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A Study on Parasite Fauna of Rats and Shrews Caught at Three Wet Markets in Kuala Terengganu, Malaysia

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Abstract

Rats and shrews are intermediate host for several pathogenic microbial species and live close to human. This study aims to determine ecto- and endo-parasites in these pests at different wet markets in Kuala Terengganu. A total of 14 rats and shrews were trapped from Pasar Batu Enam, Pasar Chabang Tiga and Pasar Besar Kedai Payang from November 2015 to February 2016 by wire traps measuring 15 x 15 x 42 cm and baited with shrimp paste and dried fish. The hosts examined were *Rattus muelleri, R. norvegicus, R. exulans* and *Suncus murinus*. The fur and skin combing was performed to collect and identify the prevalence of mites and lice. Meanwhile, the floatation technique was conducted on faecal specimen to identify the presence of helminth eggs. The post-mortem on these rats and shrews were conducted to identify the endoparasites from its internal organs. There was no significant difference ($p>0.05$) between frequency of parasite from these study sites. The mites found on skin were *Laelaps nuttali* and lice were *Polyplax spinulosa*. It indicate that Cysticercus (larva of *Taenia taeniaformis*), adult *T. taeniaformis*, *Hymenolepis diminuta, Capillaria hepatica* and *Nippostrongylus brasiliensis* are the common endoparasite species found in the liver, lung, stomach, small and large intestine of rats in these three wet markets of Kuala Terengganu. Besides, *Strongyloides* spp. egg was noted. Therefore, the rats and shrews found in these wet markets are hosts to several zoonotic parasites and it could pose a health risk to humans.

Key words: Ectoparasite, endoparasite, public health, rats, shrews, wet market

1. Introduction

Rats are usually near to human populations and can transmit disease (Gage, 1999). The wild rat community consists of commensal and forest rats. The commensal rats in Malaysia are *Rattus exulans, R. rattus diardii* and *R. tiomanicus*, while the forest rats are *Leopoldamys sabanus, Maxomys rajah, M. surifer, M. whiteheadii* and *Sundamys muelleri* (Syed Arnez and Mohd Zain, 2006). Ectoparasites and endoparasites of rats

take the part as the main role in the zoonotic cycles of various diseases. Ectoparasites invade the outside body surface of vertebrates (Hanafi-Bojd et al., 2007). In Malaysia, the main ectoparasites of rodents which is identified to be of public health importance are acarines which include most of ticks and mites (Nadchatram, 2008). There are also several studies on ectoparasites of rodents in Malaysia have been carried out (Audy and Nadchatram, 1957; Kohls, 1957; Nadchatram et al., 1966; Lim, 1972; Zahedi et al., 1984; Ho et al., 1985; Ho and Krishnasamy, 1991; Shabrina, 1990; Mariana et al., 1996; Salleh et al., 2003; Chulan et al., 2005). There are few studies on endoparasites of urban and wild rodents that have been conducted in Malaysia by Yap et al. (1977), Ambu et al. (1996), Singh and Cheong, (1971), Krishnasamy et al. (1980), Leong et al. (1979). These studies indicate the prevalence of endoparasites of rats at different habitats and it elucidate how the successful of host-parasite relationship. A lot of endoparasites species can be found in rat's tissues, organs and intestinal contents in which they give the worst implications on human health (Paramasvaran et al., 2009a).

Pasar Chabang Tiga, Pasar Besar Kedai Payang and Pasar Batu Enam are local wet markets which is located in Kuala Terengganu, Terengganu, Malaysia. These wet markets are actively operated to sell the vegetables, fruits, meats, fishes and groceries to the local community nearby. The presence of those sell items acts as the main food source for rodents. Thus, it is a good place for their survival and this condition significantly increases their number of offspring. Rats and shrews are possible to contaminate the food, environment, and water source with their parasites through urine, faeces and fleas. Since these markets operate actively for fresh produce wholesale, it may affect the sanitary condition of the products at each stall. Thus, it might have the possibility to harm the public through zoonotic disease. Parasites in these rodents are unknown which the information is still lacking especially in these wet markets. Therefore, there is a need to study on rats and shrews caught in these three wet markets in Kuala Terengganu. This study aims to identify the endoparasites and ectoparasites found in these rats and shrews; to study the abundance of parasites according to its different organs of the rats and shrews and to compare parasites between three markets.

2. Materials and Methods

2.1. Trapping locations

Trapping of rats and shrews were conducted for three days in each month of November, December 2015, January and February 2016 in the three wet markets using 42 live traps. 14 live traps were used in each market. The dried fishes and shrimp pastes (*belacan*) used as baits at each study site. The rats and shrews were trapped from Pasar Besar Kedai Payang (N 05º20'08.7432" E 103º08'07.1484"), Pasar Chabang Tiga (N 05º19'04.5084" E 103º07'32.0304") and Pasar Batu Enam (N 05º20'47.4144" E 103º05'30.3072").

Figure 1. The study site of Pasar Besar Kedai Payang, Pasar Chabang Tiga and Pasar Batu Enam in Kuala Terengganu, Malaysia (Google Maps, 2020).

2.2. Trapping

Ethical approval was obtained from the Department of Environmental Health, Kuala Terengganu City Council. All the rats and shrews were trapped by one door collapsible steel wire traps measuring 15 x 15 x 42 cm in all three wet markets. The traps were placed at several stalls at each wet market. The captured rats and shrews were collected within 3 days. Trapped rats were killed humanely by placing them into a cloth bag containing cotton wool soaked with chloroform (Paramasvaran et al., 2009a).

2.3. Rats and shrews identification

The morphometric measurements of the head-body, ear, tail, hind foot lengths and weight were recorded and each rat's sex and species were determined. Species identification was based on descriptions by Medway (1983) and Tweedie and Woods (1978). The baits were baked for effective trapping of rats and shrews.

2.4. Ectoparasite collection

The ectoparasites were collected by thoroughly combing through the fur using a fine tooth comb onto a plain white paper. Forcep was used to take out ectoparasites from the skin of rats when it is hard to dislodge them by combing (Nur Syazana et al., 2013). The ectoparasites were collected, counted, preserved in specimen bottle containing 70% ethanol and labelled for identification. A different specimen bottle was used for each rat or shrew. The collected data were included the site of location, animal ID and type of ectoparasite collected. The lice and mites specimen was observed under the microscope for identification using keys, illustrations and publications by Wall and Shearer (2001).

2.5. Post-mortem and endoparasites collection

The skin of rat or shrew was removed and the body cavity was slit open from the oesophagus to anus revealing the internal organ of heart, lung, kidney, stomach, intestine and liver. Each selected organ was removed

into different petri dishes that contained with saline solution and dissected carefully under the stereo microscope and examined for helminths. The stereo microscope, compound microscope and Dino-Eye AM4023XC Eyepiece Camera with Adapter Collars and C-Mount were used for this purpose. All parasites were washed with saline, fixed in 70% alcohol. A different specimen bottle was used for each rat or shrew. The helminths then were identified using keys, illustrations and publications by Dunn (1969). The microhabitats (predilection site) of each endoparasite species were recorded. The floatation technique was used to confirm the presence of helminth ova from the intestinal content of rats or shrews (Ministry of Agriculture, Fisheries and Food, 1986).

2.6. Data analysis

Numbers of rats or shrews infected and their parasites were reported. IBM Statistical Package for Social Sciences (Version 21) was used to analyze the data. The Fisher exact test was performed to test the significance of the frequency of parasites in three study sites.

3. Results

3.1 Ectoparasite collected from host species

Table 1 shows that three study sites were covered with the species of ectoparasites which were mites and lice from some Malayan rats and shrews in these locations.

Table 1. Number of different species of rats and shrews caught in each study site and number of host positive for ectoparasite.

Study site	n	Host	Ectoparasite	Number of host (+) Ectoparasite
PB6	2	*S. murinus*	Not found	0
	3	*R. muelleri*	Mites *Laelaps nuttali*	3
			Lice *Polyplax spinulosa*	1
	7	*R. norvegicus*	Mites *Laelaps nuttali*	7
			Lice *Polyplax spinulosa*	2
PC3		*S. murinus*	Not found	0
PBKP		*R. exulans*	Mites *Laelaps nuttali*	1

n=number of rats or shrews collected from each study site, Pasar Batu Enam (PB6), Pasar Chabang Tiga (PC3) and Pasar Besar Kedai Payang (PBKP), Kuala Terengganu, Terengganu, Malaysia.

3.2. Endoparasite collected from host species

Table 2 indicates the presence of endoparasite from *S. murinus*, *R. muelleri*, *R. norvegicus* and *R. exulans* in these study sites. Endoparasites were discovered from Class Cestoda and Nematoda.

Table 2. Number of different species of rats and shrews caught in each study site and number of host positive for endoparasite.

Study site	n	Host	No. of host (+) Endoparasite (Cestode)	No. of host (+) Endoparasite (Nematode)
PB6	2	*S. murinus*	0	0
	3	*R. muelleri*	1	3
	7	*R. norvegicus*	3	5
PC3	1	*S. murinus*	0	0
PBKP	1	*R. exulans*	0	1

n = number of rats or shrews collected from each study site, Pasar Batu Enam (PB6), Pasar Chabang Tiga (PC3) and Pasar Besar Kedai Payang (PBKP), Kuala Terengganu, Terengganu, Malaysia.

Table 3 shows the number of endoparasites collected from some predilection site or organ of the rats and shrews. The types of endoparasites found were from cestode and nematode.

Table 3. Number of endoparasites count from different predilection site of host in study sites, Pasar Batu Enam (PB6), Pasar Chabang Tiga (PC3) and Pasar Besar Kedai Payang (PBKP), Kuala Terengganu, Terengganu, Malaysia.

Endoparasites	Predilection site	Number of parasites			Total
		PB6	PC3	PBKP	
Cestodes Cysticercus (Larva of *Taenia taeniaformis*)	Liver	4	0	1	5
Taenia taeniaformis (Adult)	Lung and small Intestine	16	0	0	16
Hymenolepis diminuta	Small intestine Stomach	8 6	0 0	0 0	8 6
Nematodes *Capillaria hepatica*	Liver	0	0	6	6
Nippostrongylus brasiliensis	Small and large Intestine	27	0	0	27

3.3. Comparison of parasites by different study sites and host species

The parasites which made up of ecto- and endoparasites were found in four host species in these study sites. The positive sign represents the presence of the parasite in these stated host species (Table 4).

Table 4. Comparison between ectoparasite and endoparasite according to the species of rats and shrews and study sites, Pasar Batu Enam (PB6); Pasar Chabang Tiga (PC3) and Pasar Besar Kedai Payang (PBKP), Kuala Terengganu, Terengganu, Malaysia.

Host species	Study site	Lice	Mites	Cestodes	Nematodes
S. murinus	PB6	-	-	-	-
	PC3	-	-	-	-
R. muelleri	PB6	+	+	+	+
R. norvegicus	PB6	+	+	+	+
R. exulans	PBKP	+	+	-	+

4. Discussion

A total of 14 host species of rats and shrews were caught from Pasar Chabang Tiga, Pasar Batu Enam and Pasar Besar Kedai Payang. The present rat and shrew population in study areas was represented by *R. norvegicus* (n=7)*, R. muelleri* (n=3)*, R. exulans* (n=1)*, and S. murinus* (n=3). *S. murinus* were caught from two of these three study sites which are Pasar Batu Enam and Pasar Chabang Tiga. Different host species were trapped at these study sites. According to Priscilla et al. (2015), the different medium and high density residential areas, social status and food availability might be the key factors that determined the types of rodents living in different habitats.

Only 4 different host species were caught which the recorded with lower compared to previous studies conducted. The result of first sampling was negative, which the number of rat's caught was zero. Monsoon season with heavy rain during first sampling and second sampling was effect the data sampling. Weather can affect trapping success where dry days can increase the yield of trapping (Kelly and Caro, 2003; Paschal, 2007). The traps became less effective for trapping because the baits were wet and became odourless caused by the rain water in these study sites. The rats were not preferred with this bait. According to Medway (1983), Malayan rats are preferred with strong odour foods. A lot of food sources in the wet markets such as chicken, vegetables, fishes, banana, tapioca, rice are more attracted rather than the current baits. It is needed to consider the rodent and house shrew behaviour in these study sites. They prefer the strong odour foods. After the baits, shrimp paste and dried fish were baked for third sampling, the numbers of rats trapped were becoming increased than before. Careful selection of bait can increase the number of animals caught in relation to the habitat sampled (Lim, 1972).

However, kittens were trapped inside the collapsible trap due to the attractant of odour baked dried fish. It was randomly put the trap in the markets especially below the stall tables and near the drain as long as the rat expected to trap inside. These places were preferred by rat because there were a lot of food sources there rather than another place. The presence of kittens was also reduced the possibility for rats to be trapped. Moreover, the possibility of one door collapsible trap for rats being trapped supposed to be one individual only. However, the traps were able to trap the rats by two till three individual per trap as shown in this study at Pasar Batu Enam. It may due to food competition between rats population in the area, plus the rainy day was a bit of problem for them to find foods. Hence, the possibility for these rats to enter the trap by more than one individual is higher than before.

Moreover, Pasar Chabang Tiga reported with lowest number of rats and parasites because the market age was less than 5 years operation and the newest among three wet markets. The markets need a long period of time for suitable condition and environment for rat population to live inside. It was also the same case with previous studies by Priscilla et al. (2015) where one of three study areas, Recycle Energy Sdn Bhd Semenyih, Selangor was regularly cleaned and the waste disposal did not support the breeding place for rats as the waste was constantly shifted in order to be separated for recovery processes. In current study, Pasar Chabang Tiga did

not support the breeding site for rat population there. Moreover, the presence of cats at Pasar Chabang Tiga might reduce the possibility for population of rat to live there.

In this study, *R. norvegicus* recorded with the highest number of ectoparasites followed by *R. muelleri* and *R. exulans.* The types of ectoparasite found from these rats were mites and lice; there were no ticks and fleas found in this study. The most abundant mite species, *L. nuttali* were more abundant than the most abundant lice species, *P. spinulosa*. *P. spinulosa* also were common lice species recovered. This lice species is considered to be public health importance because this rat louse is known to harbor plague bacilli and transmit tularemia and bartonellosis to humans and play an adjunctive role in the transmission of murine typhus and plague from rat to rat (Zahedi et al., 1984; Shabrina, 1990).

P. spinulosa were common lice species recovered indicating the wide distribution of this ectoparasites among the rat population (Nur Syazana et al., 2013). Besides, Zahedi et al. (1984) found *P. spinulosa* infecting the rat populations of Ulu Klang while Paramasvaran et al. (2009b) reported this species infesting urban rats. This lice and mites need suitable condition for the survival. Mites thrive in moist circumstances and are unable to survive for more than a few days in low humidity (Nur Syazana et al., 2013).

The *L. nuttali* was found frequently on the rats rather than another species reported from previous studies which are *Ornithonyssus bacoti* and *Noetodres muris* (Paramasvaran et al., 2009b). Two mite species, *L. nuttali* and *L. echidninus* were the most predominant and this result concurred with studies by Ho and Krishnasamy (1990) and Paramasvaran et al. (2009b). Both of these were found at the skin of the rat species. The existence of these blood-sucking lice parasites are more in young, neglected and under-nourished rats (Hoppmann and Barron, 2007). However, house musk shrew, *S. murinus* has shown that there was no ectoparasite found in this species.

The absence of ticks and fleas on the rats and shrews may be due to the unsuitable environment for their survival. Paramasvaran et al., (2009a) also reported there was no tick found from the study. Fleas spend more time in the nest of their host rather than on the host itself (World Health Organisation, 2000). There was no louse recovered from the rats or shrews caught in the Pasar Chabang Tiga and Pasar Besar Kedai Payang. This may due to unsuitable ecology for louse to survive rather than Pasar Batu Enam which provides more favourable condition for this ectoparasite to survive. The presence of ectoparasites in these rats is important, since information about the distribution of these parasites and their hosts give sign to the potential transmitting newly emerging diseases in this area (Smith, 1956; Shabrina et al., 1989; Nadchatram, 2008, Madinah et al., 2011).

In this study, *R. muelleri* and *R. norvegicus caught* from Pasar Batu Enam indicated the presence of cestode and nematode, while *R. exulans* from PBKP found with nematode only. There was also no any endoparasite found from *S. murinus*. Cestodes were found with higher number than nematodes. Moreover, cestodes were found with high number in stomach rather than in the liver. The infected predilection sites of host reported were liver, lung, small intestine, large intestine and stomach. In this study, small intestines were reported with highest number of endoparasites.

Cysticercus which is the larva of *T. taeniaformis* was found with total of five numbers from Pasar Batu Enam and Pasar Besar Kedai Payang only. Cysts were found in yellowish colour and round shape. Lung and

small intestine reported with presence of adult *T. taeniaformis,* cat tapeworm with higher number than *C. hepatica* and, which about 16. There were a lot of cats in these wet markets. Adult *T. taeniaformis* occurs in the small intestine of wild and domestic cats throughout the world (McInness et al., 2014). Rats serve as intermediate hosts for the cat tapeworm, *T. taeniaformis* (Karimi et al., 2008). Rodents become infected by ingesting feed or bedding contaminated with cat faecal material. Following ingestion of the infectious egg, the larva migrates through the intestinal wall of the rat and develops into cysticerci or cysts in the liver of rat (McInness et al., 2014). The life cycle is completed when the cat as the definitive host ingests the infected rodent. The cysts are common in the liver of rats, mice, voles and other wild rodents (Baker and Flynn, 2007). *T. taeniaformis* metacestode cysts have been reported in the livers of wild rats, *R. norvegicus* in small mammals in Malaysia (Paramasvaran et al., 2005). The helminth community structures of two urban rat populations in Malaysia were investigated and three cestodes and one acanthocephalan were recovered (Mohd Zain et al., 2012). Additionally, *T. taeniaformis* was noted in rodents in Kuala Lumpur (Paramasvaran et al., 2009a). Yap et al. (1977) reported *T. taeniaformis* in commensal rats from a developed rainforest area. *T. taeniaformis* also may transmit to humans (Miyazaki, 1983). The close association of rats in areas such as Kuala Lumpur potentially contaminating the environment, water and food sources remains a public health hazard (Paramasvaran et al., 2009a).

Furthermore, cestode, *H. diminuta* was found frequently in the stomach and small intestines of host species in this study. According to Miyazaki (1983), *H. diminuta* and *T. taeniaformis* are known to have been transmitted to humans. Sinniah (1979) reported infections of *H. diminuta* in palm oil estate workers positive for helminths. Khairul (1978) also reported the infection of this same tapeworm in a villager from a fishing community in Teluk Bahang, Penang. This species also reported from Peninsular Malaysia by previous studies (Leong et al., 1979; Krishnasamy, 1980). Moreover, transmission of these zoonotic parasites to humans has been reported to be prevalent in areas where temperatures are high and sanitary conditions are poor (Miyazaki, 1983). *Hymenolepis* spp. generally need intermediate hosts such as insects, fleas and cockroaches for their development (Paramasvaran et al., 2009a). Through autoinfection, the eggs of this species can hatch and grow into adult in host's intestine. This can cause the number of adult worm become increase, and then causing severe pathological problems to host (Miyazaki, 1983). According to Parija (1990), about 21 million people suffer from hymenolepiasis and mostly, the patients are from tropics and subtropics region. Moreover, infection of *H. diminuta* may cause diarrhoea or occasionally cachexia in human (Sun, 1988).

The egg of *Strongyloides* spp. was presence in the intestinal content which was confirmed by floatation techniques in this study. According to Shintoku et al. (2005), *Strongyloides* spp. is gastrointestinal parasite that normally found in wild rat's large intestine. *Strongyloides* spp. is one of the most prevalent infections in rat in Peninsular Malaysia (Premaalatha et al., 2010).

C. hepatica was found in liver of the host from Pasar Batu Enam in this study. In Malaysia, *C. hepatica* was first reported by Audy et al. (1957), Schacher and Cheong (1971). *C. hepatica* in rodents is mainly transmitted through scavenging carrion. Other methods such as predation or faecal and mechanical transmission by carrion beetles and fly larvae have been proposed by Momma (1930) and Mobedi and Arafaa (1971) as possible modes of infection. The feeding habits of these beetles are well known but the development and

transmission of infective eggs of *C. hepatica* through beetles have not been fully established. This parasite appears to be widespread throughout Malaysia with a wide range of hosts among the rodent species. Sinniah (1979) reported 15.5% of the 3,324 rats examined from 15 localities in Peninsular Malaysia were infected with *C. hepatica.* It causes a disease known as Hepatic capillariasis, a zoonosis, mainly a disease of rats and is rarely seen in man (Siti Shafiyyah et al., 2012). However, this parasite can cause hepatitis with marked eosinophilia and persistent fever in human (Paramasvaran et al., 2009a).

Other nematode recovered in the rats was *N. brasiliensis* that found from small and large intestine with the highest number among the other endoparasites. This rat's hook worm was the common intestinal helminth species in the rat population here as previously reported (Leong et al., 1979; Syed Arnez and Mohd Zain, 2006; Paramasvaran et al., 2009a; Siti Shafiyyah et al., 2012).

This study showed that endoparasites were highly in number in intestine of rats caught. From the previous study in Kuala Lumpur, the intestinal parasites were highly prevalent in the rats (Siti Shafiyyah et al., 2012). Plus, increasing in the amount of garbage collected and the rise in the number of slums in big cities contribute to the high prevalence of rats. This was similar situation with Kuala Terengganu as the developing city nowadays. Plus, the relatively high rainfall and humidity climate in Malaysia was suitable for the eggs of certain parasites to hatch before the infective larvae penetrated or were eaten by the host (Nur Syazana et al., 2013).

Rats and shrews may directly transmit their parasites to another host. This transmission occurs by burrowing or nesting of parasites in the host and normally happens in conditions of low-host densities in the complex habitat. The process occurs in two stages, firstly through the food and secondly, through the physiological level (Priscilla et al., 2015).

The Fisher exact test value is 0.333 (Appendix). Thus, there was no significant difference ($p>0.05$) between frequency of parasite (mites, lice, nematodes and cestodes) from these three study sites. The host animals live in the same general niche and eat similar types of food such as plant materials and insects. Furthermore, the rats caught were still looked healthy and active even though their body contained and infected with mites, louse, tapeworms and ringworms. This condition revealed the successful rat host-parasite interrelationship in these study areas (Priscella et al., 2015).

The wild rats could risk the human health since leptospirosis is one of the current diseases in Malaysia which peoples are easily exposed with these rats since they are live nearby. From this study, these parasites of rats have the possible to infect the human health in these areas.

5. Conclusion and recommendation

The presence of ectoparasites were determined where mites, *L. nuttalli* and lice, *P. spinulosa* while, endoparasites were *T. taeniaformis, C. hepatica* and *N. brasiliensis.* The parasites studied clearly indicate the risk that humans face in areas. Plus, the rats as reservoir for zoonotic pathogens may cause disease outbreak in these areas if coupled with low level of sanitary. The information gained from this study will be helpful to authorities from the Kuala Terengganu City Council (MBKT) and health department to evaluate current control

methods for pest control and carry out preventive awareness programmes for local communities to improve sanitary. It is suggested that further studies should collaborate in a big team as the study can be conducted in more than three wet markets in Kuala Terengganu, which is need many hands to handle the procedures. Since, MBKT implements the trapping of pest in these wet markets periodically, the future team studies may get the rats trapped from them as it can save time, energy and budget.

Conflicts of Interests

Authors declare that there is no conflict of interests

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Appendix

Parasite Infestation

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Parasite * Frequency	3	100.0%	0	0.0%	3	100.0%

Parasite * Frequency Crosstabulation

			Frequency		Total
			3.00	11.00	
Parasite	1.00	Count	0	1	1
		Expected Count	.7	.3	1.0
		% within Parasite	0.0%	100.0%	100.0%
		% within Frequency	0.0%	100.0%	33.3%
		% of Total	0.0%	33.3%	33.3%
	2.00	Count	2	0	2
		Expected Count	1.3	.7	2.0
		% within Parasite	100.0%	0.0%	100.0%
		% within Frequency	100.0%	0.0%	66.7%
		% of Total	66.7%	0.0%	66.7%
Total		Count	2	1	3
		Expected Count	2.0	1.0	3.0
		% within Parasite	66.7%	33.3%	100.0%
		% within Frequency	100.0%	100.0%	100.0%
		% of Total	66.7%	33.3%	100.0%

Crosstabs

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.000[a]	1	.083		
Continuity Correction[b]	.188	1	.665		
Likelihood Ratio	3.819	1	.051		
Fisher's Exact Test				.333	.333
Linear-by-Linear Association	2.000	1	.157		
N of Valid Cases	3				

a. 4 cells (100.0%) have expected count less than 5. The minimum expected count is .33.

b. Computed only for a 2x2 table