	Amount (Baht)	Amount (Baht)	%
Total cost	58,674	64,736	123,410	100
Training	14,700	15,856	30,556	24.7
PPE	1,274	1,263	2,537	2.1
Exercise	10,000	12,646	22,646	18.4
Supplementary food and herb	31,550	31,270	62,820	50.9
Annual health checkup	1,150	3,700	4,850	3.9

Regarding the treatment costs after the implementation of the health promotion program, it was shown that the highest cost of treatment was spent for pain in body parts at 45.0% of the total treatment cost. 44.5% was spent for peptic ulcers. Lastly, 8.4% was spent for accidents and injuries, most of which (71.1%) came from motorcycle accidents.

The investigation on the relationship between the costs for healthcare and prevention of work-related accidents, injuries and illnesses and the costs for treatment of work-related accidents, injuries and illnesses shows that the costs for the healthcare had no relationship with the costs for treatment as shown in Table 5. The aforementioned costs mean not only the total cost, but also the cost incurred before and after the implementation of the program, while the difference between the treatment costs when having work-related accidents, injuries and illnesses before and after the program implementation shows that the treatment costs incurred after the implementation was significantly less than that incurred before the implementation ($p<0.05$) as demonstrated in Table 6.

Discussion

The sample group was composed of 49 rubber tappers, most of whom, (81.6%), were female, and only 18.4% were male. They were 50.2 yr old on average, of which 47.0% were more than 50 yr of age and categorized as aging people. Their average length of work experience was 28.1 yr, making them highly experienced tappers.

Daily working hours of the subjects were at 6.7 h on average; meanwhile, average working days a week were at 5.3 d. Both were considered normal for people at productive age. Nevertheless, the tappers need to work during the night approximately from 01:00–10:00 h when the rubber trees are still in the dark and produce more latex.

Table 4. The costs for the treatment of work-related accidents, injuries and illnesses

Data	Before		After	
	Amount (Baht)	%	Amount (Baht)	%
Total cost	66,690		16,059	
Accidents and injuries	45,780	68.6	1,349	8.4
Knife-cut when tapping and from sharpening the knife	1,130	2.5	210	15.6
Loss of income	600		0	
Self-care	530		210	
Motorcycle accidents	38,130	83.3	959	71.1
Loss of income	37,800		0	
Doctor and medical service	300		959	
Self-care	30		0	
Stumbles	3,090	6.7	None	
Loss of income	3,000			
Self-care	90			
Eye irritation and infection due to removal of rubber barks or latex from the eyes	430	0.9	150	11.1
Doctor and medical service	430		150	
Cuts on hands from weeding	3,000	6.6	None	
Loss of income	2,000			
Doctor and medical service	1,000			
Cuts on feet by broken mower blades	None		30	2.2
Doctor and medical service			30	
Peptic Ulcer	8,920	13.4	7,140	44.5
Doctor and medical service	8,220		1,440	
Antacid	700		0	
Curcuma mixed with honey	0		5,700	
Pain on body parts	11,990	18.0	7,220	45.0
Doctor and medical service	5,960		2,910	
Traditional medication	3,070		3,070	
Paracetamol	700		230	
Traditional Thai Massage	800		200	
Pain relief and massage	1,460		810	
Myitis of back muscle	None		350	2.1

Table 5. Test on the relationship between the cost spent for healthcare and prevention of work-related accidents, injuries and illnesses and the cost spent for treatment when having work-related accidents, injuries and illnesses by Spearman Correlation

Independent Variable	Dependent Variable	R	*p*
The total cost for healthcare	The total cost for treatment	–0.075	0.304
The cost spent for healthcare before the implementation of the health promotion program for rubber tappers	The cost spent for treatment before the implementation of the health promotion program for rubber tappers	–0.074	0.307
The cost spent for healthcare after the implementation of the health promotion program for rubber tappers	The cost spent for treatment after the implementation of the health promotion program for rubber tappers	–0.175	0.114

Table 6. The test on the difference between the treatment costs when having work-related accidents, injuries and illnesses before and after the implementation of the health promotion program for rubber tappers by Wilcoxon Signed Ranks test

Variable	Z test	*p*
The total treatment cost	–3.721	<0.001*
The treatment cost for work-related accidents and injuries	–2.625	0.009*
The treatment cost for illnesses	–3.062	0.002*

*: Level of statistical significance at 0.05

In addition, the tappers had average sleeping hours at only 5.9 h. Similar results were found in the study of Bensaard N *et al*[5]. The lack of adequate sleep led to health problems of the tappers as identified in the health promotion work plan for workforce from the informal sector for 2004–2006 of the Thai Health Promotion Foundation.

The total costs of healthcare and prevention of work-related accidents, injuries and illnesses of the sample group increased 10% after the program implementation. The costs of the annual health checkup after the program implementation increased twice as much as that before the program implementation. This finding demonstrates is that the subjects became more aware of the annual health checkup. As mentioned by WHO, health promotion strategies are not limited to a specific health problem, nor to a specific set of behavior[6]. On the other hand, the cost for exercise was less. It was found that the cost increased only 26%. It was apparent that a number of subjects doing exercise increased 3 times after the program implementation. Since doing stretching exercise involved no cost of exercise apparatus and the exercise could be done during leisure time, such as when watching TV, the exercise did not result in a loss of income. The costs of occupational injuries and diseases were classified[7–9]. The costs of illness, costs of injuries and costs of disease were considered in this study. From Table 4, it is apparent that the treatment costs for work-related accidents, injuries and illnesses after the program implementation reduced the treatment costs incurred before the implementation at 76%. Furthermore, the test on the research assumption proves that the treatment costs incurred after the implementation were significantly less than the costs incurred before the implementation, in which the treatment costs for accidents and injuries decreased mostly at 97%; meanwhile, the costs for body pain and peptic ulcer reduced 39% and 20% respectively. From the study, it was apparent that most of the treatment costs (57%) were spent for accidents and injuries; whereas, 23% was spent for body pain, and 19% was paid for peptic ulcers. This data reiterates that taking supplementary food and herbs did not help prevent or reduce the seriousness of accidents and injuries and did not alleviate the stomachache from peptic ulcer nor body pain. From the aforementioned discussion, it can be concluded that the costs for healthcare and the prevention of work-related accidents, injuries and illnesses by the subjects did not help reduce treatment costs when they had work-related accidents, injuries and illnesses.

The limitation of this study

The technique of sample random sampling could not be used in this study as the rubber tappers at Klong Piya Sub-District, Jana District, Songkla Province did not work independently but under a group system. The tappers united and formed up around 10 rubber groups, each of which had about 60–70 members. Any request or communication to the group members had to be agreed by their group leaders. Therefore one rubber group of 10 groups was randomly selected for this study.

The strength of this study

This research is aimed at analyzing the cost of occupational health and safety and reducing work-related health problems, accidents, injuries and illnesses found in a group of rubber tappers. In reviewing relevant literature, the researcher is ascertained that this research topic has never been studied in Thailand before. In addition, this study made the subjects recognized that to do the exercise regularly could alleviate the pain of their body parts, and this satisfied them so greatly that some subjects introduced the exercise program to other rubber groups and several professional groups, as well as, the elderly club in the community.

Conclusion

From the study on the relationship between the costs for healthcare and prevention of work-related accidents, injuries and illnesses and the treatment costs for work-related accidents, injuries and illnesses in the group of rubber tappers, it was found that the amount spent for healthcare and prevention in the sample group did not reduce the treatment costs incurred when having work-related accidents, injuries and illnesses. Considering the study on the difference of the treatment costs of work-related accidents, injuries and illnesses before and after the implementation of the health promotion program, it is proved that the treatment cost incurred after the program implementation was less than that before the implementation significantly. It is confirmed that the proportion of injured subjects after the program implementation was significantly less than that before the implementation.

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