

## CHAPTER 7

### DISCUSSION

#### 7.1 Introduction

This project was part of a Research and Development project to investigate the socio-economic impact of dermatitis amongst the paddy farming community in Kota Bharu area, Kelantan. Infected farmers were not able to work their fields, resulting in decreased productivity. A survey was done with the aim to investigate the occurrence of dermatitis amongst the population from the four infected villages (see also Sections 1.6 and 7.2) via a questionnaire (see Critic on questionnaire Section 7.3). The data in the questionnaire were then sorted and analyse statistically to correlate farming activities to occurrence of dermatitis (Section 2.4). Previous studies on cercarial dermatitis in Malaysia dealt mainly with determination of the natural hosts of the schistosomes causing dermatitis and this is the first time that the focus is on the effects of dermatitis on the farmers.

The prevalence of dermatitis among the general population of the four villages surveyed ( $N = 2081$ ) is low only 8.5 per cent and 97.7% are farmers (Chapter 4). There is a significant association between the occurrence of dermatitis and the types of occupation ( $\chi^2 = 875.599$ ,  $df = 12$ ,  $p < 0.000$ ). The analysis shows that the occurrence of dermatitis is hence restricted to paddy field farmers since 97.7 per cent of the infected cases were paddy field farmers and the prevalence of dermatitis among paddy field farmers is 47.9 per cent (Chapter 4).

## **7.2 Factors Affecting the Occurrence of Dermatitis**

This study also shows that the dermatitis is due to schistosome cercariae and not to chemicals (Sections 5.24 to 5.26). There are significant associations between the occurrence of dermatitis and the villages (Section 5.1 and refer Table 7.1) suggesting that there is something in the environment of these four villages that are causing the dermatitis. The fact that there is also significant association with the preparation of the paddy fields before the planting season begins (Section 5.2.1 and refer Table 7.1); during the transplanting of seedlings (Section 5.2.3 and refer Table 7.1); and water sources for farming (5.3.1 and refer Table 7.1) suggest that water plays an important role in the infection. The significant association with rearing of ducks (Section 5.4.2 and refer Table 7.1) and the rearing of cows (Section 5.4.4 and refer Table 7.1) suggest that the dermatitis could be due to the cercariae from these animals i.e. cercarial dermatitis.

The positive associations with cows and ducks rearing do not rule out dermatitis caused by chemicals. The lack of association between the application of fertilizers and pesticides and dermatitis (Section 5.2.4, Section 5.2.5, Section 5.2.6 and refer Table 7.1); the types of pesticides and fertilizer used (Section 5.2.4, Section 5.2.5, Section 5.2.6 and refer Table 7.1) and the hours spent in the field during the planting season (Section 5.2.7 and refer Table 7.1) indicate that chemicals are not the cause of the dermatitis experienced by the farmers. All the other factors such as sex of the farmers; age group of the farmers; method of paddy field farming; the sowing of seed phase in paddy planting, harvesting of paddy, water sources for domestic usage; general animal husbandry; and the rearing of buffaloes, chicken as well as goats have no significant associations with the occurrence of dermatitis (see Table 7.1).

**Table 7.1: The Pearson's Chi-square Test of Association Values ( $\chi^2$ ) for All Factors in Association with the Occurrence of Dermatitis**

Factors	$\chi^2$	df	p	S*,NS
Village	16.402	3	0.001	S*
Sex	0.125	1	0.723	NS
Age Group	5.105	5	0.404	NS
Preparation of Field before planting season begin	4.664	1	0.031	S*
Method used during Preparation of Field	0.923	3	0.829	NS
Sowing of Seeds (Menyemai)	3.721	2	0.156	NS
Transplanting of Seedlings (Mengubah)	7.469	2	0.024	S*
Application of Fertilizer (Membaja)	2.747	2	0.253	NS
Type of Fertilizer Used	4.502	4	0.342	NS
Weeding of Field/Application of Pesticides (Merumput)	1.878	2	0.391	NS
Type of Pesticides Used during Weeding Stage	9.666	9	0.378	NS
Harvesting of Paddy	2.131	2	0.345	NS
Type of Pesticides Used during Harvesting Stage	12.571	8	0.130	NS
Hours spent in Field during the planting season	10.027	7	0.187	NS
Water Source For Farming	8.440	3	0.038	S*
Waster Source for Domestic Usage	5.121	3	0.163	NS
Animal Husbandry	1.169	1	0.280	NS
(a) Rearing of Chicken	0.766	1	0.382	NS
(b) Rearing of Duck	4.561	1	0.033	S*
(c) Rearing of Buffalo	1.138	1	0.286	NS
(d) Rearing of Cow	9.188	1	0.003	S*
(e) Rearing of Goat	0.275	1	0.600	NS

S\* = Significant at the 0.05 level

NS = Non Significant at the 0.05 level

**Table 7.2: Summary of the Occurrence of Dermatitis Among Paddy Field Farmers According to Village**

<b>Village</b>	<b>Infected</b>	<b>Not infected</b>	<b>Total</b>	<b>Occurrence Rate (%)</b>
Tok Junuh	29	21	50	58.00
Alor Bakat	73	114	187	39.04
Serdang Muda	30	32	62	48.40
Serdang Surau	40	20	60	66.67
<b>Total</b>	<b>172</b>	<b>187</b>	<b>359</b>	<b>47.91</b>

From Table 7.2 and Section 5.1 it can be seen that the highest number of infected cases is from Kampung Alor Bakat followed by Kampung Serdang Surau, Kampung Serdang Muda and the least numbers of infected cases are from Kampung Tok Junuh. However if we look at occurrence rate of dermatitis, Kampung Alor Bakat has shows the lowest occurrence rate at 48.40 per cent whereas Kampung Serdang Surau shows the highest occurrence rate of dermatitis (66.67 per cent), which is two thirds of the farmers population. The reason for this will be discussed at the end of this chapter when all other factors have been taken into consideration. As shown in Table 7.1 and Section 5.2 there is no significant association between the sex and age group with the occurrence of dermatitis, even though more male farmers are infected than female farmers. This is due to the fact that more paddy farmers are males compared to females (see Table 3.5.2) therefore it is expected that there will be a higher number of infected males than females.

The hours spent in the field also was not a factor contributing to the occurrence of dermatitis, this suggested that the dermatitis is not due to a cumulative effect of chemicals if chemicals involved, since the time of exposure is not a factor that results in the occurrence of dermatitis. If a cumulative effect occurs then red dots or rashes would appear when the threshold level is reached. There is no significant association between the occurrence of dermatitis with the use of fertilizers and pesticides (Section 5.2.4, 5.2.5 and 5.2.6). Hence we can safely say that the probability of contact dermatitis is low. But in these cases the rashes and itch occurs when farmers come out of the paddy fields and the reoccurrence occurs once they go into the field again (Section 6.4 and Section 6.5). No significant association has been found between the occurrence of dermatitis with the types of pesticides and fertilizers used. Therefore chemicals can be ruled out as a possible cause of dermatitis in this case.

There is a significant association between the occurrence of dermatitis and the type of water sources for farming (Table 7.1) and the highest prevalence occurs amongst farmers using water from the irrigation canal ('taliair') (Table 5.3.1). It was found that 75 per cent of the users were infected. However it should be noted that only four people used the water from the irrigation canal and this sample is too small for the above stated statistic to give an accurate measure.

There is no significant association between the occurrence of dermatitis and the water sources for domestic usage, probably because the water is boiled. It may also be due to the fact that the water sources for domestic usage are different from that for farming since 99.7 per cent of the domestic usage was either from the well or from the piped water which is free from the presence of cercariae.

There is no significant association between the overall animal husbandry with the occurrence of dermatitis (Section 5.4) but when the animal husbandry was broken down into the different types of animal, a significant association between the occurrence of dermatitis and the rearing of ducks and cows (Section 5.4.2 and 5.4.4, respectively) was determined. However there is no association between the rearing of chicken, buffaloes and goats with the occurrence of dermatitis (Section 5.4.1, 5.4.3 and 5.4.5, respectively). The reason for this is that for goats and buffaloes the number of villagers rearing these animals are small and therefore the test of association may not be significant for such a small number and also another factor may be that all three animals may not carry any cercariae within their body.

From all the factors above we know that the highest number of dermatitis cases was in Kampung Alor Bakat which has the lowest occurrence rate of dermatitis and this has led us to further investigate the factors (water sources for farming, rearing of duck and cows) that had an association with the occurrence of dermatitis with the different villages. Table 7.3 shows the distribution pattern of the factors according to the different villages.

Using Pearson Chi-Square test of association, an analysis for the association between the villages and the occurrence of dermatitis and the water source used for farming was carried out and it was found that only Kampung Serdang Tua had a significant association with the occurrence of dermatitis and the water source used for farming as shown in Table 7.4.

Another association was carried between the villages, the occurrence of dermatitis and the rearing of ducks and cows. The results of the association were tabulated in Table 7.5. The results showed that there is a significant association for Kampung Tok Junuh with occurrence of dermatitis and the rearing of ducks while for Kampung Alor Bakat there is a significant association with occurrence of dermatitis and the rearing of cows and ducks. There is no significant association found for the rest of the variables.

**Table 7.3: Distribution of Occurrence of Dermatitis and Water Sources for Farming, Rearing of Ducks and Cows According to the Different Villages**

Factors		Occurrence of Dermatitis	Tok Junuh	Alor Bakat	Serdang Muda	Serdang Surau (Tua)	Total
Water Sources For Farming	River	Yes	19	37	16	25	97
		No	11	53	16	4	84
	Stream	Yes	9	34	13	15	71
		No	7	58	15	15	95
	Irrigation Canal	Yes	1	2	-	-	3
		No	1	-	-	-	1
	Unavailable	Yes	-	-	1	-	1
		No	2	2	1	1	6
Rearing of Ducks	Yes	Yes	21	33	9	9	72
		No	8	40	21	31	100
	No	Yes	9	35	9	5	58
		No	12	79	23	15	129
Rearing of cows	Yes	Yes	18	36	14	15	83
		No	11	37	16	25	89
	No	Yes	9	24	19	9	61
		No	12	90	13	11	126

**Table 7.4: Results of the Pearson Chi-square Test of Association between the Villages, Occurrence of Dermatitis and Water Source Use for Farming**

<b>Factors</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>p</b>
Kampung Tok Junuh vs Occurrence of Dermatitis vs Water Source From Field	3.185	3	0.364
Kampung Alor Bakat vs Occurrence of Dermatitis vs Water Source From Field	4.722	3	0.193
Kampung Serdang Muda vs Occurrence of Dermatitis vs Water Source From Field	0.078	3	0.962
Kampung Serdang Surau (Tua) vs Occurrence of Dermatitis vs Water Source From Field	10.733	3	0.005*

\* Significant at the 0.05 level

**Table 7.5: Results of the Pearson Chi-square Test of Association between the Villages, Occurrence of Dermatitis, Rearing of Ducks and Cows**

<b>Factors</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>P</b>
Kampung Tok Junuh vs Occurrence of Dermatitis vs Rearing of Ducks	4.433	1	0.035*
Kampung Alor Bakat vs Occurrence of Dermatitis vs Rearing of Ducks	4.046	1	0.044*
Kampung Serdang Muda vs Occurrence of Dermatitis vs Rearing of Ducks	0.26	1	0.871
Kampung Serdang Surau (Tua) vs Occurrence of Dermatitis vs Rearing of Ducks	0.017	1	0.829
Kampung Tok Junuh vs Occurrence of Dermatitis vs Rearing of Cows	1.1810	1	0.179
Kampung Alor Bakat vs Occurrence of Dermatitis vs Rearing of Cows	16.313	1	0.000*
Kampung Serdang Muda vs Occurrence of Dermatitis vs Rearing of Cows	1.004	1	0.316
Kampung Serdang Surau (Tua) vs Occurrence of Dermatitis vs Rearing of Cows	0.313	1	0.576

\* Significant at the 0.05 level



Therefore based on this we can deduce that the probability of the high occurrence rate in Kampung Serdang Tua is due to the fact that most of the farmers are using water from the river for farming. From Table 7.3 we can see that the occurrence of dermatitis is higher in the river water than that of the stream (anak sungai). The highest numbers of infection occurs in Kampung Alor Bakat and this could be due to the fact that this place has the highest number of farmers rearing ducks and cows compared to other villages, and animal rearing (ducks and cows) is a factor that has been found to contribute to the occurrence for dermatitis. This is supported by the fact that the rearing of these animals has a significant association with the occurrence of dermatitis in Kampung Alor Bakat (Table 7.4).

From this we can deduce that the probable cause of dermatitis may be due to the cercarial dermatitis rather than the contact dermatitis since there was no significant association found between the occurrence of dermatitis with the use of pesticides or fertilizers. Also there is no reason for a cumulative effect of irritant that causes either the irritant contact dermatitis or allergic contact dermatitis since the prevalence of dermatitis has no significant association with the hours spent in field where the exposure to chemicals may exceed the tolerant doses if exposed for too long or by spending a long time in the field. There was also no significant association found between the types of pesticides and fertilizers used with the occurrence of dermatitis. Therefore this further rejects the hypothesis that the dermatitis is due to contact dermatitis.

During the period of the study aquatic snails (golden apple snail *Indoplanorbis exustus*) were collected and cercariae were isolated from the snails. Although the species of the cercariae was not identified but the cercariae collected had the characteristic forked tail of the schistosomes (Dr. Stephen Ambu, pers. com.) These cercariae could be the cause of the dermatitis. A detailed examination of the cercariae should be conducted to determine their identity. Unfortunately, the samples of the cercariae were not available for further studies.

That dermatitis was due to cercarial dermatitis was supported by the fact that a significant association was found between the preparation of field before planting begins and the transplanting of paddy seedlings where in both stages, the field was filled with water (Section 5.2.1 and Section 5.2.3). The presence of snails and the fact that these snails were shedding forked tail cercariae further proved that the causative agent is schistosome cercariae. The significant association found between the occurrence of dermatitis and the rearing of ducks ( $\chi^2 = 4.561$ ,  $df = 1$ ,  $p = 0.033$ ) and cows ( $\chi^2 = 4.561$ ,  $df = 1$ ,  $p = 0.033$ ) point to the fact that the cercarial dermatitis is most probably caused by cercariae from the schistosomes from these two animals. These animals are host to *T. brevis* (in duck), *S. spindale* (in cow) and *S. nasale* (in cow) (see Table 1.1). The cercariae from these animals can invade human skin causing dermatitis.

### 7.3 Critic of Questionnaire

One major limitation is the questionnaire design. This is also true for most surveys where inadequacies are only detected after the surveys were conducted. In this survey certain questions, which can give a better statistical analysis, were left out. The location of the paddy fields where the farmers work was not included. This may be important since the four villages are located next to each other and they probably work in the same paddy fields or paddy fields using the same water sources. If this question is included than we can determine the association (if any) between the locations of the paddy field and the occurrence of dermatitis.

Also the administration of the questionnaire is very important. In most cases incomplete data collection is due to the fact that the interviewers may have failed to ask pertinent questions. In this study the limitation is clear in questions 11 and 17. In question 11, the majority of the respondents could not remember the name of the chemicals and the types of pesticides or fertilizers used. This situation can be improved if the interviewer had asked to look at the sample of pesticide or fertilizer. As for question 17 which concerns the number of times being infected and length of time being infected, a high number of respondents stated that the numbers of times being infected was every time they went to the field. In this situation the interviewer should have probed further because "every time" will not give the number of years they are being infected and we also do not know how many times they plant paddy in a year.

## **7.4 Control and Prevention of Cercarial Dermatitis**

Section 7.2 shows that the dermatitis suffered by the farmers in the 4 villages in Kelantan is most likely to be cercarial dermatitis rather than contact dermatitis. Cercarial dermatitis hence caused a serious economic situation affecting food production and economic loss to farmers. During the recent update visit to the study sites, it was found that certain portions of the fields were not used because of dermatitis and in extreme cases some paddy field farmers have converted their paddy fields to tobacco fields. The control of the dermatitis is important to prevent further conversion of paddy land to other types of products.

The control of the cercarial dermatitis should be carried out using an integrated approach combining both biological and chemical methods although as far as possible chemicals, should be not be used or if necessary to be used with great care. Since a significant association was found between the occurrence of dermatitis and the rearing of ducks and cows (as explained in Section 1.2), it is likely that the cercariae is from schistosomes of cows or ducks or both. One way to control cercarial dermatitis is to keep these animals in a fenced area away from the water ways to prevent them from coming into contact with the irrigation water or water sources for paddy farming.

The snails are intermediate hosts of schistosome, and are important in the life cycle of the cercariae, causing cercarial dermatitis. Control of the identified snail hosts forms one of the most important biological means for the control and prevention of cercariae dermatitis. In biological control the intermediate host of the cercariae species, the snails, could be eliminated using natural predator.

Snails can also be eliminated using chemicals although this is not encouraged. In order to effectively plan and evaluate snail control measures, knowledge of the species, their ecology, bionomics and population dynamics of the molluscan hosts is clearly important. Fluctuations in snail population density and in the production of cercariae in many tropical areas are very pronounced, and transmission may be limited and related to the presence of water during certain times of the year (Bradley and Webbe, 1978 and Webbe, and Jordan, 1993). Identification of the snail is important in order to find a natural biological and chemical control agents. The use of chemical control should only be used for limited period of the year, and with proper instructions.

The removal of water from the aquatic habitat as suggested by Webbe and Jordan (1993) although it is an effective measure to eliminate the cercariae is not a viable solution for wet paddy field ecosystems where water plays an important part in the growth of rice. In areas where paddy or rice growing is the important farming activity, community involvement must be established in order to pursue effective measures (WHO, 1973, Webbe and Jordan, 1993) either in a community effort to physically remove snails from the paddy fields or consciously prevent ducks and cows into water sources meant for the paddy fields.