ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: https://ijrps.com

Validation of FAT4CP© first aid module and assessment tool: Evaluating module acceptance and the Knowledge, Attitude and Confidence (KAC) on first aid response among childcare providers

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Article History:

Received on: 02.10.2018
Revised on: 12.12.2018
Accepted on: 15.12.2018

Keywords:

Assessment tool,
First aid,
Knowledge Attitude and Confidence,
Childcare provider

ABSTRACT

At present, there is a paucity of Malaysian policy on paediatric first aid training for childcare providers. Thus, this study has developed a first aid module called FAT4CP© for childcare providers and aim to determine the acceptance level of the module and validate an instrument that evaluates the competency of their knowledge, attitude and confidence (KAC) in conducting first aid. Focusing on the content, graphics and design, evaluation of acceptance for the module involved 15 childcare providers with at least one year of experience in handling children at childcare centres and 15 healthcare professionals. Together with the module, an assessment tool was developed, with content and face validity assessed by content experts. A self-administrated questionnaire was distributed to 70 childcare providers to measure their first aid KAC. Construct validity of the questionnaire was examined using Exploratory Factor Analysis (EFA) with principal component methods and varimax rotation. Cronbach's α values were used to estimate the reliability of the questionnaire. This study revealed that the module was well accepted with a majority of the childcare providers (93.3%, n=14) indicated that they understood the information contained in the module. The first aid assessment tool was also found to be reliable in measuring knowledge, attitude and confidence among childcare providers with Cronbach's alpha of 0.56, 0.95 and 0.92, respectively. For content validity, the questionnaires were critically reviewed in terms of relevance, clarity, simplicity, and ambiguity. In conclusion, the findings of this study demonstrated that the module was well received, and the assessment tool is valid and reliable in measuring first aid KAC among childcare providers.

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ISSN: 0975-7538
DOI: https://doi.org/10.26452/ijrps.v9iSPL2.1737

Production and Hosted by
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INTRODUCTION

Unintended injuries that occur at daycare or childcare centres may lead to morbidity and mortality which subsequently may result in a lawsuit for negligence. Childcare providers are not just expected to provide a safe environment for children, but they are also expected to provide comprehensive first aid at child care centres. There are several compulsory pieces of training offered to childcare providers and the training vary based on policies of each country. Part of the training includes health and safety, fire safety, infection control and early

childhood education (Johnston *et al.,* 2000). Despite expectations that caregivers should be well-informed and equipped with knowledge on first aid response, first aid training is not a compulsory module for childcare providers in Malaysia, hence making inappropriate first aid response as one of the greatest issues for caregivers (Youngblut *et al.,* 2005). The past two decades have seen the incidence of injuries at childcare centres in developed countries such as Canada and the United States of America to be preventable and manageable with appropriate training on first aid response (Brison *et al.,* 2006). Therefore, there is a growing demand for exclusive first aid training and certification amongst childcare providers to meet the increasing awareness of the community.

In Malaysia, first aid training developed by the National Committee on Resuscitation Training (NCORT) are in accordance with the American Heart Association (AHA) recommendations. The first aid training focuses on educating all community members without discriminating the individual's background. Programmes such as Home First Aid, CPR & AED and Occupational Safety & Health provide intensive training and certifications upon request by any community members. The programmes, however, are more prominent among healthcare deliverers due to the paucity of Malaysian policy and accentuation on the first aid training programmes (Sheng *et al.,* 2008). Hence, there is a lacking of a first aid training module for childcare providers that focuses on responses towards possible injuries that may occur at childcare centres and has never been published (Lee *et al.,* 2010).

As reviewed and recommended by Swor et al. (2008), a successful first aid training for the public without basic medical knowledge depends on trained instructors, interactive modules and hands-on practical. Other factors such as learning environment, reading ability and participants' emotion may also affect first aid skill acquisition and retention (Thorne *et al.,* 2017). Each member of the community has a distinct cognitive level. Therefore the biggest challenge in providing community-based first aid module is not merely the dissemination of knowledge and training, but also the retention of the knowledge and skills acquired. Accurate assessment tools are also necessary to enable the evaluation of correct knowledge understanding in line with the attitude and confidence of a designated group in the community performing first aid (Kuramoto *et al.,* 2008).

This study encompasses two phases; the first phase was to develop and assess the acceptance level of the module provided in the FAT4CP© training programme, and the second phase was to validate the instruments used to evaluate childcare providers' knowledge, attitude and confidence (KAC) in performing first aid.

METHODS

Participants

Participants enrolled in the evaluation of FAT4CP© module were childcare providers from childcare centres in Negeri Sembilan, Malaysia, and healthcare professionals recruited among academicians at the Faculty of Medicine and Health Sciences, Universiti Sains Islam Malaysia as well as Medical Officers from Ministry of Health, Malaysia. The inclusion criteria for childcare providers are those who have been working as childcare providers during the study period with at least one year experience in the area, able to read and write, no hearing or vision problems, and no mental or terminal disease. The inclusion criteria for healthcare professionals are those involved in the care of children in the clinical settings for the past one year.

For the validation of KAC assessment tools, only childcare providers recruited from childcare centres in Negeri Sembilan were enrolled as participants. The sampling criteria include those with a minimum of one year experience in handling children at childcare centres, able to read and write, no mental or terminal diseases and have never undergone first aid training.

Development and Evaluation of FAT4CP© Module

The 'First Aid Training Module and Certification for Childcare Provider' (FAT4CP©) was developed by a group of multidisciplinary team comprised of emergency physicians, family medicine specialists, pharmacologists, pathologists and nutritionists based on Wizowski et al. (2008) and 2015 AHA guidelines (Atkins *et al.,* 2018) mainly for use at childcare centres. A systematic literature search was also performed to assess available materials on the latest policies, guidelines and recommendations in first aid response for children. A professional artist was employed to assist in illustrating the messages conveyed in the module. Once the module's face, content, and suitability of the design have been validated, evaluation of the module was carried out to obtain feedbacks from childcare providers and healthcare professionals as the target group (Luyten *et al.,* 2017).

The evaluation of acceptance towards the module was based on the protocol described by Nutbeam (1998). Participants were given one hour of ample time to answer a self-administered questionnaire consisting of sociodemographic parameters, and

subsequently to understand and evaluate the acceptance of the module with respect to its content, graphics and design.

First Aid KAC Questionnaire

The questionnaire consists of four sections; the first section asks sociodemographic questions, while the other three sections assess the KAC domains represented by 35 items. These questions were designed based on literature search and expert reviews. The first domain is intended to assess childcare providers' level of knowledge on first aid module. There are ten questions in this domain with a true or false option for each; score '1' is given for true answers and '0' for false answers. For the second domain, there are 15 items which reflect the childcare providers' opinions and attitude about first aid response. The answers are in Likert scale from '1'- Strongly disagree to '4'- Strongly agree. The final domain of the questionnaire assessed the childcare providers' level of confidence in performing first aid response. This domain encompasses 10 items scored using a Likert scale from '1'- Strongly disagree to '4'- Strongly agree. Data from the KAC domains were summed into a percentage score so as to treat the variable as continuous data. The domains and scoring for KAC questionnaire were summarized in Table 1.

Statistical Analysis

Data entry and analysis were computed using IBM® SPSS® Statistics software version 22.0 (Armonk, NY, USA: IBM Corp). Data were checked for completeness and examined for normality distribution using the stem-and-leaf plot and the Kolmogorov-Smirnov Test. For continuous variables, normally distributed data were expressed as means and standard deviations, whereas medians and interquartile ranges were computed for skewed distributed variables. Frequencies and percentages were calculated for ordinal and nominal data.

The construct validity was examined using Exploratory Factor Analysis (EFA); the principal component analysis (PCA) was used to generate a scree plot and eigenvalues (≥1) to decide on the number of factors obtained. Factor extraction using PCA was undertaken to obtain the loadings (preferably 0.30 or greater) for each of the factors (Costello and Osborne 2005). Upon obtaining the factor loadings for each factor, the loadings were rotated to maximize high loadings and minimize low loadings so that the simplest possible structure was achieved. Hence, to obtain the simplest structure, the varimax (orthogonal) rotation was employed assuming that the factors were uncorrelated with one another. If the factors were correlated, an oblique rotation (such as the oblimin, Promax or direct quartimin) would be preferred. The Kaiser-Meyer-Okin (KMO) test for sampling adequacy was measured to determine the matrix appropriateness for factor analysis. A value of 0.80 suggested sufficient correlation to conduct the analysis (Hair *et al.,* 2009). The internal consistency of KAC was scrutinized using Cronbach's alpha coefficients, inter-item correlations, and item-total correlations. A value of ≥0.70 indicated high internal consistency, while ≥0.40 of item-total correlation demonstrated a good correlation between items of KAC (Nunnaly and Bernstein, 1994).

RESULTS

Development and Acceptance of FAT4CP© Module

The FAT4CP© module was developed to address three important domains in first aid response (Table 2). Design of the module and training programme adapted first aid guidelines from the 2015 AHA and American Red Cross (ARC) Guidelines for First Aid (Zideman *et al.,* 2015) for use as a reference guide for first aid training and to be utilized at childcare centres. Assessment of module acceptance involved 15 experienced childcare providers (two male and 13 female, aged 27.0±2.5 years) and 15 healthcare professionals (9 male and 6 female, aged 34.7±7.3 years). Our results indicated that 93.3% of childcare providers and 100% of healthcare professionals understood the module content. Detailed analysis of acceptance towards the module is described in Table 3. Based on the feedbacks by respondents (Figure 1), the module was modified to include only minimal use of difficult medical terminologies, the addition of figures and illustrations, and structures of sentences were simplified for better understanding.

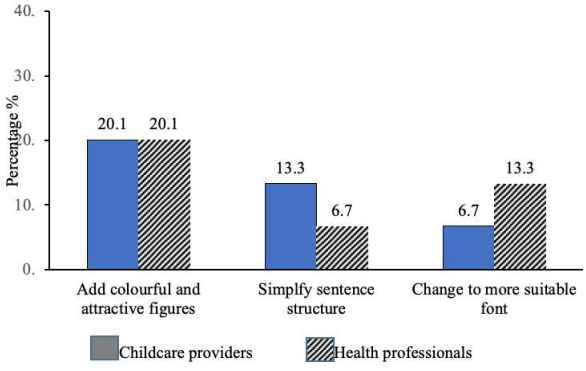

Figure 1: Suggestions to improve understanding of the information in the module

Validation of FAT4CP© KAC Assessment Tool

Seventy childcare providers (68 female and 2 male) completed the assessment tool; the majority of the participants (86.7%, n=60) have received only secondary education while the remaining

Table 1: Domain content and scoring for Knowledge, Attitude and Confidence (KAC) on first aid questionnaire

Domains	No of items	Scoring
Knowledge	10	Dichotomous 1=True, 0=False
Attitude	15	4-point Likert Scale 1=Strongly disagree, 4= Strongly agree
Confidence	10	4-point Likert Scale 1=Strongly disagree, 4 = Strongly agree

Table 2: Content of the FAT4CP© module

Domains	Content
Domain 1: Cardiopulmonary Resuscitation	1. Cardiopulmonary resuscitation 2. Choking
Domain 2: Non-Trauma Cases	1. Asthma 2. Fever 3. Faint 4. Epilepsy 5. Dengue fever 6. Hyperthermia 7. Hypothermia 8. Diarrhoea 9. Nosebleed
Domain 3: Trauma Cases	1. Ear injury 2. Eye injury 3. Hand and foot injury 4. Neck injury 5. Chest injury 6. Open wound 7. Burn 8. Snakebite 9. Electrical shock

Table 3: Analysis of the acceptance of the FAT4CP© module among childcare providers and healthcare professionals

Parameters	Childcare providers n (%)		Healthcare professionals n (%)	
	Yes	No	Yes	No
Titles are clearly stated	13 (86.7)	2 (13.3)	14 (93.3)	1 (6.7)
Contents are easily understood	14 (93.3)	1 (6.7)	15 (100)	0 (0)
Terminologies are easily understood	14 (93.3)	1 (6.7)	14 (93.3)	1 (6.7)
Sentences are clear and easily understood	14 (93.3)	1 (6.7)	14 (93.3)	1 (6.7)
Figures are clear	14 (93.3)	1 (6.7)	15 (100)	0 (0)
Figures are suitable	15 (100)	0 (0)	15 (100)	0 (0)
Figures are attractive	14 (93.3)	1 (6.7)	13 (86.7)	2 (13.3)
Combination of colours are attractive	15 (100)	0 (0)	13 (86.7)	2 (13.3)
Usage of suitable fonts	14 (93.3)	1 (6.7)	13 (86.7)	2 (13.3)

14.3% (n=10) received tertiary education. Explanatory Factor Analysis (EFA) was performed to assess the construct validity of the KAC questionnaire. EFA results are shown in Table 4 and 5 indicated that items

for attitude and confidence domains achieved sufficient factor loadings above 0.30 which stipulates significant factorial contribution (Costello & Osborne, 2005).

Table 6 showed the results of reliability analysis for the 35 items of KAC domains. Attitude (α=0.95) and confidence (α=0.92) recorded Cronbach's alpha values of >0.70, which indicated satisfactory internal consistency reliability. Whereas, knowledge domain demonstrated moderate Cronbach's alpha value of 0.70 (Schmitt 1996). These were reflected by item-total correlation scores ranging between 0.20 to 0.89.

DISCUSSION

An educational package module on first aid response for childcare providers termed as FAT4CP© was successfully developed and copyrighted by Universiti Sains Islam Malaysia with the

Table 4: Exploratory factor analysis of items in the attitude domain (N=70)

Items	Factor loading	
	F1	F2
A1: I will bring the child immediately to the hospital if they experience vomiting after falling off the cradle.	0.82	--
A2: Children suffering from severe diarrhoea should be taken to the hospital	0.81	--
A3: I think children are at high risk to get heat stroke based on climate and weather in Malaysia	0.79	--
A4: Regular electrical appliance maintenance is essential to avoid accidental electric shock	0.87	--
A5: When a child experiences convulsions, I will insert the object into his mouth to avoid the child to bite his tongue.	0.56	--
A6: All child caregivers need to be trained to handle children with fever	0.91	--
A7: All child caregivers need to understand the cause of fainting among children	0.87	--
A8: I will bring the child to the hospital immediately if the burned occurred at the genital area.	0.85	--
A9: I will provide an asthma reliever called metered dose inhaler if the child has an asthma attack.	0.91	--
A10: Early emergency treatment can only be done at the nearest health centre.	--	0.82
A11: I will provide an asthma reliever called metered dose inhaler if the child has an asthma attack	0.57	
A12: I think the case of hyperthermia can be handled in the nurseries	--	0.79
A13: I need to have clear knowledge in handling snake bites cases	0.78	--
A14: I think all child caregivers need to know about the risks, complications and emergency treatments for an ear injury	0.86	--
A15: I need to know the cause and how to avoid hypothermia	0.87	--

Table 5: Exploratory factor analysis of items in the confidence domain (N=70)

Item	Factor loading	
	F1	F2
C1: I am confident that I can give an early emergency treatment if the child has a nose bleeding	0.69	--
C2: I am confident to handle the situation of snake bites against children	0.79	--
C3: I am confident that I can handle the situation of a child having seizures	0.86	--
C4: I am convinced I can do CPR if a victim of electrical shock is unconscious and does not breathe	0.84	--
C5: I am confident that I can provide emergency first aid for neck injury cases	0.83	--
C6: I am confident to handle a faint child	0.87	--
C7: I am confident to handle children suspected of dengue fever	--	0.69
C8: I am confident it can provide metered doses of the inhaler to children with asthma attacks	0.75	--
C9: I believe I can handle children who suffered burns caused by hot water.	0.66	--
C10: I am confident to perform the 'Heimlich manoeuvre' procedure.	0.80	--

aim to enhance childcare providers' KAC in performing first aid response. Following recommendations by Shahar et al. (2011), the educational package was produced in a convenient A5 size booklet to allow portable mobility and convenience for patient education. A module is an imperative tool which supplements first aid training

as there are multiple resources on first aid available in the market either online or published as books (Butler *et al.,* 2013, Kelly and Tangney, 2005), however, this is the first module of its kind that was exclusively designed based on emergency situations that may occur in childcare centres which could provide a continuous source of information for childcare providers (Kelly and Tangney, 2005).

FAT4CP© KAC assessment tool aims to integrate all aspects into three domains; cardiopulmonary resuscitation (CPR), non-trauma cases, and trauma cases. Existing assessment tools are more focused on CPR and do not include elements of first aid response in the assessments. Present assessment tools were also developed to assess knowledge and competency of healthcare professionals rather than layman without any healthcare background (Roshana *et al.,* 2012).

Waibel and Misra (2003) reported that the prevalence of unintended injuries occurring at preschools and playgrounds in urban areas worldwide was approximately 40%. Injury alone accounts for one half and one-third of all deaths in children aged 1 to 4 years in the United States of America and China respectively. As most injuries require early first aid response, it is critical to be able to assess childcare providers' competency in performing first aid (Hashikawa *et al.,* 2013). Therefore, the KAC questionnaire was designed to be a self-administrated instrument that is user-friendly and will allow researchers to get better insights into childcare providers' understanding of first aid training provided to them. Hence, this study also determined the validity and reliability of the KAC questionnaire administered to childcare providers on the first aid response.

Table 6: Item-total correlations and Cronbach's alpha coefficients for KAC (N=70)

Subscales	Items	Corrected Item total correlation	Cronbach's alpha
Knowledge	Q1	0.29	0.56
	Q2	0.31	
	Q3	0.22	
	Q4	0.22	
	Q5	0.21	
	Q6	0.20	
	Q7	0.26	
	Q8	0.29	
	Q9	0.25	
	Q10	0.30	
Attitude	A1	0.82	0.95
	A2	0.82	
	A3	0.68	
	A4	0.80	
	A5	0.60	
	A6	0.89	
	A7	0.82	
	A8	0.84	
	A9	0.87	
	A10	0.33	
	A11	0.63	
	A12	0.30	
	A13	0.78	
	A14	0.87	
	A15	0.88	
Confidence	C1	0.62	0.92
	C2	0.72	
	C3	0.80	
	C4	0.77	
	C5	0.76	
	C6	0.83	
	C7	0.38	
	C8	0.70	
	C9	0.59	
	C10	0.73	

To assess the construct validity of the questionnaire, Explanatory Factor Analysis (EFA) was performed, and the method of principal axis factoring using orthogonal (varimax) rotation for factors extraction was chosen. Schmitt (1996) suggested that the cut-off value of at least 0.30 appeared to be a strong factor loading coefficient. Factor loading is important to identify items to be deleted as it suggested the correlation between items in the respective factor. Findings of our analysis using PCA demonstrated that 13 items under the attitude domains are likely to be internally associated. A similar result was also recorded for items under confidence domain with 9 items scored factor loading of at least 0.40.

In addition, both attitude and confidence domain reported significant Bartlett's test of Sphericity and KMO of more than 0.60, respectively hence, indicate the suitability of data for structure detection. On the contrary, items in the knowledge domain were developed based on the highlighted area and essential knowledge related to first aid. Therefore, items in this domain were not operationally defined which further disallowed general grouping (Troachim 2006). Based on this justification, all items listed in the knowledge domain do not require factor analysis.

Despite the preference of internal reliability values of 0.70 or greater as an indication that a test is sufficiently reliable in measuring knowledge structures, there are multiple studies that reported Cronbach's α values for knowledge ranging from 0.50 to 0.80 (Deniz and Alsaffar, 2013). In this study, the Cronbach's α value of 0.60 in knowledge among childcare providers is considered acceptable as the participants came from multiple backgrounds and their education level ranged from secondary to tertiary level. Furthermore, none of the participants was previously trained in first aid or has any background in health education.

The key strength of the assessment tool is the ability to homogenously assess users' attitude and confidence based on their exposure to first aid training. The tool comprehensively assesses elements of knowledge, attitude and confidence towards first aid and yet it is simple to be implemented. It is designed for dichotomous response to ensure that users are able to complete the assessment within the minimal time frame and does not require interpretation from raters (Ilic *et al.,* 2014).

There were several limitations addressed in this study with the main concern was the sample selection. The respondents that participated in the assessment of module acceptance and validation of the assessment tool were selected based on convenient sampling. Due to the nature of the job in

childcare centres, the majority of the participants were female. However, gender was included as a potential confounding variable and does not pose any significant effect on the results. It is generally accepted and reflected in this study that education level had a significant effect on the knowledge of first aid (Vaillancourt *et al.,* 2008). Therefore, future studies must include an emphasis on the homogeneity of the education level in the sampling frame.

CONCLUSION

The newly developed FAT4CP© module was well accepted by both participating groups, childcare providers and healthcare professionals. Minor modifications with respect to medical terminologies, illustration and figures were done based on recommendations by respondents to facilitate comprehension and acceptance towards the module. The module's assessment tool also proved to be valid and reliable in measuring KAC on first aid response. The printed module has the potential to enhance knowledge of childcare providers on first aid, and subsequently may increase the application of first aid response at childcare centres. Evidence-based on the efficacy of the module in enhancing KAC can be assessed using the FAT4CP© assessment tool provided.

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