EFFECTIVENESS OF SCHOOL-BASED HEALTH EDUCATION INTERVENTION ON KNOWLEDGE, ATTITUDE AND PRACTICES IN PEDICULOSIS CAPITIS

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ABSTRACT

Pediculosis capitis can be found in any age and race although school-age children are the groups that are mostly at risk. The objective of this study was to develop, implement and evaluate the effectiveness of the health educational module based on KAP Model on the level of knowledge, attitude and practices on Pediculosis capitis among school children in Selangor. A cluster randomised controlled trial was conducted among students aged 10-11 years. Using simple random sampling, 10 schools were selected. At baseline, a validated questionnaire was given to assess their KAP level and screening for Pediculosis capitis was done. Then the schools were divided into intervention and control groups. The intervention group received approximately 3 hours of concise educational module whereas the control group only received a 30-minutes health talk on the knowledge component of the module. All the students were prescribed with pediculicides for application at home. After two-weeks, the post-intervention assessment was conducted using the same questionnaires. The students were re-examined for evidence of Pediculosis capitis after treatment. A total of 4,344 students were examined and 318 students were found to be infested with Pediculosis capitis. The overall prevalence was 7.32 %. In the intervention group, only the attitude showed significant increase at 2-weeks post-intervention as compared to baseline ($\chi 2 = 4.878$, df =1, p = 0.027). Both knowledge and practice did not show significant increase of good knowledge and practice level at 2-weeks post-intervention as compared to baseline. In the control group, none of the variable showed significant increase at 2-weeks postintervention as compared to baseline. Generalized Estimating Equations (GEE) was conducted to determine the effectiveness of the educational intervention module in increasing the respondents' KAP on Pediculosis capitis. GEE showed significant association of knowledge level and time point with group. The odds of having good knowledge in the intervention group is 1.7 times higher as compared to the control group (AOR = 1.748, 95% CI:1.006 – 3.035, p = 0.048). The odds of having good knowledge at 2-weeks postintervention was 1.1% higher as compared to baseline after adjusting for trial covariates (AOR =0 .011, 95% CI:0.006 – 0.019, p<0.001).

Keywords: Pediculosis capitis, reinfestation, KAP, primary school

INTRODUCTION

Pediculosis capitis is a Public Health concern all over the world (Rukke et al, 2012). Apart from the common cold, the head louse infestation among elementary school-age children is the most prevalent communicable disease (Rukke et al, 2012). It can be found in any age and race although school-age children are the groups that are mostly at risk (Alborzi & Shekkariz, 2016). American Centre for Disease Control and Prevention (CDC) has outlined that prevalence rates over 5% indicate an epidemic of lice infestation (CDC, 2013).

In a developed country like United States alone, an estimated 6 million to 12 million infestations occur each year among children 3 to 11 years of age4. In Australia, 13% of children had an active infection and 3.3% (61/1838) had an inactive infection (Counahan et al, 2014). Meanwhile, in Korea, the overall prevalence of Pediculosis capitis was 4.1% including 3.7% of the urban areas and 4.7% of the rural areas (Oh et al, 2010).

The prevalence in the south-east Asia reveals that Pediculosis capitis is still a major Public Health threat in this part of the region. In Bangkok, Thailand, the overall prevalence was 23.32% (Rassami & Soonwera,2012). Overall prevalence of 55.3% was reported in Indonesia (Karimah, Hidayah, Dahlan, 2016). The prevalence found higher infestation on girls (81.3%), long hair (76.9%), curly hair (52.9%), washing hair three times or more in a week (59.3%), mothers only graduated from elementary school (60%), family income (63.3%), staying with four or more persons in the same house (56.3%), having previous Pediculosis capitis (6.2%).

In Malaysia, a study among primary school children in Kelantan recorded the prevalence of 35.0% with 11.9% inactive, 23.1% active, 18.2% light and 16.8% heavy infestations (Bachok et al, 2006). The associated factors were girls; low family income; Pediculosis capitis among family member and having four or more siblings. The most recent study on the prevalence and predictors of Pediculosis capitis was conducted among 7-12 years old school children in Hulu Langat district with the overall prevalence of 15.3% (Tohit, Rampal & Lye, 2017). The prevalence of pediculosis was significantly higher among females, age 10 years or more, Indian ethnicity and history of contact with an infected person.

Knowledge, attitude and practices (KAP) of a person have always been associated with infestation of Pediculosis capitis. However, studies on the KAP among school children were limited. Most of the studies have been conducted among the parents and teachers (Sidoti et al, 2009; Albashtawy & Hasna, 2012; Magalhaes, Figueiredo & Capingana, 2011). Proficient level of knowledge may contribute in the correct diagnosis of Pediculosis capitis and proper prevention and management of its infestation. Appropriate behaviour will reduce the risk of being infested with Pediculosis capitis. Subsequently, good practice results in successful prevention and management of Pediculosis capitis.

A study among primary school children in Iran reveals that the level of knowledge on Pediculosis capitis was associated with its prevalence (Shirvani & Shokravi, 2011). The quasi-experimental study among 153 students showed that, prior to health intervention, the knowledge level in the intervention group was low (1.3%) but significantly improved after the intervention (85.3%, $p< .0001$, Wilcoxon = -7.77). Before the intervention, only 5.3% of the students in the experimental group had favourable attitude to Pediculosis capitis control but the level significantly improved to 78.8% after the intervention ($p< .0001$, Wilcoxon = -7.473). The practice scores in the intervention group was 6.7% prior to the intervention but it significantly improved to 93.3% after the intervention ($p< .0001$, Wilcoxon = -7.379).

A team of researchers had conducted a study on the knowledge, risky behaviour and practice regarding Pediculosis capitis among 1,335 primary school students in Egypt (El Magrabi, El Houfey & Mahmoud, 2015). Majority of the students had correct knowledge about Pediculosis capitis infestation, treatment and prevention; however, they could not control the risky behaviours. The risk factors behaviours recorded significant association with Pediculosis capitis were sharing head covers or hats (29.2%, $p=.028$), sharing towels (62.9%, $p=.006$), sharing clothes (42.8%, $p=.008$) and sleeping on the same bed (67.5%, $p=.047$). The practice of treating Pediculosis capitis by using lice medicines recorded highest option by the students (86.8%), followed by use of natural hair oils (7.5%) and kerosene (5.7%). The practice of checking for infestation daily recorded highest prevalence of Pediculosis capitis (53.6%, $p = <.001$).

It is widely accepted that the school environment helps in the spread of the infestation, simply because close physical contact among students provides favourable conditions for transmission of parasite to other students (Shirvani & Shokravi, 2011). There is a need for continuous health education program to raise the awareness of students, parents, teachers and nurses about nit free school environment. In addition to that, they must be encouraged to prevent Pediculosis capitis by improving the healthy behaviours and implying the correct practices (El Magrabi, El Houfey & Mahmoud, 2015).

Currently, personal hygiene examination is carried out among the standard one students to detect head lice infestation, scabies, and other skin problems. The school health mobile team is also provided by the Health District Office. However, the data obtained from such examination is limited as it is only carried out among the standard one students. In most of the schools, "Doktor Muda" (Young Doctors) program has been established to instill the awareness of taking care individual's health among the children. Lice eradication is one of the initiatives under this program. However, the effectiveness of lice eradication is questionable as no proper health intervention has been carried out to tackle such problem.

The objective of this study was to develop, implement and evaluate the effectiveness of the health educational module based on KAP Model on the level of knowledge, attitude and practices on Pediculosis capitis among 10-11 years old school children in Hulu Langat district, Selangor. To control and prevent head lice infestation, health education plays an important role. It includes raising awareness of the children, family and the school community on the biology of the head lice, its transmission, treatment and environmental control of its transmission.

In Malaysia, there is lack of local data on the prevalence of pediculosis capitis among the primary school children. Apart from that, little work has been performed to evaluate the effectiveness of health education module in educating the public regarding the preventive and control measure of head lice. Therefore, this study is aimed to determine the prevalence and predictors of pediculosis capitis and the effectiveness of health education in ensuring the sustainability of successful eradication of head lice.
A problem as serious as head lice may not be eradicated; but education on this matter to the children and the caregivers may help to reduce its incidence and recurrence. The results of this research can be used by the policy makers to plan preventive measures by focusing on the predictors of pediculosis capitis and elevating the degree of community's knowledge on pediculosis capitis. Effective interventions that involve both pharmacological and health education can be taken. Effective interventions will ensure the sustainability of head lice eradication.

METHODOLOGY

PARTICIPANTS

This cluster randomised controlled trial was conducted during the 2017 academic year. The study was conducted in accordance with the Declaration of Helsinki. Participation of students in the study was voluntarily and written informed consent was obtained from the parents of students who were willing to participate in the study. Both female and male students aged 10-11 years were included if they were willing to participate in the study and the educational course and available throughout the data collection period. The exclusion criteria were failure to complete the questionnaire, students who were attending special education classes, participated in another clinical study within one month before entry to this study, usage of any pediculicide at the time of data collection or for the whole or partial duration of one month prior to the data collection. Those with active scalp infection or scalp lesions (such as psoariasis or eczema) and allergic to any ingredient of the pediculicide based on the information provided by the parents were also excluded.

INSTRUMENTATION

Since there were no standard questionnaires in this field, a researcher-made questionnaire was designed based on the existing literature. To ensure the content and face validity of the questionnaire, a panel of five experts in health education, medical entomology, health education and public health was asked to express their opinions and comments regarding the questionnaire items. Moreover, 40 eligible students who were not included in the study were asked to read and answer the questions and confirm their clarity. The required modifications were finally made to the questionnaire and its final version was used for the study.

The reliability of the questionnaire was also determined. The calculated Cronbach's alpha was 0.77 for the whole scale. The designed self-administered questionnaire was comprised of five parts. The first part included demographic information such as age, gender and parents' occupation and educational level. The second part assessed the risk factors associated with Pediculosis capitis. The third section consisted twelve "true/false/I don't know" questions about the students' level of knowledge about lice, its transmission and prevention, symptoms and treatment. In this part, incorrect and correct answers were scored as zero and one, respectively. The total scores ranged from zero to twelve. The fourth part dealt with the attitude associated with Pediculosis capitis evaluated by five items scored on a five-point Likert scale from one (strongly disagree) to five (strongly agree). It is noteworthy that the scoring was reversed in case of negatively phrased. The fifth part collected data about practices associated with Pediculosis capitis. The seven items in this part had three-choice answers (always, sometimes, and never) and were scored from one to three. The questionnaires were distributed among the intervention and control groups and the completed questionnaires were analyzed to identify the educational needs of students. The educational content was then planned based on the determined needs.

The students and family members with Pediculosis capitis were supplied with pediculicide, Dimeticone 4% gel in 70 ml bottles (LiceClear® 4% lotion, Apex Pharmacy Sdn.Bhd.). A plastic lice comb was included in the packaging. The student was taught on the necessary procedure of its application, as explained in the health education module. A handout was also given to the caregivers on the direction of its application.

PROCEDURE

Sample size was calculated based on two population's proportions formula for hypothesis testing. Power was set at 80% with 95% confidence interval. A list of government primary schools was obtained from the authorities. Using simple random sampling, 10 schools were randomly selected out of 87 schools in the district. The researchers visited the schools to conduct screening for Pediculosis capitis among the students aged 10-11 years. The prevalence of Pediculosis capitis was determined at this level. A total of 4,344 students aged 10-11 years were screened and 318 students were found to have Pediculosis capitis. Subsequently, the ten selected schools, were divided into intervention and control groups with five schools in each group using online random group allocation. At baseline, the students were required to complete the questionnaires.

To sensitize the students, the school declared the two weeks period for the screening and intervention activities as "I'm Free from Head Lice" week. The educational course comprised of 45-minute health talk, 30-minutes of Question & Answer session, 1-hour of group discussion, and distribution of pamphlets. The students in the control group only received a 30-minutes health talk on the knowledge component of Pediculosis capitis infestation. Subsequently, the practical sessions were conducted which consisted of demonstration on finding head lice and application of pediculicide. All the students were prescribed with pediculicides to be applied at home as instructed. Sufficient number of pediculicides were also supplied for their family members who had Pediculosis capitis as informed by the parents in the consent form. After two-weeks, the post-intervention assessment was conducted using the same questionnaires. The students were re-examined for evidence of Pediculosis capitis after treatment.

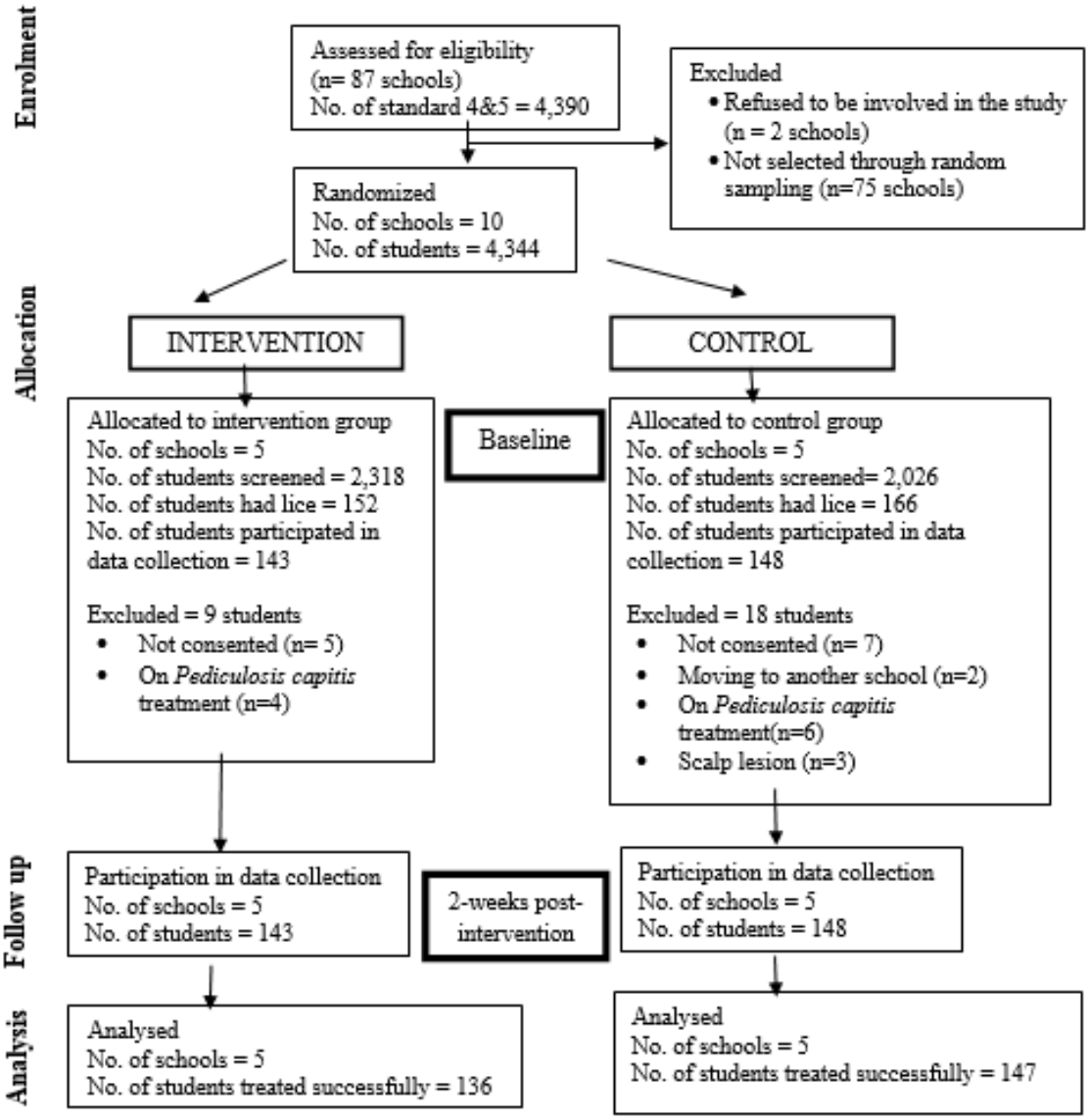
DATA ANALYSIS

After collecting all the completed questionnaires, data were coded, cleaned and analyzed using descriptive statistics (e.g. frequency, mean, and standard deviation) and inferential statistics (including chi-square test, McNemar test, multivariate linear regression analysis and Generalized Estimating Equation). All analyses were performed using SPSS version 21 (SPSS Inc., Chicago, IL, USA) at a significance level of 0.05. Normal distribution of data was determined using the Kolmogorov-Smirnov test and histogram.

RESULTS

Ten schools were selected out of 87 schools through simple random sampling. A total of 4,344 students were examined and 318 students were found to be infested with Pediculosis capitis. The overall prevalence was 7.32 %. The response rate at baseline was 94.48 %. In the intervention group, 152 students were found out to have lice but nine students were excluded due to not consented (five students) and on Pediculosis capitis treatment (four students). Therefore, only 143 students were involved in data collection at baseline and 2-weeks post-intervention. In the control group, 166 students had Pediculosis capitis but eighteen of them were excluded for several reasons. Therefore, only 291 students were included in the study, giving the number of students in the intervention group of 143 (49.1%) and 148 (5.9%) students in the control group. Figure 1 shows the CONSORT flowchart describing progress of participants through the study.

Figure 1: CONSORT flowchart describing progress of participants through the study



Based on the chi-square analysis, it shows that gender ($\chi 2$ =5.811, Degree of freedom [df] =1, p = .022) and father's education level ($\chi 2$ = 8.317, df =2, p=.04) had significant difference between the intervention and control groups. Girls predominated both groups with 138 (96.5%) in the intervention group and 132 (89.2%) in the control group. Previous infestation with Pediculosis capitis had significant difference between the intervention and control groups ($\chi 2$ =6.449, df =1, p = .011). Table 1 shows the socio-demographic characteristics associated with the intervention and control groups.

Table 1: Socio-demographic characteristics associated with the intervention and control groups

Factors	Intervention		Control		$\chi 2$ (df)	p-value
	Frequency (N =143)	%	Frequency (N = 148)	%		
Age (years)						
10	71	48.0	71	49.7	0.082(1)	0.775a
11	72	52.0	77	5.3		
Ethnicity						
Malay	133	93.0	140	94.6	0.494(2)	0.781
Indian	8	5.6	7	4.7		
Others	2	1.4	1	0.7		
Gender						
Boy	5	3.5	16	1.8	5.811(1)	**0.016a***
Girl	138	96.5	132	89.2		
Father's Education Level						
No formal education	3	21	0	0	8.317(3)	**0.040***
Lower education	1	0.7	2	1.4		
Secondary education	50	35.0	35	23.6		
Tertiary education	89	62.2	111	75.0		
Mother's Education Level						
No formal education	3	2.1	1	0.7	2.675(3)	0.448
Lower education	2	1.4	1	0.7		
Secondary education	47	32.9	41	27.7		
Tertiary education	91	63.6	105	7.9		
Father's Employment Status						
Employed	141	98.6	142	95.9	1.918(1)	0.166
Unemployed	2	1.4	6	4.1		
Mother's Employment Status						
Employed	104	72.7	99	66.9	1.174(1)	0.279
Unemployed	39	27.3	49	33.1		
Monthly Household Income						
RM 4000 or less	57	39.9	43	29.1	3.765(1)	0.052
More than RM 4000	86	6.1	105	7.9		
Number of Siblings						
5 or less	135	94.4	138	93.2	0.169(1)	0.681
More than 5	8	5.6	10	6.8		
Number of Family Members Living in The Same Household						
10 or less	136	95.1	145	98.0	1.803(1)	0.179[a]
More than 10	7	4.9	3	2.0		
Previous infestation						
Yes	86	6.1	67	45.3	6.449(1)	**0.011a***
No	57	39.9	81	54.7		
Contact with person with lice infestation						
Yes	66	46.2	66	44.6	0.071(1)	0.789a
No	77	53.8	82	55.4		
Hair type						
Straight	32	22.4	45	3.4	2.409(1)	0.121a
Curly	111	77.6	103	69.6		
Hair length						
Not beyond shoulder level	46	32.2	60	4.5	2.202(1)	0.138a
Beyond shoulder level	97	67.8	88	59.5		

Note : ($\chi 2$)-Chi square test ; (a)- Fischer exact test; (*)– Significant $p < 0.05$

Mc Nemar chi-square test was conducted to determine the changes in KAP level at baseline and 2-weeks post-intervention. In the intervention group, only the attitude showed significant increase at 2-weeks post-intervention as compared to baseline ($\chi 2 = 4.878$, df =1, $p = .027$). The respondents who had poor level of attitude at baseline and good level at 2-weeks post-intervention was 71.6%. Both knowledge and practice did not show significant increase of good knowledge and practice level at 2-weeks

post-intervention as compared to baseline. In the control group, none of the variable showed significant increase at 2-weeks post-intervention as compared to baseline. For knowledge, attitude and practice variables, respondents with poor level at baseline and good level at 2-weeks post-intervention were 84%, 75.5% and 76.4% respectively. The results are shown in table 2.

Table 2: Comparison of KAP level within and between intervention and control groups at baseline and 2-weeks post-intervention

Variable	2-weeks post-intervention		$\chi 2$ (df)	p-value
	Good, N(%)	Poor, N(%)		
INTERVENTION GROUP (N=143)				
Knowledge at baseline				
Good	12 (85.7)	2(14.2)	0.001(1)	0.973
Poor	111(86.0)	18 (14.0)		
Attitude at baseline				
Good	0 (0.0)	2 (10.0)	4.878(1)	0.027*
Poor	101 (71.6)	40 (28.4)		
Practice at baseline				
Good	74 (79.6)	19 (2.4)	0.244(1)	0.621
Poor	38 (76.0)	12 (24.0)		
CONTROL GROUP (N=148)				
Knowledge at baseline				
Good	3 (75.0)	1 (25.0)	0.233(1)	0.629
Poor	121 (84.0)	23 (16.0)		
Attitude at baseline				
Good	1 (10.0)	0 (0.0)	0.324(1)	0.569
Poor	111 (75.5)	36 (24.5)		
Practice at baseline				
Good	71 (79.8)	18 (2.2)	1.450(1)	0.229
Poor	113 (76.4)	35 (23.6)		

Generalized Estimating Equations (GEE) was conducted to determine the effectiveness of the educational intervention module in increasing the respondents' KAP on Pediculosis capitis. From the Chi-square test analysis of the socio-demographic characteristics and individual characteristics associated with the intervention and control groups (Table 1), all the variables with p<.25 were tested in the GEE model. They were analyzed as the covariates to determine the actual effect of the intervention on the KAP level of the respondents at 2-weeks post-intervention. The variables with p<.25 included were gender, father's education level, father's employment status, monthly household income, number of family members living in the same household, previous infestation, hair type and hair length. In the final model, only the variables that have significant association (p<.05) with the intervention and control groups were retained (i.e hair type and previous infestation). The interaction between the groups and time were also examined.

As for the knowledge level (Table 3), GEE analysis showed significant association of knowledge level and time point with group. The odds of having good knowledge in the intervention group is 1.7 times higher as compared to the control group (AOR = 1.748, 95% CI:1.006 – 3.035, p = .048). The odds of having good knowledge at 2-weeks post-intervention was 1.1% higher as compared to baseline after adjusting for trial covariates (AOR = .011, 95% CI:.006 – .019, p <.001). There was no interaction between the group and time. The GEE analysis showed significant difference between attitude level at 2-weeks post-intervention and baseline (Table 4). The odds of respondents to have good attitude at 2-weeks post-intervention is .4% higher as compared to baseline (AOR = .004, 95% CI:.001 – .012, p <.001). There was no significant difference in term of group. and no interaction between the group and time. At 2-weeks post intervention, the level of practice showed significant difference with the level of practice at baseline (Table 5). The odds of respondents to have good practice at 2-weeks post-intervention is two times higher as compared to baseline (AOR = 2.083, 95% CI:1.454 – 2.985, p<.001). The respondents with previous history of lice infestation had the odds of 1.7 times higher to have better level of practice as compared to those without previous history of head lice infestation (AOR = 1.758, 95% CI:1.205 – 2.565, p = .003). There was no significant difference in term of group. Interaction between the group and time was also examined and showed no significant interaction.

Table 3: Comparison of knowledge level between intervention and control groups over two weeks, adjusted by the covariates

Variables	B	SE	Wald	AOR	95% CI		p-value
					Lower	Upper	
Knowledge level at 2-weeks post intervention							
Intercept	1.724	1.1499	2.247	5.604			
Group							
Intervention	0.558	0.2817	3.926	1.748	1.006	3.035	0.048*
Control	1						
Time							
2-weeks post-intervention	-4.549	0.2951	237.578	0.011	0.006	0.019	<0.001
Baseline	1						

Note: Calculated using Generalized Estimating Equations (GEE); (*) – Significant p<0.05, Adjusted for gender, previous lice infestation, father's education, hair length.

Table 4: Comparison of attitude level between intervention and control groups over two weeks, adjusted by the covariates

Variables	B	SE	Wald	AOR	95% CI		p-value
					Lower	Upper	
Attitude level at 2-weeks post-intervention							
Intercept	0.630	0.2587	5.927	1.877			
Time							
2-weeks post-intervention	-5.603	0.6068	85.281	0.004	0.001	0.012	<0.001*
Baseline	1						

Note: Calculated using Generalized Estimating Equations (GEE); (*) – Significant p< .05; Adjusted by gender, previous lice, father's education, hair length.

Table 5: Comparison of practice level between intervention and control groups over two weeks, adjusted by the covariates

Variables	B	SE	Wald	AOR	95% CI		p-value
					Lower	Upper	
Practice level at 2-weeks post-intervention							
Intercept	0.514	0.2549	5.927	1.672			
Time							
2-weeks post-intervention	0.734	0.1836	15.979	2.083	1.454	2.985	<0.001*
Baseline	1						
Previous lice							
Yes	0.564	0.1927	8.574	1.758	1.205	2.565	0.003*
No	1						

Note: Calculated using Generalized Estimating Equations (GEE); (*) – Significant p< 0.05; Adjusted by gender, previous lice, father's education, hair length.

DISCUSSION

Pediculosis capitis is still a public health concern all around the world. It is caused by the ectoparasite Pediculus humanus capitis. In this study, the overall prevalence was 7.32 %. A level of more than 5% of infestation is considered as an epidemic of Pediculosis capitis (CDC,2018). Another observational study among government primary school children in Hulu Langat district recorded a high prevalence of 15.3%10. The respondents included were from 7 to 12 years old. The dense population of Hulu Langat district contributes to the higher prevalence of Pediculosis capitis. The density can be measured by the number of schools, school size, inhabitant density or urban settlement area. In addition to this, more densely populated municipalities may have a larger number of inhabitants travelling abroad to areas with higher prevalence, which might increase influx of new head lice into the system compared to less densely inhabited areas. More densely populated municipalities are also likely to contain a higher number of persons not receiving appropriate treatment for head lice and repeatedly infesting others. The selection of students aged 10-11 years in current study was related to the finding in the study by Tohit et al (2017) where age 10 years or more had higher prevalence of Pediculosis capitis (Tohit et al, 2017). In this study, the girls were predominantly infested as compared to boys. Most previous studies have shown the prevalence to be higher in girls, a finding which is thought to be due to gender-related behavioural differences (Rassami & Soonwera, 2012; Karimah et al, ,2016). Close contact between heads for boys tends to occur briefly in rough play and sports, while for girls close head contact is often more intimate and prolonged.

The strength of this study could be seen primarily in its design, together with the way of the research has been conducted. This study used randomized control trial which is the gold standard of clinical research. This study used a cluster randomized controlled trial (CRCT) in which individuals were randomized in groups. The whole schools were randomized and all the students within a given cluster were assigned to the same study arm, either intervention or control groups. When individual randomization is not feasible, researchers can opt for a CRCT (Torgerson, 2001). As in this study, the students in the same school were not feasible to be randomized into different group of treatment arms in view of risk of high contamination effect. There would be too much shared knowledge of different interventions and overlap in the school personnel who were in contact with the respondents' i.e the Health teacher who conducted periodic head and scalp examination. Thus, CRCT was conducted to minimize the risk of contamination between the intervention and control respondents. Another study also showed the importance of clustering the students into classes and schools was more important than single-student characteristics. The results elicited from clusters are more reflective of the whole populations Williams et al, 2001). It is more useful in the policy making process due to its robustness.

The clustering ensured the generalization of the results obtained as compared to individualized results. The random allocation of clusters (schools) to separate groups of the study helped to overcome threats of selection bias. Blinding of respondents in this study helped to reduce response bias. The study had large sample size and very high response rate. The rate of drop-out in this study was very minimal (<5%), hence preserving the population distribution in both study groups. It assured comparability and validity of the results.

The findings of this study demonstrated the effectiveness of health education intervention in improving knowledge related to Pediculosis capitis among students aged 10-11 years old. The finding was in line with the study conducted in Iran (Moshki, Zamani & Mojadam, 2017). Similar findings of improvement of knowledge on Pediculosis capitis after an intervention was recorded by other studies (Bachok et al, 2006; Shirvani & Shokravi, 2011).

The health education intervention was not effective in improving the level of attitude of the respondents. This finding was in line with the results reported from a quasi-experimental study in Iran. In the control group, 5.1% had favourable attitude to head lice control before the educational intervention; however, there was no significant difference after the intervention. Practice level was not improved after the health intervention in this study. This finding in contrast with the study by (Shirvani & Shokravi, 2011). In that study, in the intervention group, only 6.7% had good practice about the control of head louse and performed personal hygiene (bathing, combing) before the intervention. However, the percentage increased to 93.3% after the educational intervention ($p< 0.001$).

Screening for head lice shall be made mandatory at regular interval in primary schools. It can be incorporated in the Health Education sessions, at least once in two months. In Malaysia, The 'Young Doctor Club' was formed in schools to provide continuous health education to the students through empowering the students and teachers. This entity must be mobilized further to enable them managing the problem of head lice in schools. They should be trained to diagnose head lice infestation including differentiating between active and inactive infestation. They can also monitor any treatment given to the infested student to ensure better treatment compliance. In future studies involving intervention, it is recommended that such studies should be conducted for a longer follow up period than the current study to ascertain the impact of the intervention on long term knowledge, attitude and practice on Pediculosis capitis. It can be carried out in the interval of 3 months or longer to determine the sustainability of the effects garnered from the health intervention. Interventions should also involve the parents and caregivers for better compliance. As the cognitive level between the lower primary (aged 7-9) and the upper primary (aged 10-12) has distinct variances, specific module for the lower primary school children should be developed. It may involve more interactive sessions using animation or the icons or characters which are familiar and friendlier to the children.

It would be particularly interesting for future similar studies to explore the results of current study in diverse types of schools. The private schools should be included as the problem of head lice can affect all children from various economic strata. The secondary schools should also be examined as they are at risk of infestation especially with the presence of younger siblings at home. The research can also be conducted among day-care centres where some children may spend time being together with other children who are infested with head lice. The studies can also be conducted at the community level such as among households or institutions.

Where feasible, it is recommended that the study further asses the behaviour modification as compared to attitude changes in current study. Suitable health behaviour models can be used to carry out the research in the future. Health Belief Model or Socioecological Model can be explored for understanding various aspects of psychosocial factors which influence behaviour modifications in the management of Pediculosis capitis. Due to paucity of recurrent Pediculosis capitis in literature, exploring this issue is also recommended for future research. The factors related to and predictors of recurrent Pediculosis capitis can be identified to reduce its occurrence in the targeted population.

Pediculosis capitis is a relevant and on-going issue in the society, especially among the primary school children. The intervention is created to instill awareness and improve the knowledge of the students, teachers and care givers to prevent infestation with head lice. It is important to ensure the sustainability of the intervention and effective impacts on the prevention and treatment of head lice among the children. There are several methods to ensure the sustainability of the intervention:

a) During each visit to the schools involved, the students and teachers from student's health club will be given briefing and education to conduct periodic head scalp examination for the students in the respective schools. They will be provided with health education materials related to head lice infestation. It may consist of prevalence of head lice in children, risk factors to

have head lice infestation and the prevention and treatment of head lice infestation. They will also be taught in differentiating the children with active head lice infestation and the children who have been treated.

b) The researchers will pay a periodic visit to the schools to follow-up on the effectiveness of treatment and prevention of head lice in the respective schools. During the visits, the researchers will identify the strength and weaknesses of the implementation of health activity by the school's health club. Necessary improvement will be recommended for any weaknesses identified. Similarly, the strength from the activity conducted will be highlighted and encouraged accordingly.

c) The researchers will work together with School Health Team in the Health District Office to ensure that pediculosis capitis will be a n important issue to be addressed during the visit of the School Health Team to the schools. Most of the times, the team has great emphasized on immunization program, screening for congenital cardiac disease and screening for eye problems. By having the data from this research, the team might incorporate the screening, treatment and prevention of head lice in their program as well.

CONCLUSION

The present study had some limitations worth mentioning. However, as much as possible, necessary measures had been taken to ensure the limitations did not interfere or jeopardize the validity of the results obtained in this research. The limitation was encountered in managing the family involvement. Some of the students included in this study recorded other family members who were also infested with Pediculosis capitis. Each infested family member was provided with a bottle of pediculicide, similar as being used by the respondents. However, the researcher was unable to assess the compliance and the methods of application among the family members who were treated. This might impose risk of cross-infestation among the students who recorded treatment failure at 2-weeks post-intervention.

The limitation was also encountered in term of possibility of the control group being exposed to information sources. The location of the schools included in the study were quite a distance from each other to allow contamination to occur. However, the control group might have been exposed to other information sources such as mass media, social media and printed materials during the study period which could not be controlled.

This study had shown effectiveness of school-based health education intervention in improving knowledge of respondents towards preventing recurrent infestation with Pediculosis capitis. However, the health education module was not effective in improving the attitude and practices of the respondents. A timeline of 2-weeks duration showed significant improvement in the KAP of the respondents as compared to baseline. At 2-weeks post-intervention, the odds to have poor knowledge was 98.9% lower and the odds to have poor attitude was 99.6% lower than the baseline.

HUMAN SUBJECTS APPROVAL STATEMENT

Approval for this research was obtained from Research Ethics Committee of University Putra Malaysia, FPSK (EXP16) P163, as well as Ministry of Education, state and district Education department and participating schools. Parents provided active consents and students completed a child assent form.

ACKNOWLEDGEMENTS

The researchers would like to acknowledge the teachers and students involved in this study.

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