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THE PRELIMINARY ASSESSMENT OF KNOWLEDGE, AWARENESS AND PRACTICES TOWARDS SARCOCYSTOSIS AMONG SABAHAN UNIVERSITY STUDENT IN SELANGOR, MALAYSIA

Nazatul Shazwani Ahmad Damanhuri, Neni Widiasmoro Selamat and Tengku Idzzan Nadzirah Tengku-Idris*

Faculty Health and Life Science, Management and Science University, 40100 Shah Alam, Selangor, Malaysia
**Corresponding author: tengku_idzzan@msu.edu.my*

Abstract

Sarcocystosis is caused by members of genus of *Sarcocystis*, an intracellular protozoal parasite in the phylum Apicomplexa. Most types of *Sarcocystis* have never been related with overt diseases while others have caused clinical cases. *Sarcocystis* spp. is generally disseminated in mammals and animals like birds and reptiles. These living beings cycle through two hosts, which are definitive and intermediate hosts known as predator and prey, respectively. The aim of the study was to access the Knowledge, Awareness and Practices towards sarcocystosis among Sabahan University student in Selangor, Malaysia. The research questionnaire was then be distributed to the chosen universities in Selangor either private or government universities. The mean value of knowledge was 0.5867, 0.19954±SD, awareness was 0.4783, 0.28758±SD and practices was 0.5883, 0.16748±SD. The SD of knowledge awareness and practices were consistent. Overall, the Knowledge, Awareness, Practices levels regarding the human sarcocystosis among Sabahan university student in Selangor, Malaysia were in average level. This may due to the fact that the disease is quite rare in Malaysia. However, the result showed that few of them have the knowledge about about the disease.

Keywords: Sarcocystosis, Knowledge, Awareness, Practices, Student.

INTRODUCTION

Sarcocystosis is caused by members of genus from the family Sarcocystidae, an intracellular protozoan parasite in the phylum Apicomplexa. *Sarcocystis* spp. is ubiquitous in nature and is discovered around the world (Rosenthal, 2020). Two hosts are needed to maintain the life cycle, an intermediate (prey) host, in which the parasite grows into sarcocysts containing infectious zoites that infects the muscles. The definitive (predator) host consumes the intermediate host infected with sarcocysts and becomes infected by intestinal-stage parasites. Then, the definitive host excretes oocysts or sporocysts into the environment (Fayer *et al.,* 2015). Despite the fact that others may exist, only *Sarcocystis nesbitti* has been identified in to utilized humans as accidental intermediate host and non-human primates serve as intermediate hosts, with a snake potentially serving as the definitive host. In addition, two species which are *S. hominis* and *S. suihominis* have been identified in humans as definitive hosts and cattle and pigs served as an intermediate hosts, respectively (Fayer *et al.,* 2015).

In Malaysia, the previous outbreaks of acute muscular sarcocystosis occurred in Pangkor and Tioman Islands that caused over 100 international travelers. They experienced symptoms of relapsing fever and myalgia, headache, diarrhea, coughing and arthralgia. In addition, some of the infected individuals were reported to have facial swelling and *S. nesbitti* was reported to be responsible for the outbreak (AbuBakar *et al.,* 2013; Dubey *et al.,* 2016). The transmission of the disease is proposed via water, where the travelers may accidentally consume contaminated water in Tioman Island. With the lack of basic infrastructures and the unavailability of treated water in Tioman in certain villages, the risk of accidentally ingesting the parasite in the water possesses a huge risk of infection (Shahari *et al.,* 2016).

In this study, the target respondents were the university students from Sabah. Many rural areas in Sabah have been developed into tourism attraction destinations. It is important to possess a good Knowledge, Awareness and Practices (KAP) on the studies of sarcocystosis as it is one of the neglected parasitic infections in the world. Poor practice of sanitation may due to the poor basic infrastructure available in rural areas. For example, lacks of clean and treated water. Apart from it, the target population was being selected due to the limited research done in the targeted population areas. This research was going to assess the Knowledge,

Awareness and Practices of human sarcocystosis among the Sabahan university students in Selangor. In addition, this study was conducted to educate the respondents on the disease in order to reduce the transmission of the disease in the future.

MATERIALS AND METHODS

A cross sectional study was conducted on the Knowledge, Awareness and Practices (KAP), on the sarcocystosis among Sabahan university student in Selangor, Malaysia. The data were collected from Sabahan university student in Selangor, Malaysia. The study was carried out from February 2019 until November 2020.

The sample size was calculated by using Raosoft sample size calculator. Based on the Sabahan student respondent in Selangor University, it shows that only 50 students with a respondent distribution of 95%.

The reference population of this study was Sabahan students in Selangor's university, eligible age 18 to 26 and above around Selangor University after an implementation of the inclusion and exclusion criteria. Inclusion criteria include the student age 18 to 26 years old**,** registered with university in Selangor**,** Sabahan student and student that understand the purpose of the study. Exclusion criteria include Sabahan people in Selangor**,** student that do not understand the purpose of the study and not registered with Selangor's university**.**

Research instruments is an instruments used to acquire, measure, and analyze information from subjects around the research point. The instruments used in this research was a self-administered questionnaires (SAQ) that alludes to a survey that was designed specifically to be done by a respondent without an intervention of the analysts, for example a questioner gathering the information (Lavrakas, 2008). This questionnaire consisted of four sections where the first section was demographic information, followed by Knowledge, Awareness and Practices section. In the demographic part, it consisted of six characteristics of the respondent. In knowledge section, the section focused more on the understandings about the *Sarcocystis* spp. Third part which was the awareness was more to the alertness of the population about the species and last section was more on the daily routine behavior on ways to prevent the species. The questionnaire required respondent to choose based on their understanding either 'yes', 'no' or 'not sure'.

For the statistical analysis, the data was analyzed, transform and entered into the SPSS Windows version 26.0. SPSS for Windows version 26.0, is progressive programming essentially utilized by research researchers which assist them with preparing basic information into the easiest ways. Also, the yield can be gotten through graphical representation so researchers can understand the result easily (Noels, 2018). Descriptive statistics analysis was used to portray the essential highlights of the information in the studies. They give straightforward outlines about the samples and the measures. Proportions of the central tendency and scattering are utilized to depict the quantitative data. For continuous data, trial of the ordinariness is a significant advance for choosing the proportions of central tendency and statistical methods for the data analysis. At the point when the information follows the normal distribution, parametric tests may be used, but if the data is not normally distributed, nonparametric strategies were utilized to compare the groups. There were various strategies used to test the normality of information, including the numerical and visual techniques, also, every strategy has its own focal points and weaknesses (Mishra *et al.*, 2019).

Shapiro Wilk test was used to figure out either the data is normally distributed or not. Also, this test was used since the sample number was less than 50 samples. In this study, the total of samples was only 32 and the test was used to determine whether there are normally distributed or not between the level of Knowledge, Awareness and Practices (KAP) and the sociodemographic characteristics of the respondent. Spearman rho correlation test was used when there is a two variable and both are ranked ordered. Equal intervals are not required so the data no need to be quantitative. In this study, this test was used to observe the correlation between the Knowledge, Awareness and Practices (KAP) towards the sarcocystosis among the Sabahan Universities student in Selangor.

Mann Whitney U test is a non-parametric test that was used to compared the differences between two test (X and Y), when the test are not normally distributed and in a small amount of samples. In this study, it can be compared only for the KAP and the sociodemographic characteristics such as gender and status due to two independent samples. Kruskal Wallis test was used the data have more than two categorical data samples. This test was used to observe whether there are any significant differences between two or more independent group. In this study, it can only be compared between KAP and the sociodemographic characteristics such as ethnic, family, income and age due to more independent samples.

RESULTS

Normality Test

A total of 32 respondents were successfully collected. In this study, Shapiro Wilk test was used because the test was more suitable on the samples that have below then 50 samples. Table 1 shows that the result for knowledge for male was normally distributed which was 0.235. Meanwhile, for the female, the result was 0.000 which was not normally distributed. Then the normality test for awareness was male (0.513), female (0.068) and practices, male (0.240) and female (0.014). Table 2 shows the knowledge of the age 18–20 years old was 0.133, 21–25 years old as 0.005 and 26 and above was 0.481. For awareness, the age of 18–20 years old was 0.044, 21–25 years old was 0.047 and 26 and above as 0.021 and practices score shows that the age of 18–20 years old was0.555, 21–25 years old was 0.014 and 26 and above was 0.150. Table 3 shows the knowledge of the married population was 0.000 and single was 0.021. The awareness showed that the result for single as 0.121 and married was 0.000. While for practices, singles showed a decrease level of 0.002 and marriage was increased by 0.637.

Mean and Standard Deviation

The scale score for mean used in this study was 0 for answer "no", 0.5 for "not sure" and 1 is for "true" answer. Then, according to Table 4, it shows the mean value of knowledge (0.5867, 0.19954±SD), awareness (0.4783, 0.28758±SD) and practices (0.5883, 0.16748±SD). The respondent as a whole has relatively moderate KAP. The SD of knowledge awareness and practices were consistent.

Spearman RHO Correlation Test

In this spearman rho correlation test, Table 5 shows spearman rho in awareness was 0.502 which indicated a positive correlation between the three lists which was Knowledge, Awareness and Practices since the p-value (sig) of 0.005 was less than specified 0.01_{a} level and the practices data was 0.112 which also indicated a positive correlation since the p-value of 0.554 was less than the specified 0.01_{a} level.

Mann Whitney U Test

According to Table 6, the mean knowledge for the gender showed that both genders have the same mean which was 15.50. For the mean of awareness and practices, female was 16.06 and 15.96, whereas, the male was 11.88 and 12.50, respectively. For the mean of status showed in Table 7, single population was 16.11 and married was 10.00 on knowledge. On the other hand, married population is slightly more aware (16.50) and has good practices (22.67) than the single population (awareness: 15.390; practices: 14.70).

Kruskal Wallis Test

According to Table 8, the knowledge of the mixed ethnicity has the highest mean rank compared to the rest (28.00), followed by Malay (17.83), Bajau (19.75), Suluk (8.92), Dusun (17.70), Idahan (3.50), Kadazan (10.00), Bugis (26.00) and Lundayeh (2.00). For awareness, mean rank of Bugis (23.00) which was higher than the rest, with Malay (17.58), Bajau (16.50), Suluk (14.08), Dusun (12.80), Idahan (22.00), Kadazan (6.50), mixed (16.50) and Lundayeh (4.50). Mean rank for practices shows that mixed ethnicity has the highest rank of 27.50, followed by Malay (13.88), Bajau (12.50), Suluk (22.33), Dusun (11.20), Idahan (18.00), Kadazan (13.00), Bugis (7.00) and Lundayeh (18.00). Table 9 shows that young adults with the age between 18 to 20 years old (18.79) were the highest mean in the knowledge result compared to the adult population of 21–25 years old (13.94) and 26 and above (15.79). Then, adult in range of age 21 to 25 years (16.31) old do aware on the sarcocystosis than the other respondents of 18–20 years old (15.29) and 26 and above (13.86). Table 10 shows an income category, where the middle paycheck receiver has knowledge (22.50), awareness (26.00) and practices (27.50) higher than the rest. For the family member category, the lesser members in the family which comprises of two family members have more knowledge (29.50) than people with 2-10 member (16.15) and family member with more than 10 people in a family (10.57) and awareness of 2 family members (16.50), 2–10 members (15.30) and over than 10 members (14.92). Also, family members that have over 10 people have the highest practices (17.67) than 2 family members (7.00) and 2 to 10 family members (15.30) according to Table 11.

Table 1. Normality test by using Shapiro-Wilk test based on gender.

		Shapiro-Wilk		
	Gender	**Statistics**	**Df**	**Sig.**
Knowledge	Male	0.853	4	0.235
	Female	0.805	26	0.000
Awareness	Male	0.916	4	0.513
	Female	0.928	26	0.068
Practices	Male	0.854	4	0.240
	Female	0.898	26	0.014

Table 2. Normality test by using Shapiro-Wilk test based on level of ages.

		Shapiro-Wilk		
	Age	**Statistics**	**Df**	**Sig.**
Knowledge	18 - 20	0.854	7	0.133
	21 - 25	0.819	16	0.005
	26 & Above	0.921	7	0.481
Awareness	18 - 20	0.803	7	0.044
	21 - 25	0.885	16	0.047
	26 & Above	0.772	7	0.021
Practices	18 - 20	0.931	7	0.555
	21 - 25	0.851	16	0.014
	26 & Above	0.860	7	0.150

Table 3. Normality test by using Shapiro-Wilk test based on status.

		Shapiro-Wilk		
	Status	**Statistics**	**Df**	**Sig.**
Knowledge	Single	0.908	27	0.021
	Married	0.000	3	0.000
Awareness	Single	0.200	27	0.121
	Married	0.000	3	0.000
Practices	Single	0.858	27	0.002
	Married	0.964	3	0.637

Table 4. Overall KAP of respondents.

Types	**Score range**	**Mean**	**SD**
Knowledge	0.00 - 1.00	0.5867	0.19954
Awareness	0.00 - 1.00	0.4783	0.28758
Practices	0.00 - 1.00	0.5883	0.16748

Table 5. Overall of KAP correlation test.

Types		**Knowledge**	**Awareness**	**Practices**
Knowledge	Correlation Coefficient	1.000	0.502	0.112
	Sig. (2-tailed)	-	0.005	0.554
	N	30	30	30
Awareness	Correlation Coefficient	0.502	1.000	0.317
	Sig. (2-tailed)	0.005	-	0.087
	N	30	30	30
Practices	Correlation Coefficient	0.112	0.317	1.000
	Sig. (2-tailed)	0.554	0.087	-
	N	30	30	30

Table 6. Mann Whitney U test based on gender.

Types	Gender	N	Mean rank	Sum of rank
	Male	4	15.50	62.00
Knowledge	Female	25	15.50	403.00
	Male	4	11.88	47.50
Awareness	Female	26	16.06	417.50
	Male	4	12.50	50.00
Practices	Female	26	15.96	415.00

Table 7. Mann Whitney U test based on status.

Types	Status	N	Mean rank	Sum of rank
	Single	27	16.11	425.00
Knowledge	Married	3	10.00	30.00
	Single	27	15.39	415.50
Awareness	Married	3	16.50	49.50
	Single	27	14.70	397.00
Practices	Married	3	22.67	68.00

Table 8. Kruskal Wallis test based on ethnicity.

Types	Ethnic	N	Mean rank	Sig.
	Malay	12	17.83	
	Bajau	2	19.75	
	Suluk	6	8.92	0.089
	Dusun	5	17.70	
Knowledge	Idahan	1	3.50	
	Kadazan	1	10.00	
	Bugis	1	26.00	
	Mixed	1	28.00	
	Lundayeh	1	2.00	
	Malay	12	17.58	
	Bajau	2	16.50	
	Suluk	6	14.08	
	Dusun	5	12.80	
Awareness	Idahan	1	22.00	
	Kadazan	1	6.50	0.711
	Bugis	1	23.00	
	Mixed	1	16.50	
	Lundayeh	1	4.50	
	Malay	12	13.88	
	Bajau	2	12.50	
	Suluk	6	22.33	
	Dusun	5	11.20	
Practices	Idahan	1	18.00	
	Kadazan	1	13.00	0.356
	Bugis	1	7.00	
	Mixed	1	27.50	
	Lundayeh	1	18.00	

Table 9. Kruskal Wallis test based on age.

Types	Age	N	Mean rank	Sig.
Knowledge	18-20	7	18.79	0.456
	21-25	16	13.94	
	26 & above	7	15.79	
	Total	30	-	
Awareness	18-20	7	15.29	0.819
	21-25	16	16.31	
	26 & above	7	13.86	
	Total	30	-	
Practices	18-20	7	16.93	0.857
	21-25	16	14.78	
	26 & above	7	15.71	
	Total	30	-	

Table 10. Kruskal Wallis test based on income.

Types	Income	N	Mean rank	Sig.
Knowledge	<RM500	4	8.00	0.382
	RM500-RM1500	4	15.25	
	RM1600-RM2500	1	22.50	
	RM2600-RM3000	3	17.83	
	>RM3000	18	16.44	
	Total	30	-	
Awareness	<RM500	4	10.25	0.350
	RM500-RM1500	4	16.25	
	RM1600-RM2500	1	26.00	
	RM2600-RM3000	3	21.33	
	>RM3000	18	14.94	
	Total	30	-	
Practices	<RM500	4	8.25	0.097
	RM500-1500	4	14.25	
	RM1600-RM2500	1	27.50	
	RM2600-RM3000	3	9.00	
	>RM3000	18	17.81	
	Total	30	-	

Table 11. Kruskal Wallis test based on family members.

Types	Family	N	Mean rank	Sig.
Knowledge	2	1	29.50	0.095
	2-10	23	16.15	
	>10	6	10.57	
	Total	30	-	
Awareness	2	1	16.50	0.978
	2-10	23	15.61	
	>10	6	14.92	
	Total	30	-	
Practices	2	1	7.00	0.506
	2-10	23	15.30	
	>10	6	17.67	
	Total	30	-	

DISCUSSION

The present study demonstrates that the Shapiro Wilk test was a suitable analysis for 30 respondents. The Shapiro Wilk test is a non-parametric test that is useful for the small amount of samples of < 50 samples (Glen, 2014). The p-value in this study was 0.005. It shows that the results were normally distributed for the gender of male towards the Knowledge, Awareness and Practices of sarcocystosis among the Sabahan universities students. The gender result also indicates that it was normally distributed. In addition, respondents from the Sabahan universities student in Selangor have more awareness and good practices regarding sarcocystosis. But, male have more knowledge of the disease. Table 2 shows that the result was normally distributed in all ranges of ages in the studies. According to Table 3, the result of the married population was not normally distributed. If the significant value is greater than 0.005 means that the data is normally distributed but if the data is below the significant value, it deviates from a normal value. Otherwise, the result for knowledge and awareness of a single population was not normally distributed. The scoring for the questionnaire was set to (0 = No, 0.5 = not sure, 1 = yes). From Table 4, it shows the mean for KAP studies were in the moderate range which were knowledge (0.5867±SD), awareness (0.4783) and practices (0.5883). It can be concluded that the Sabahan universities students have a balance on basic knowledge; also they are aware of the disease around them and follow the practices regulation carefully. From the study, it shows that the respondents of Sabahan universities students have an average level of basic understanding of sarcocystosis. In Table 5 of Spearman rho correlation test, the result indicates positive correlation among the KAP lists. All of the tests were statistically significant or positive correlation results. This test was used when there are two variables and both of the variables are rank ordered. The significant p-value was 0.005. In this study, it states that there was a statistically significant (positive) correlation between the Knowledge, Awareness and Practices level among the respondents of Sabahan universities students in Selangor. In addition, Mann Whitney U test is a non-parametric test that it is distribution free. Also, it is an alternative of the independent samples of t-test. Mann Whitney U test is used when the assumptions for independent samples of t-test have been violated in particular the assumptions of the normality that the dependent variables is normally distributed. From the knowledge result, the knowledge of both gender were equal. This finding was supported by a study done by Travis Bradberry in 2016, where he suggested that in many years of studies, both genders had an equal of general intelligence (Bradberry, 2016). For awareness and practices, the results in this study indicated that awareness (female =16.06, male =11.88) and practices (female =15.96, male =12.50). Similar finding was found in 2016 where females take more actions and are associated to practice and possess since childhood in manners rather than men. Also, females tend to take care of others more than male did (Bradberry, 2016).

Table 2 shows single population tend to have more basic knowledge about sarcocystosis than the married population because single population spend more time in pursuing their interests and hobbies, so they have more time to make more additional knowledge (Depaulo, 2020). Married population had higher results than the single population due to the partner taking care and helping out each other to be healthy mentally and physically. Also, the married population tends to think twice before engaging with risky behavior than the single population (Pace, 2020).

Nevertheless, Kruskal Wallis test on Table 8 shows mixed ethnics explored more of the ways of living from the mixed cultures. In addition, the mixed populations also tend to have better practices, gain more knowledge and start to practice the basic things. It shows the young adult population can devote a lot of energy to learn almost anything. Also, young adults have more practice towards sarcocystosis disease because they have greater ability how to follow instructions. Awareness from Table 8 shows middle age respondents have more experiences in life and they may have high awareness to avoid health problems in future. According to Table 8, middle paycheck receivers have the balance in life where they have the knowledge to be aware of the disease and practice good hygiene for them. With lesser family members, they do have the basic knowledge and share and together get aware of their own better lifestyle. Meanwhile, family members that have over 10 people had the highest practices result because they tend to practice good hygiene to protect the family.

CONCLUSION

Overall, Knowledge, Awareness and Practices level regarding the human sarcocystosis among Sabahan university students in Selangor, Malaysia were at an average level because this disease is categorized under the neglected tropical disease and the cases in Malaysia are quite rare. Hence, most of the university students were not aware of the disease. However, some of the results showed that few of the university students have knowledge of the basics about the disease. Therefore, awareness programs to spread the knowledge and promote good hygiene practices should be conducted and these programs may benefit the public communities.

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