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ORIGINAL ARTICLES

Improving awareness, knowledge and attitude of epilepsy using an Interactive Animated Epilepsy Education Programme (IAEEP) among Malaysian teachers and students

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Abstract

Background: Improving awareness, knowledge and attittude (AKA) of teachers and students about epilepsy is an important step to reduce the stigma experienced by children with epilepsy. To date there are no studies evaluating effectiveness of an information technology based epilepsy education programme in improving AKA among teachers and students. *Method:* Cross-sectional study was to assess the baseline AKA of epilepsy among Malaysian teachers and secondary school students, and to examine effectiveness improving their AKA using the Interactive Animated Epilepsy Education Programme (IAEEP). AKA of teachers and students were assessed pre- and post-implementation of IAEEP. *Results:* Total of 54 teachers and 67 secondary students participated in this study. The baseline AKA on epilepsy among Malaysian teachers was low in the awareness domain, moderate in the knowledge domain, and positive in the attitude domain. The baseline AKA on epilepsy among students was very low in the awareness domain, low in the knowledge domain, and indifferent in the attitude domain. The AKA scores in all domains of teachers and students improved significantly after introduction of IAEEP ($P<0.001$). Post-IAEEP the AKA of teachers was moderate in the awareness domain, high in the knowledge domain, and very positive in the attitude domain; the AKA of students was low in the awareness domain, very high in the knowledge domain, and very positive in the attitude domain *Conclusion:* Our findings highlight a need for epilepsy educational programmes to be implemented in Malaysian schools. The IAEEP is an effective educational programme to improve the AKA particularly in the knowledge domain among teachers and students.

Keywords: Epilepsy, epilepsy education programme, teacher, student, awareness, knowledge, attitude

INTRODUCTION

Epilepsy is one of the most prevalent neurological conditions with more than 80% of people with epilepsy being from developing countries.[1] Epilepsy has a significant psychosocial impact on the patient that is associated with family dysfunction, low self-esteem, increased anxiety and depression.[1-3] Patients with epilepsy also suffer from epilepsy-related stigma due to ignorance, misconceptions and negative attitudes regarding epilepsy that leads to discrimination in these patients.[1-3] As stigma often arises from public misperceptions, education of the community is undeniably a very important step in mitigating epilepsy-related stigma.[4]

In Malaysia, previous publications have reported a lack of awareness, limited knowledge, false beliefs and negative attitudes among the general public towards patients with epilepsy.[5,6]

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However it is not known if this low level of awareness, knowledge and attitude (AKA) also extends to teachers and students in Malaysia. The school years represent an important period for the child's social, psychological and physical development and children with epilepsy (CWE) will have the most contact with their teachers and peers in school. Thus, a good AKA on epilepsy by teachers and school children is important and can have a significant impact on the quality of life of CWE.[7] Therefore, early steps to raise awareness of and educate about epilepsy in schools have been advocated by the World Health Organisation recommendations in the 68th World Health Assembly in May 2015 regarding the agenda of Global burden of epilepsy and the need for coordinated action at the country level to address its health, social and public knowledge implications.[8]

In tandem with advancement of information technology, health education programmes can be easily accesible and administered.[9] However, unlike conditions like asthma and diabetes melitus, tailored information technology education programmes for epilepsy are scarce.[10] The Interactive Animated Epilepsy Education Programme (IAEEP) is the first interactive and animated learning programme for CWE and parents in Malaysia. The IAEEP was developed in July 2013 by University Sultan Zainal Abidin (UniSZA) and Hospital Sultanah Nur Zahirah (Neurology and Paediatric departments) in Terengganu, Malaysia.[10] In September 2014, the University Malaya (UM) Paediatric Neurology division further revised and improved the IAEEP to enable the IAEEP to be used among the general public.

To date, there are 4 published studies in Asia from Malaysia, Thailand and India assessing AKA of epilepsy among teachers, and only 2 studies in Asia from Malaysia and India assessing knowledge and attitude of epilepsy among school students.[11-15] There are no studies to date evaluating the usefulness of an information technology based epilepsy education programme on improving AKA among teachers and students. The primary objectives of our study were to: i) assess the baseline level of AKA among Malaysian school teachers and students; and ii) assess the effectiveness of the IAEEP in raising AKA of epilepsy among Malaysian teachers and students.

METHODS

Participant recruitment

This is an interventional cross-sectional study involving 2 different target groups in Kuala Lumpur, Malaysia. Teachers and secondary school students from schools in Kuala Lumpur were recruited at the Malaysian Epilepsy Council exhibition booth during the annual 2-day state-level Kuala Lumpur Teacher's day celebration held in June 2015 and May 2016. Teachers and students from schools in Kuala Lumpur participated in this annual event. Official written approval had been given by the Kuala Lumpur state education department to the Malaysian Epilepsy Council, Malaysia Society of Neurosciences to run the epilepsy education awareness programme (Ref: KPMSP-100-10/6/2).

All teachers and students who visited the Malaysian Epilepsy Council epilepsy booth were given information of the study and consent was obtained from them to participate in this study. The participants were provided with basic epilepsy education using the IAEEP programme uploaded on laptop computers. AKA Epilepsy questionnaire was administered at two time points before the IAEEP provision and immediately after the IAEEP to assess the effectiveness of the epilepsy educational programme. Another structured feedback form was given at the end of the session to evaluate the usefulness of the IAEEP.

AKA Epilepsy Questionnaire

A validated, self-administered questionnaire, the AKA Epilepsy questionnaire was used to evaluate the AKA towards epilepsy among the respondents.[6] The AKA epilepsy questionnaire comprises three domains: Awareness (5 items), Knowledge (8 items) and Attitudes (4 items) with each item response score ranging from 0 to 10. Score interpretation of the Awareness domain was: 0-10= very low (category 1), 11-20= low (category 2), 21-30= moderate (category 3), 31-40= high (category 4), and 41-50= very high (category 5); the Knowledge domain was: 0-16= very low (category 1), 17-32= low (category 2), 33-48= moderate (category 3), 49-65= high (category 4), 66-80= very high (category 5); the Attitude domain was: 0-7= very negative (category 1), 8-15= negative (category 2), 16-23= indifferent (category 3), 24-31= positive (category 4), and 32-40= very positive (category 5); and finally the total AKA score was generated with score range

from 0 to 170 with score interpretation of 0-33= very poor (category 1), 34-67= poor (category 2), 68-101= moderate (category 3), 102-135= good (category 4), and 136-170= excellent (category 5).

IAEEP

The IAEEP is a validated education programme that is available in Malay, English and Mandarin language.[10] It has been shown to be easily understandable with a high positive user feedback among Malaysian parents and CWE.[10,13] It is the first interactive and information technology based animated epilepsy programme in Malaysia which requires user participation. The IAEEP is copyrighted and licensed under the authors name (Fong CY, Lua PL). Permission to use the IAEEP can be obtained by contacting the authors.

The IAEEP can be installed with Windows software on laptops and tablet / android devices. It covers 9 topics of epilepsy ("what is epilepsy", "safety tips", "medication", "school", "dealing with epilepsy", "first aid", "teenage years", "good life" and "sudden unexpected death in epilepsy") and takes about 20 minutes to complete. Evaluation of the IAEEP usefulness was done using a structured feedback form at the end of the IAEEP session comprising of 7 questions. The feedback forms assessed whether IAEEP was practical and acceptable to the participants.

Statistical analysis

All data were analyzed using IBM Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics were reported as frequencies, percentages, median and interquartile range (IQR). The change in the distribution of the correct responses compared with incorrect and not sure responses at each question between pre- and post-intervention was assessed using the McNemar test. To test the difference between pre- and post-intervention categorical scores the Wilcoxon signed rank test was used. The level of significance was taken as $P<0.05$.

RESULTS

Participant characteristics

A total of 54 school teachers and 67 secondary school students participated in the study. The teachers were from 26 government schools and the students were from 22 secondary government schools in Kuala Lumpur. Among the teachers; 16 (29.6%) taught at primary school level, 24 (44.4%) taught at secondary school level, and 14 (25.9%) taught both at primary and secondary school levels. Among the 51 teachers who stated their years of teaching experience; 13 (25.5%) had up to 5 years of experience, 11 (21.6%) had up to 10 years of experience, 15 (29.4%) had up to 20 years of experience, and 12 (23.5%) had over 20 years of experience. Among the secondary school students; 38 (56.7%) were at the lower secondary level of age 13-15 years old and 29 (43.3%) were at the upper secondary level of age 16-19 years old.

Participants AKA at baseline and following IAEEP provision

Table 1 shows the participants AKA levels before and after IAEEP provision. The baseline AKA of our teachers were very low to moderate for awareness in 50 (92.6%), very low to moderate for knowledge in 38 (70.4%), very negative to indifferent for attitude in 19 (35.2%) and very poor to moderate for total AKA score in 43 (79.6%). Among the students, the baseline AKA were very low to moderate for awareness in 64 (95.5%), very low to moderate for knowledge in 53 (79.1%), very negative to indifferent for attitude in 44 (65.7%) and very poor to moderate for total AKA score in 64 (95.5%).

Table 2 shows median AKA categorical scores and effect of IAEEP on AKA categorical scores of teachers and students. Following provision of the IAEEP, a statistically significant increase in category scores was seen in all domains of the AKA and total AKA level for both the teachers and students (Table 2). The greatest category rise was seen among the students. Among the teachers: an increment of 1 level was seen in the awareness, attitude and total AKA score domains; and an increment of 2 levels in the knowledge domain. Among the students: an increment of 1 level was seen in the awareness and the total AKA score domains; increment of 2 levels in the attitude domain; and increment of 3 levels in the knowledge domain.

Table 3 and 4 show the individual teacher and student responses to the AKA epilepsy questionnaire before and after IAEEP provision. Among teachers a statistically significant increase in correct responses was seen in 2 of the 5 awareness domain questions, 7 of the 8 knowledge domain questions, and 2 of the 4 attitude domain questions. Among students a statistically significant increase in correct responses was seen in 2 of the 5 awareness domain questions, 8 of

Table 1: Awareness, knowledge, attitude (AKA) and general AKA level of epilepsy pre-IAEEP and post-IAEEP for teachers and student.

Characteristics	Teachers (n=54)		Students (n=67)	
	Number of participants (%)		Number of participants (%)	
	Before intervention	After intervention	Before intervention	After intervention
Awareness				
Very low	12 (22.2)	4 (7.4)	37 (55.2)	10 (14.9)
Low	31 (57.4)	18 (33.3)	26 (38.8)	35 (52.2)
Moderate	7 (13.0)	24 (44.4)	1 (1.5)	17 (25.4)
High	4 (7.4)	7 (13.0)	3 (4.5)	3 (4.5)
Very high	0 (0.0)	1 (1.9)	0 (0.0)	2 (3.0)
Knowledge				
Very low	6 (11.1)	0 (0.0)	14 (20.9)	1 (1.5)
Low	19 (35.2)	0 (0.0)	24 (35.8)	1 (1.5)
Moderate	13 (24.1)	1 (1.9)	15 (22.4)	23 (34.3)
High	13 (24.1)	17 (31.5)	12 (17.9)	0 (0.0)
Very high	3 (5.6)	36 (66.7)	2 (3.0)	42 (62.7)
Attitude				
Very negative	7 (13.0)	0 (0.0)	15 (22.4)	2 (3.0)
Negative	0 (22.0	1 (1.9)	13 (19.4)	0 (0.0)
Indifferent	12 (2.0)	3 (5.6)	16 (23.9)	4 (6.0)
Positive	17 (31.5)	2 (3.7)	11 (16.4)	17 (25.4)
Very positive	18 (33.3)	48 (88.9)	12 (17.9)	44 (65.7)
Total AKA				
Very poor	4 (7.4)	0 (0.0)	14 (20.9)	0 (0.0)
Poor	9 (16.7)	0 (0.0)	19 (28.4)	1 (1.5)
Moderate	30 (55.6)	3 (5.6)	31 (46.3)	6 (9.0)
Good	10 (18.5)	25 (46.3)	1 (1.5)	40 (59.7)
Excellent	1 (1.9)	26 (48.1)	2 (3.0)	20 (29.9)

the 8 knowledge domain questions, and 4 of the 4 attitude domain questions.

Participants feedback on IAEEP

Our participants gave an excellent feedback on the IAEEP (Table 5). All 54 (100%) of teachers in this study agreed that the IAEEP is a good programme and would recommend this programme to be given to others, with the vast majority of the teachers 53 (98.1%) agreeing that the language used in the programme was simple and easy to understand. Among the students, 52 of the 67 (77.6%) students completed the feedback form. Similarly all of these student respondents 52 (100%) agreed that the IAEEP is a good programme, the vast majority 51 (98.1%) would recommend this programme to be given to others, and 50 (96.2%) agreed that the language used in the programme is simple and easy to understand.

DISCUSSION

Our study shows that the baseline AKA on epilepsy among Malaysian teachers was low in the awareness domain, moderate in the knowledge domain, positive in the attitude domain, and moderate in the total AKA domain. The baseline AKA findings were lower among students when compared with teachers whereby the students AKA was very low in the awareness domain, low in the knowledge domain, indifferent in the attitude domain, and moderate in the total AKA domain. Our findings among teachers and students are better when compared to another Malaysian study examining AKA among a rural population in East Coast Peninsular Malaysia that reported poor level of total AKA domain.[6] However our AKA results were worse when compared with a study involving the urban Malaysian Chinese population that showed better AKA findings with good awareness of epilepsy and positive attitude[17] and also worse when compared with another study of Malaysian university students that reported favourable level of awareness and knowledge of epilepsy with a more tolerant attitude towards epilepsy.[18]

Table 2. Category scores on awareness, knowledge, attitude (AKA) and general AKA level of epilepsy pre-IAEEP and post-IAEEP for teachers and students

Characteristics	Teacher (n=54)				Student (n=67)			
	Median score (IQR)	Category score	Category score interpretation	p-value	Median score (IQR)	Category score	Category interpretation	p-value
Awareness								
Before intervention	20 (0.0)	2	Low	p<0.001*	10 (10.0)	1	Very low	p<0.001*
After intervention	30 (10.0)	3	Moderate		20 (20.0)	2	Low	
Knowledge								
Before intervention	40 (20.0)	3	Moderate	p<0.001*	30 (20.0)	2	Low	p<0.001*
After intervention	70 (20.0)	5	Very high		70 (20.0)	5	Very high	
Attitude								
Before intervention	30 (20.0)	4	Positive	p<0.001*	20 (20.0)	3	Indifferent	p<0.001*
After intervention	40 (0.0)	5	Very positive		40 (10.0)	5	Very positive	
Total AKA								
Before intervention	90 (32.5)	3	Moderate	p<0.001*	70 (40.0)	3	Moderate	p<0.001*
After intervention	130 (30.0)	4	Good		130 (20.0)	4	Good	

*Significant p-value(P<0.05) based on Wilcoxon signed rank test.

Published studies among teachers in developing countries showed poor awareness, knowledge and attitude among teachers in Thailand[11]; poor knowledge and negative attitude among trainee teachers in Lagos, Nigeria[19]; good awareness, positive attitude but a lack of knowledge among teachers in Chandigarh, India[12]; negative attitude among teachers in Medan, Indonesia[13]; positive attitude among teachers in Kuala Lumpur, Malaysia[15]; and teachers in Sudan showed poor awareness and lack of knowledge but a positive atttitude towards epilepsy.[20] In general our Malaysian teacher's AKA findings were better when compared to studies from Thailand, Indonesia and Nigeria; similar to the study from Malaysia and Sudan; and had poorer awareness when compared to the study form India. Among the 4 published studies of school students in developing countries, Malaysia students had more positive attitude than the general population; and all the other studies from Ethiopia, Turkey and India showed students having poor knowledge and negative attitude towards epilepsy.[14,21-23] Our findings show that our students knowledge towards epilepsy were similar to all these studies with our students also having low scores in the knowledge domain, however our students had possibly better attitude towards epilepsy. Overall our baseline AKA findings when compared with other studies performed both locally and in other developing countries highlight a need to raise the level of AKA among Malaysian teachers and students particularly in the awareness and knowledge domains. It also reiterates the importance of having epilepsy educational programmes that is not just catered for students but also for teachers.

Our study also gave important insights to the misconceptions that Malaysian teachers and students have about epilepsy. A sizeable number of respondents from both teachers (14.8%) and students (35.8%) thought that epilepsy is a mental disease. This finding from our teachers are similar to 18.2% misconception rates among the adult rural population in East Coast Peninsular Malaysia.[6] Our finding is also similar to other studies conducted among teachers with 16% of teachers in Chandigarh India considered people with epilepsy to be insane[12]; 10% of school teachers in Egypt considered epilepsy as one form of psychiatric illness[24]; and 9.5% of primary school teachers in Italy thought epilepsy to be a psychological or psychiatric disease.[25] Among students our findings were similar to another local study showing that 39.7% of tertiary students in a Malaysian university thought that epilepsy

Table 3: Teachers' responses on awareness, knowledge and attitude on epilepsy pre-IAEEP and post-IAEEP (N=54)

Question number	Questions	Positive / Correct response	Pre-intervention			Post-intervention			P-value
			Yes (%)	No (%)	Not sure (%)	Yes (%)	No (%)	Not sure (%)	
Awareness Domain									
1	Have you heard or read anything about "epilepsy"?	Yes	52 (96.3)	2 (3.7)	-	54 (100.0)	0 (0.0)	-	P<0.0001*
2	Have you attended any seminar or lecture about "epilepsy"?	Yes	2 (3.7)	52 (96.3)	-	38 (70.4)	16 (29.6)	-	P<0.0001*
3	Have you seen anyone having an "epilepsy attack"?	Yes	41 (75.9)	13 (24.1)	-	40 (74.1)	14 (25.9)	-	1.000
4	Have you given any emergency help for "epilepsy"?	Yes	8 (14.8)	46 (85.2)	-	8 (14.8)	46 (85.2)	-	1.000
5	Does any of your family member has "epilepsy"?	Yes	6 (11.1)	48 (88.9)	-	5 (9.3)	49 (90.7)	-	0.453
Knowledge Domain									
6	Do you know what causes "epilepsy"?	Yes	7 (13.0)	21 (38.9)	26 (48.1)	48 (88.9)	4 (7.4)	2 (3.7)	P<0.0001*
7	Do you think "epilepsy" is infectious?	No	1 (1.9)	39 (72.2)	14 (25.9)	3 (5.6)	50 (92.6)	1 (1.9)	0.003*
8	Do you think "epilepsy" is an inherited disease?	No	21 (38.9)	13 (24.1)	20 (37.0)	9 (16.7)	44 (81.5)	1 (1.9)	P<0.0001*
9	Do you think "epilepsy" is a mental disease?	No	8 (14.8)	25 (46.3)	21 (38.9)	8 (14.8)	45 (83.3)	1 (1.9)	P<0.0001*
10	Do you think "epilepsy" is caused by evil spirits?	No	3 (45.6)	42 (77.8)	9 (16.7)	1 (1.9)	52 (96.3)	1 (1.9)	0.006*
11	Do you think "epilepsy" can cause death?	Yes	29 (53.7)	8 (14.8)	17 (31.5)	41 (75.9)	11 (20.4)	2 (3.7)	0.017*
12	Do you think "epilepsy" is curable?	Yes	41 (75.9)	1 (1.9)	12 (22.2)	49 (90.7)	3 (5.6)	2 (3.7)	0.057
13	Do you know how to perform an emergency help for "epilepsy"?	Yes	1 (1.9)	39 (72.2)	14 (25.9)	46 (85.2)	6 (11.1)	2 (3.7)	P<0.0001*
Attitude Domain									
14	Do you think that "epilepsy" patient can participate in sporting activities?	Yes	31 (57.4)	2 (3.7)	21 (38.)	53 (98.1)	1 (1.5)	0 (0.0)	P<0.0001*
15	Do you think that "epilepsy" patient can drive?	Yes	25 (46.3)	13 (24.1)	16 (29.6)	49 (90.7)	3 (5.6)	2 (3.7)	P<0.0001*
16	Do you think that "epilepsy" patient" can get married and have a family?	Yes	45 (83.3)	1 (1.9)	8 (14.8)	51 (94.4)	1 (1.9)	2 (3.7)	0.070
17	Do you think that "epilepsy" patient can socialise with the community?	Yes	47 (87.0)	2 (3.7)	5 (9.3)	52 (96.3)	2 (3.7)	0 (0.0)	0.063

*Significant p-value (P<0.05) based on McNemar test.

Table 4: Students' responses on awareness, knowledge and attitude on epilepsy pre-IAEEP and post-IAEEP (N=67)

Question number	Questions	Positive / Correct response	Pre-intervention			Post-intervention			P-value
			Yes (%)	No (%)	Not sure (%)	Yes (%)	No (%)	Not sure (%)	
Awareness Domain									
1	Have you heard or read anything about "epilepsy"?	Yes	47 (70.1)	20 (29.9)	-	67 (100.0)	0 (0.0)	-	P<0.0001*
2	Have you attended any seminar or lecture about "epilepsy"?	Yes	1 (1.5)	66 (98.5)	-	48 (71.6)	19 (28.4)	-	P<0.0001*
3	Have you seen anyone having an "epilepsy attack"?	Yes	31 (46.3)	36 (53.7)	-	26 (38.8)	41 (61.2)	-	0.125
4	Have you given any emergency help for "epilepsy"?	Yes	2 (3.0)	65 (97.0)	-	4 (6.0)	63 (94.0)	-	0.500
5	Does any of your family member has "epilepsy"?	Yes	5 (7.5)	62 (92.5)	-	8 (11.9)	59 (90.3)	-	0.250
Knowledge Domain									
6	Do you know what causes "epilepsy"?	Yes	6 (9.0)	29 (43.3)	32 (47.8)	57 (85.1)	2 (3.0)	8 (11.9)	P<0.0001*
7	Do you think "epilepsy" is infectious?	No	3 (4.5)	40 (59.7)	24 (35.8)	2 (3.0)	63 (94.0)	2 (3.0)	P<0.0001*
8	Do you think "epilepsy" is an inherited disease?	No	20 (29.9)	21 (31.1)	26 (38.8)	7 (10.4)	56 (83.6)	4 (6.0)	P<0.0001*
9	Do you think "epilepsy" is a mental disease?	No	24 (35.8)	26 (38.8)	17 (25.4)	15 (2.4)	50 (74.6)	2 (3.0)	P<0.0001*
10	Do you think "epilepsy" is caused by evil spirits?	No	2 (3.0)	40 (59.7)	25 (37.3)	2 (3.0)	62 (92.5)	3 (4.5)	P<0.0001*
11	Do you think "epilepsy" can cause death?	Yes	28 (41.8)	17 (25.4)	22 (32.8)	45 (67.2)	16 (23.9)	6 (9.0)	0.003*
12	Do you think "epilepsy" is curable?	Yes	39 (73.6)	0 (0.0)	14 (26.4)	59 (88.1)	4 (6.0)	4 (6.0)	P<0.0001*
13	Do you know how to perform an emergency help for "epilepsy"?	Yes	3 (4.5)	51 (76.1)	13 (19.4)	59 (88.1)	2 (3.0)	6 (9.0)	P<0.0001*
Attitude Domain									
14	Do you think that "epilepsy" patient can participate in sporting activities?	Yes	23 (34.3)	15 (22.4)	29 (43.3)	63 (94.0)	3 (4.5)	1 (1.5)	P<0.0001*
15	Do you think that "epilepsy" patient can drive?	Yes	16 (23.9)	23 (34.3)	28 (41.8)	46 (68.7)	14 (20.9)	7 (10.4)	P<0.0001*
16	Do you think that "epilepsy" patient" can get married and have a family?	Yes	44 (65.7)	3 (4.5)	20 (29.9)	63 (94.0)	3 (4.5)	1 (1.5)	P<0.0001*
17	Do you think that "epilepsy" patient can socialise with the community?	Yes	43 (79.1)	6 (9.0)	18 (26.9)	63 (94.0)	3 (4.5)	1 (1.5)	P<0.0001*

*Significant p-value (P<0.05) based on McNemar test.

Table 5. Feedback responses for IAEEP for both teachers (n=54) and students (n=52)

Questions	Responses			
	Teachers (n=54)		Students (n=52)	
	Yes	No	Yes	No
1. Do you think the IAEEP is a good programme?	54	0	52	0
2. Is the language used in the IAEEP simple and easy to understand?	53	1	50	2
3. Does the IAEEP attract your interest?	55	0	52	0
4. Do you like the IAEEP?	54	0	52	0
5. Do you think the IAEEP is beneficial to you?	54	0	52	0
6. Would you recommend the IAEEP to be given to others?	54	0	51	1
7. Do you want to receive such a programme in the future?	54	0	52	0

is a form of mental illness[18], but worse when compared to other studies in developed western countries that showed 19% and 9% of students from schools and collages in United States and Canada respectively believed that epilepsy is a mental disease.[26,27] Our study also showed that a number of respondents still had misconceptions that epilepsy was infectious and was caused by evil spirit with 72.2% of teachers and 59.7% of students who correctly answered that epilepsy was non-infectious; and 77.8% of teachers and 59.7% of students who correctly answered that epilepsy was not caused by evil spirit. This is similar to other studies in other regions that demonstrated the prevalent belief among teachers and students that epilepsy is contagious[19,28] and is due to evil spirits.[12,19,20,28]

Despite a relatively high proportion of teachers (96.3%) and students (67%) reported that they have read or heard about epilepsy, only 3.7% of teachers and 1.5% of students reported that they ever attended an educational programme about epilepsy. This indicates that there is a pressing need for epilepsy educational programmes to be undertaken in Malaysian schools catered for both students and teachers. This is important to ensure accurate information is provided to them about epilepsy as our study showed there were significant gaps of knowledge and attitude regarding epilepsy (Table 4 and 5). One of the areas of striking lack of knowledge was the knowledge of first aid emergency management during a seizure, with only 1.9% of teachers and 4.5% of students reported knowing what emergency help to perform during a seizure. It is imperative that this poor first aid seizure knowledge is addressed among teachers and students as CWE are at risk of having seizures in school. Another area of lack of positive attitude towards epilepsy was the belief of whether epilepsy patients could participate in sports activities with only 57.4% of teachers and 34.3% of students who believed that this was possible; and the belief whether epilepsy patients could drive with only 46.3% of teachers and 23.9% of students who believed that this was possible. It is important to address these lack of positive attitudes in particular ensuring that all CWE have a balanced healthy lifestyle with minimal restriction of their physical activity as advocated in a recent guideline.[29] This is because the school years play a pivotal role in enabling CWE participate in extracurricular and sports activities.

Our study has shown that the IAEEP was an effective information technology educational programme in significantly raising the AKA particularly in the knowledge domain of both Malaysian teachers and students. The positive effect of the IAEEP was greatest seen among students due to their lower baseline AKA level with a statistically significant rise in correct responses were seen in all the questions in the knowledge and attitude domain of the AKA questionnaire (Table 4). Previous studies assessing effect of educational intervention on school teachers have also shown AKA improvement towards epilepsy. Various educational intervention programmes have been used including structured teaching programmes, workshops, educational kit with posters, fairy tale stories and brochures.[12,19,25] With the advancement of computer science, technological intervention is increasedly being used in the education of chronic diseases.[9] For children who have a limited attention span, imparting health care education with the application of computer technology has been a proven effective form of educational

intervention.[30] Educational programmes targeting CWE and their caregivers have been developed in different countries such as MOSES (Modular Service Package Epilepsy)[31], FAMOSES (Modular Service Package Epilepsy for families)[32], and FLIP&FLAP [33] that have showed positive results in improving AKA. However, to our knowledge that have been no studies evaluating the usefulness of technological-based education programmes in improving epilepsy AKA among the general public including teachers and students.

This study had excellent respondent feeback reaffirming that IAEEP is potentially an invaluable educational tool to improve the AKA among Malaysian teachers and students. The IAEEP strengths include it being a programme that is simple, relatively quick to complete the programme yet still being a highly educational experience. It also requires user interaction which enhances the user's educational experience. It does not require trained clinicians to deliver the programme enabling it to be easily delivered to all schools. The IAEEP also uses a user-friendly technological platform that is cost-effective as it can be downloaded onto standard laptops, computers or android devices without needing any additional software products. All these strenghts will enable the IAEEP to be easily implemented and provided to all government Malaysian schools at a negligible cost. In addition the IAEEP which is available in 3 languages may also be useful epilepsy educational programme to be used in other Asian coutries.

We recognise that there are limitations to our study. This study was conducted in a predominantly urban state in Malaysia and may not be a representative finding of teachers and students from the rural region. We only assessed the participant's immediate AKA effect after the IAEEP programme and did not assess the long term effect on their AKA. It is possible that the AKA effect from the IAEEP reduces over time due to reduced knowledge retention and future studies should also assess the AKA effects over a longer period of time. However unpublished results from our IAEEP study among Malaysian parents of CWE showed that the positive AKA effects remained persistent 4-6 months after the IAEEP provision. We also did not assess the potential effects of improving the teachers and students AKA on the quality of life of CWE attending the same schhol.

In conclusion, our findings highlight a need for epilepsy educational programmes to be implemented in Malaysian schools among both teachers and students. The IAEEP is an effective information technology educational programme to improve the AKA particularly in the knowledge domain among teachers and students. Feedback from participants have shown that the IAEEP is a highly acceptable epilepsy educational tool. We recommend that the IAEEP should be considered as an educational tool to improve the AKA of epilepsy among Malaysian teachers and students.

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REFERENCES

1. de Boer HM, Mula M, Sander JW. The global burden and stigma of epilepsy. *Epilepsy Behav* 2008; 12(4):540-6.
2. Jan MM. Clinical review of pediatric epilepsy. *Neurosciences* 2005; 10(4): 255-64.
3. Baker GA, Brooks J, Buck D, Jacoby A. The stigma of epilepsy: a European perspective. *Epilepsia* 2000; 41(1): 98-104.
4. Morrell MJ. Stigma and epilepsy. *Epilepsy Behav* 2002; 3(6S2): 21-5.
5. Lua PL, Neni WS. Awareness, knowledge, and attitudes with respect to epilepsy: an investigation in relation to health-related quality of life within a Malaysian setting. *Epilepsy Behav* 2011; 21(3): 248-54.
6. Neni SW, Latif AZ, Wong SY, Lua PL. Awareness, knowledge and attitudes towards epilepsy among rural populations in East Coast Peninsular Malaysia: a preliminary exploration. *Seizure* 2010; 19(5): 280-90.
7. Bishop M, Boaq EM. Teachers' knowledge about epilepsy and attitudes toward students with epilepsy: results of a national survey. *Epilepsy Behav* 2006; 8: 397-405.
8. World Health Organization. Executive Board, 136th Session. Global Burden of Epilepsy and the Need for Coordinated Action at the Country Level to Address its Health, Social and Public Knowledge Implications, Geneva, 2015. Available at: https://www.ilae.org/files/dmfile/WHO-Epilepsy-2015.pdf (assessed April 23, 2018).
9. Ortega-Navas MC. The use of new technologies as a tool for the promotion of health education. *Procedia – Social and Behavioural Sciences* 2017; 237: 23-9.

10. Lua PL, Neni WS, Lee JK, Abd Aziz Z. The interactive animated epilepsy education programme (IAEEP): how feasible, acceptable and practical is the technology to children? *Technol Health Care* 2013; 21(6): 547-56.
11. Kankirawatana P. Epilepsy awareness among school teachers in Thailand. *Epilepsia* 1999; 40(4): 497-501.
12. Goel S, Singh N, Singh A. Evaluating the impact of comprehensive epilepsy education programme for school teachers in Chandigarh city, India. *Seizure* 2014; 23(1): 41-6.
13. Rambe AS, Shahrir H. Awareness, attitudes and understanding towards epilepsy among school teachers in Medan, Indonesia. *Neurol J Southeast Asia* 2002; 7:77-80.
14. Lim KS, Hills MD, Choo WY, Wong MH, Wu C, Tan CT. A web-based survey of attitudes towards epilepsy in secondary and tertiary students in Malaysia, using the Public Attitudes Towards Epilepsy (PATE) scale. *Epilepsy Behav* 2013; 26(2):158-61.
15. Lim KS, Hills MD, Choo WY, Wong MH, Wu C, Tan CT. Attitudes toward epilepsy among primary and secondary school teachers in Malaysia, using the Public Attitudes Toward Epilepsy (PATE) scale. *Epilepsy Res* 2013; 106:433-9
16. Fong CY, Lim WK, Kong AN, Lua PL, Ong LC. Provision of sudden unexpected death in epilepsy (SUDEP) information among Malaysian parents of children with epilepsy. *Epilepsy Behav* 2017; 75: 6-12
17. Hasan SS, Alen YK, Wayne WG, Ahmadi K, Anwar M, Goh GK. Understanding of and attitudes toward epilepsy among the urban Chinese population in Malaysia. *Singapore Med J* 2010; 51(4): 290-9.
18. Ab Rahman AF. Awareness and knowledge of epilepsy among students in a Malaysian university. *Seizure* 2005; 14(8): 593-6.
19. Eze CN, Ebuehi OM, Brigo F, Otte WM, Igwe SC. Effect of Health Education on Trainee Teachers' Knowledge, Attitudes, and First Aid Management of Epilepsy: An Interventional Study. *Seizure* 2015; 33: 46-53.
20. Babikar HE, Abbas IM. Knowledge, practice and attitude toward epilepsy among primary and secondary school teachers in South Gezira locality, Gezira State, Sudan. *J Family Community Med* 2011; 18(1): 17-21.
21. Tekle-Haimanot R, Preux PM, Gerard D, Worku DK, Belay HD, Gebrewold MA. Impact of an educational comic book on epilepsy-related knowledge, awareness, and attitudes among school children in Ethiopia. *Epilepsy Behav* 2016; 61: 218-23.
22. Bozkaya IO, Arhan E, Serdaroglu A, Soysal AS, Ozkan Z, Gucuyener K. Knowledge of, perception of, and attitudes toward epilepsy of schoolchildren in Ankara and the effect of an educational program. *Epilepsy Behav* 2010; 17(1): 56-63.
23. Kolar Sridara Murthy M, Govindappa L, Sinha S. Outcome of a school-based health education program for epilepsy awareness among schoolchildren. *Epilepsy Behav* 2016; 57(Pt A): 77-81.
24. Shehata GA, Mahran DG. Knowledge, attitude and practice with respect to epilepsy among school teachers in Assiut city, Egypt. *Epilepsy Res* 2010; 92(2-3):191-200.
25. Mecarelli O, Messina P, Copovilla G, *et al*. An educational campaign about epilepsy among Italian primary schoolteachers. 2. The results of a focused training program. *Epilepsy Behav* 2014; 42: 93-7.
26. Austin JK, Shafer PO, Deering JB. Epilepsy familiarity, knowledge, and perceptions of stigma: Report from a survey of adolescents in the general population. *Epilepsy Behav* 2002; 3: 368-75.
27. Young GB, Derry P, Hutchinson I, *et al*. An epilepsy questionnaire study of knowledge and attitudes in Canadian college students. *Epilepsia* 2002; 43: 652-8.
28. Pandian JD, Santosh D, Kumar TS, Sarma PS, Radhakrishnan K. High school students' knowledge, attitude, and practice with respect to epilepsy in Kerala, southern India. *Epilepsy Behav* 2006; 9: 492-7.
29. Copovilla G, Kaufman KR, Perucca E, Moshe SL, Arida RM. Epilepsy, seizures, physical exercise and sports: a report from the ILAE Task Force on Sports and Epilepsy. *Epilepsia* 2016; 57(1): 6-12.
30. Lewis D. Computer-based Approaches to Patient Education. *J Am Med Inform Assoc* 1999; 6(4): 272-82.
31. May TW, Pfäfflin M. The efficacy of an educational treatment program for patients with epilepsy (MOSES): results of a controlled, randomized study. Modular Service Package Epilepsy. *Epilepsia* 2002; 43(5): 539-49.
32. Hagemann A, Pfäfflin M, Nussbeck FW, May TW. The efficacy of an educational program for parents of children with epilepsy (FAMOSES): Results of a controlled multicenter evaluation study. *Epilepsy Behav* 2016; 64(Pt A): 143-51.
33. Jantzen S, Muller-Godeffroy E, Hallfahrt-Krisi T, *et al*. FLIP&FLAP—A training programme for children and adolescents with epilepsy, and their parents. *Seizure* 2009; 18(7): 478-86.