

Development and Item Analysis of a Self-Reporting Instrument to Capture Children's Knowledge and Behaviours on Zoonotic-Related Diseases from Household Pets

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Abstract

Zoonotic infections, which can develop into life-threatening conditions, should not be taken lightly. Despite the rising number of pet owners, knowledge of zoonotic diseases and children's behaviour when associating with pets at home remains limited. In Malaysia, few studies have investigated children's knowledge of zoonotic diseases and personal hygiene practices while caring for pets at home. Therefore, this focused on item development, validation, and analysis to assess content validity, acceptability, and contribution to internal consistency for age appropriateness among children. A pre-validation questionnaire was validated on two primary domains, knowledge, and behaviour, by subject matter experts (SME) specialising in zoonoses. A total of 66 children were selected to answer 14 dichotomous scale questions, with the responses subjected to further analysis. The post-validation process was performed by assessing the item suitability for the target group. Several items in the instrument should be modified. Meanwhile, some items should be retained due to the significance in evaluating the knowledge of disease transmission among children. The rationale underlying this modification stemmed from prior research findings and expert feedback. The final self-reporting instrument, Cognitive Affective Behaviours – Institute for Health Behavioural Research- Zoonoses Children-01 (CAB-IHBR-Zoonoses C-01), includes 10 items with adequate content coverage, acceptable qualities, and favourable expert reviews.

Keywords: Zoonotic diseases, Household pets, Zoonoses Children, Item Development, Item Analysis, Malaysia

1. Introduction

Zoonotic diseases pose significant public health risks, which could lead to social and economic burdens [52]. Approximately one billion cases and millions of fatalities are attributed to zoonoses-related diseases

annually, and 60% of newly reported and emerging infectious diseases globally are zoonoses-related. The last three decades have witnessed the discovery of more than 30 novel human infections, of which 75% are of animal origin [53]. Careless animal handling is one of the critical factors that could increase the risk of animal-related infections among children. They can remain healthy by adopting risk-reducing behaviours; thus, creating awareness is essential in preventing contact-transmitted illnesses [37]. Furthermore, children's knowledge and behaviour must be evaluated to determine the extent to which they manage the risk of disease transmission.

The most common household pets in Malaysia are cats and dogs [14]. Children have a good relationship with their furry companions [35]. Increasing physical interaction between man and animals promotes the spread of zoonotic infections in the human population [28, 17]. Leptospirosis, scabies, rabies, and Q fever are the most prevalent zoonotic infections associated with cats and dogs in Malaysia [29, 25]. Furthermore, most studies in Malaysia reported children's and adults' unawareness of animal-to-human disease transmission, including pet owners [18, 54]. As the risk of exposure to zoonotic diseases is not limited to stray animals, but also includes vaccinated pets, this finding proves concerning.

Another study revealed that 2.5% of pet owners had contracted a disease from their pets [43]. Despite the low prevalence, the infection could substantially impact the victims, particularly the populations at risk, such as children [46]. Children are prone to zoonotic infections due to increased physical contact with their pets [12, 51] and poor hygiene practices [2, 7, 34]. As untreated zoonotic diseases have life-threatening implications [19], it is imperative to understand the mechanism of infection transmission from animals to humans and practice hand hygiene as a preventive measure against these diseases [33, 9].

To date, no nationwide study in Malaysia has assessed the children's knowledge of diseases transmitted by pets and their pet-care practices. Most research targets adults and a single disease [5, 13, 1, 40, 42], excluding the study conducted by Rashid (2018). Nevertheless, Rashid (2018) targeted those aged 12 and older. Therefore, younger children's knowledge and pet-handling behaviour remain unknown and warrant further investigation. Moreover, the existing literature focuses on zoonosis awareness, attitude, and behaviour [4, 23, 8, 10], while the available instruments in Malaysia only emphasise prevalent zoonotic-related diseases [35, 54]. Thus, this study aims to develop and validate a new self-reporting assessment instrument for animal-related illnesses and behaviours, emphasising children's self-hygiene.

2. Methodology

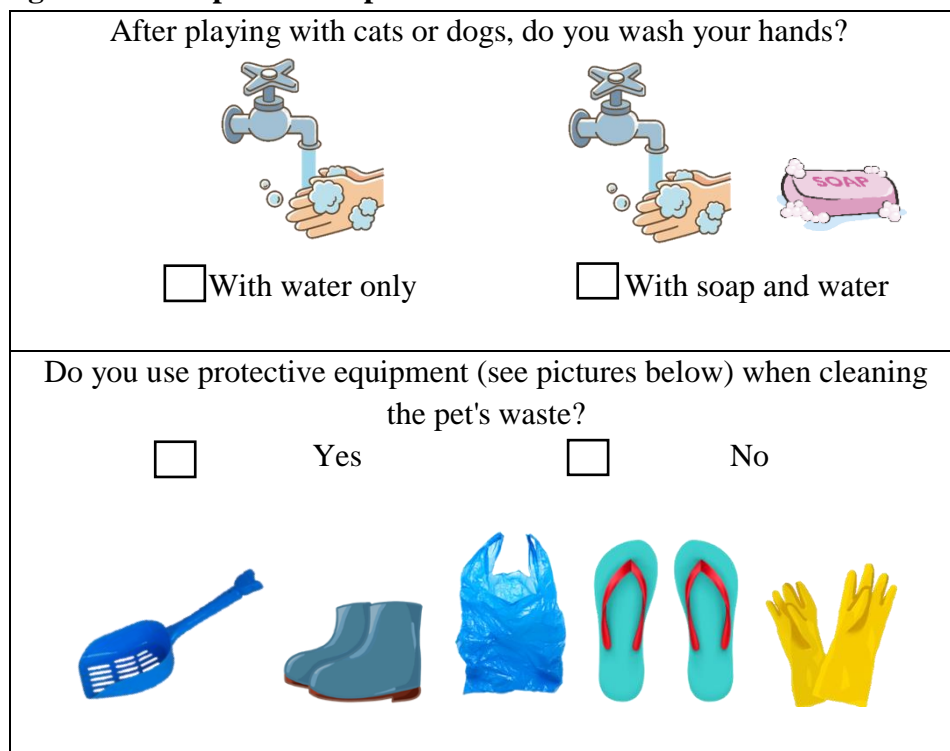
The general workflow to develop the questionnaire items for this study is presented as follows: published questionnaires and scientific literature review, focus group discussions (FGD) with the research team and stakeholders, subject matter experts (SME) evaluation, pilot study, and questionnaire validation. The focus and direction of the instrument were determined and discussed based on stakeholder needs and guidelines set by the Communicable Disease Control Unit, Ministry of Health (MOH) Malaysia, and the Department of Veterinary Services, Ministry of Agriculture and Food Industries (MOA), Malaysia. Furthermore, the development and validation processes adhered to the procedure and considered the cultural sensitivity of Malaysian children. Several FGD with relevant stakeholders were conducted to identify the focus and direction of instrument development domains. At the end of this process, perception is deemed a higher-

order cognitive process that goes beyond the comprehension of children under 12 years [32]. Therefore, the main domains of the assessment are limited to knowledge and behaviour.

2.1 Items generation

A comprehensive literature search was conducted to identify several key terms relevant to the children's assessment instruments. The keywords and phrases used in the following literature search include "zoonoses", "children", "zoonoses in children", "zoonotic infection", and the Boolean combinations. Most literature related to the aim of this study originates from Western countries focusing on adults [45, 49, 16]. Towards the end of this process, a study that emphasised rabies [3] and a knowledge, attitude, and practices (KAP) study on zoonoses [45] were adapted to develop the instrument for this study. Demographic characteristics, awareness of pet-related diseases in the general population (cognitive), pet care practices and personal hygiene when handling pets (behaviour), behaviour in seeking health-related zoonotic infections (behaviour), and awareness of animal rights (cognitive) were identified as key domains in the initial discussion. Several items were modified, and others were adapted to fulfil the study requirements as the literature has limited reference instruments. New items focusing on personal hygiene were also developed due to the significant relevance to this study, which was drawn from the literature search [7, 34, 9]. The instrument development considered the need to be culturally and age-appropriate for children between seven and 12 years. Most items were graphic-based content to ease the thought process and promote a deeper understanding among the participants [27, 44]. Figure 1 illustrates a graphical item included in the instrument.

Figure 1: Examples of Graphic Contents in the Assessment Instrument.



The instrument was also translated from English to Malay, following the standard procedures detailed in the translation guidelines [48]. Phrases and sentences were constructed carefully to ensure the instrument was age-appropriate. The instruments were translated into Malay, the primary language Malaysians speak

and write. Forward translation was conducted by two independent translators fluent in English and understood the intention underlying every item. Meanwhile, backward translation was performed by a panel of experts to ensure the accuracy of the initial translation. They also evaluated the meaning compatibility between the original instrument (English) and the translated version (Malay).

2.2 Validity of the questionnaire

Once the complete draft was obtained, the instrument was evaluated for validity to ensure the instrument fully measures the construct of interest in terms of relevance and representativeness. In addition, the content validity assessment aims to ascertain whether the instrument accurately measures the intended construct. The validation process also determined the extent to which the instrument language, content, and structure proved adequate for measuring the target population's knowledge and behaviour [47]. The assessment was performed by a panel of SMEs from various backgrounds who are familiar with the validation procedures. The SME panel includes a veterinarian, an epidemiologist, an academician specializing in research methodology, and a public health specialist. The panels evaluated all items at the development stage to ensure readability and comprehensiveness. Further item tuning was performed to suit the Malaysian culture and children.

The instrument was later validated to determine whether the instrument competently measures the intended construct at face value [26]. This procedure also determines the applicability of items for each domain to identify the relevance of study measurement, knowledge, and behaviour. The main objective is to ensure the applicability of the instrument for respondents, whether they understand the items and find the items reasonable, unambiguous, and clear [36]. This process involved 19 participants who were technically untrained observers of the study and completed within 10 to 15 minutes. The participants responded to cognitive comprehension, including language, difficulty level, clarity, and relevance of the questions. Some items deemed unsuitable, incomprehensible, or irrelevant were adjusted or removed.

2.3 Cognitive debriefing

Cognitive testing was conducted among 16 respondents to assess their interpretation of the items presented according to the domain before the pilot study. The step was undertaken to verify the valid meaning of all items among participants. Based on suggestions from the respondents, several changes were made in the technical terms and terminologies used in the instrument to ensure relevance, clarity, and simplicity. Several items were also reworded and rearranged to improve readability and comprehension.

2.4 Pilot study

A pilot study was conducted to assess whether the instrument measures the intended construct accurately and whether the measurement is consistent and stable [41]. The study was performed in urban and rural settings. The urban setting included Subang Jaya, Setia Alam, and Shah Alam, while the rural localities were Meru and Hulu Selangor. The pilot study was performed between November and December 2019, with a sample size of 66 out of the initial 100 recruitments (66% response rate). The eligibility criteria for this study were children aged 7 to 12 years old with no mental health problems. The purposive criteria were established to ensure that the study population was adequately represented across different strata. The main ethnicity in Malaysia was considered to gain a deeper understanding of their knowledge and behaviour patterns and enhance the elucidation of outcomes [11, 15].

The team of researchers was trained before the data collection activities were conducted. The training program emphasised various aspects, including the briefing of items, identification of the target audience, survey conduct techniques, and the overall study purpose. Field manuals are distributed to the research team to ensure that standard operating procedures are effectively executed during field operations. Subsequently, the instruments were administered by trained interviewers in face-to-face interviews with participants who voluntarily agreed to participate in the study. Informed consent was obtained from the participant's parents or legal guardians in the presence of a witness prior to the interviews, as this study involved minors. Participants who declined to participate were excluded from the pilot study.

2.5 Statistical Analysis

The data analysis was performed using the Statistical Package for Social Science (SPSS) version 22.0 for Windows (IBM, USA). First, the data was subjected to a thorough cleaning process and comprehensive checking. The items of the proposed instrument were then evaluated for validity and reliability. Additionally, the SMEs perspectives on validity were considered before deciding to accept, reject, or revise the items. The item was also analysed to determine the internal consistency of difficulty and discrimination indices for the knowledge and behaviors domains [21]. Item difficulty refers to how participants respond to the items, precisely the degree of the items that could be classified as easy, medium, or hard [50]. A lower percentage indicates the question is harder to answer. Items with a p-value between 20% – 90% are considered good and acceptable, while 40% – 60% are excellent as the discrimination index is maximum at this range. A p-value of < 20% is too difficult, while > 90% is too easy, unacceptable, and requires modification [38]. Item discrimination measures the efficacy of an item in discriminating between high and low scorers: good, fair, or pair to be used [50]. Items that scored > 0.40 are considered excellent, 0.30-0.39 is reasonably good but requires improvement, 0.20-0.29 is marginal and should be reviewed, and < 0.19 is poor and should be eliminated or completely revised [38].

3. Results

3.1 Content validity











The major issues during the initial instrument development was poor image selection, which did not accurately convey the items meaning. The SMEs reviewed the draft tools to ensure proper language for the targeted audience, wording clarity, technical terms used, and overall structure to clarify items meaning, including the items flow. Upon discussing with the SMEs, several illustrations, such as cats, were changed to convey the true message of the items. Another suggestion by the SMEs was to consider the animal option in the knowledge domain, as all animals could transmit diseases to humans. This item, which initially included a hamster, chicken, dog, cat, and rabbit, was later changed to only dogs, cats, and rabbits, as suggested by the SMEs, to avoid confusion among participants. In addition, modifications were made to include appropriate images and simple sentences to improve the items and prevent confusion among the participants. Most items for each domain were retained as the contents were comprehensive and clear.

3.2 Face validity

The participants answered all items in the correct order based on the section and numbers for face validation. Nonetheless, some participants tend to ignore the instructions and skip irrelevant questions, particularly the screening items in the demographic section. The item concerns pet ownership status, which directed participants to answer different items based on the (Yes/No) responses. Consequently, the item

was tabulated to differentiate and direct participants to the relevant item based on 'yes' and 'no' responses. In the knowledge domain, most participants commented on the item specifically on which animals can make them sick. Initially, the items required participants to choose among five animals (hamster, chicken, dog, cat, and rabbit) that could make them ill. When they scanned the items, participants were unsure how to answer this item (whether they should tick or circle the answer), as the instructions were unclear. Therefore, the item command was changed to a (yes/no) response rather than making them circle the answer (see Figure 2). The new instruction enabled the participants to mark all the animals conveniently. There was also feedback concerning unclear images in the instrument.

Figure 2: Amendment of The Item Based on SMEs' Recommendation.

Before amendment	After amendment									
<p>Which animals could cause you to fall sick? The answer can be more than one.</p> 	<p>Can the animals below make you sick? Answer all.</p> <table border="1" data-bbox="871 898 1321 1122"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Rabbit</td> <td>Dog</td> <td>Cat</td> </tr> <tr> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> <td><input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table>				Rabbit	Dog	Cat	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
										
Rabbit	Dog	Cat								
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No								

In the behaviour domain, participants with cats or dogs do not necessarily have physical contact with their pets. This point was considered when developing the instrument, and changes were made to simplify the item structure. There is no screening question preceding the question "After feeding the cat or dog, do you wash your hands?" during the validation process. Furthermore, there are instances when children would only play with the animal but not feed them as they are not the pet owners. Therefore, a screening question was added before this question. In the screening question, the instruction that points to the following question was placed within the tick box to improve item visibility for participants as they respond to each item.

3.3 Item analysis

Internal consistency of validities was determined using the item analysis results to evaluate the performance of items. The difficulty and discrimination indices examined knowledge and behaviours domains in the tools (see Table 1). Of the 14 items in the knowledge and behaviour domains, the difficulty index for most questions was acceptable (0.2 - 0.9), excluding items A4, A8, B2 (too easy and unacceptable), A6, and B3 (too difficult). Nevertheless, these items were retained following a discussion with stakeholders, as children often have close relationships with pets and are the most at risk of infection [22]. Therefore, assessing children's knowledge about infectious diseases and how they manage and interact with pets is imperative.

Most items in the knowledge and behaviour domains were also in the excellent (DI value > 0.4) and acceptable (0.20 - 0.29) ranges. Despite that, items A4 and A8 had poor discrimination index but were retained, as the items measure the stakeholders' knowledge for health promotion purposes.

Table 1: Summary of Item Analysis and the Interpretation for CAB-IHBR-Zoonoses C-01

Item	Questions	Difficulty Index	Discrimination Index
Knowledge			
A1	Do you know that animals can transmit diseases to humans?	0.76 Acceptable	0.59 Excellent
A2	Can hamsters make you sick?	0.72 Acceptable	0.65 Excellent
A3	Can chicken make you sick?	0.78 Acceptable	0.35 Good
A4	Can a dog make you sick?	0.94 Easy	0.18 Poor
A5	Can cats make you sick?	0.54 Acceptable	0.65 Excellent
A6	Can rabbits make you sick?	0.16 Difficult	0.47 Excellent
A7	The cat in the picture can transmit diseases to humans.	0.77 Acceptable	0.55 Excellent
A8	The dog in the picture can transmit diseases to humans.	0.99 Easy	0.05 Poor
Behaviors			
B1	After playing with cats or dogs, do you wash your hands?	0.67 Acceptable	0.77 Excellent
B2	Do you use protective equipment whenever you clean the pet's waste?	0.93 Easy	0.59 Excellent
B3	Do you wash your hands after cleaning the dog's or cat's waste (or litter boxes)?	1.0 Difficult	0.68 Excellent
B4	Do you wash your hands after feeding the cat or dog?	0.77 Acceptable	0.91 Excellent
B5	Do you wash your hands or other body parts after the dog(s) or cat(s) lick you?	0.82 Acceptable	0.64 Excellent
B6	Do the cats or dogs sleep with you on the same mattress or bed?	0.36 Acceptable	0.27 Acceptable

4. Discussion

This study is the first to delineate the instrument development and assess Malaysian children's knowledge and behaviour regarding zoonotic diseases from household pets called Cognitive Affective Behaviours – Institute for Health Behavioural Research- Zoonoses Children-01 (CAB-IHBR-Zoonoses C-01). The instrument is available in English and Malay languages. The final version of the CAB-IHBR-Zoonoses C-01 tool contains 10 items: four items on pet disease awareness (cats and dogs) and six main items on children's behaviour relating to pet care and personal hygiene. It is a tool that can assist healthcare practitioners and educators in assessing children's awareness levels and behaviour to deliver preventive messages about pet-related diseases.

The finalised version of the CAB-IHBR-Zoonoses C-01 tool reflected good internal consistency and reliability in knowledge and behaviour domains. Items A4 and A8 scored poorly in the difficulty index, indicating that the items were rated difficult for children and should be deleted. Nevertheless, items A4 and A8 were retained to gauge disease transmission knowledge in young children. Items A4, A5, and A6 were subsequently combined into a single item to create one comprehensive item in response to suggestions from SMEs. Meanwhile, items A2, A3 and B7 were omitted from the instrument. The modifications were performed in line with past works. For instance, Hermida et al. (2021) revealed that health education content for specific information must be straightforward and easily grasped in any studies on communicable disease prevention among children. In a Chinese study on dog bites, the importance of measuring health-seeking behaviour across all age groups in a complex feature of the human-animal disease, such as actions to be taken after a dog bite, must be measured to identify the suitable preventive measures [31].

Based on the analysis and the interpretation results, improvements and changes were made to the instrument. Most changes included languages and graphical context to suit the children's comprehension of the human-pet interaction and zoonotic disease prevention. Pictures are closely linked to written or spoken text and can significantly increase attention to recall health education information than text alone. Furthermore, illustrations can improve comprehension when illustrating relationships between ideas or spatial relationships [24]. The present study measured children's knowledge of pet disease prevention practices using a dichotomous scale as responses to items in the assessment tool. Despite the convenience of a dichotomous scale that provides a clear binary answer for a child's cognitive level [6], this method is susceptible to response bias. Respondents are more likely to choose positive answers.

As this validated instrument will be administered for self-reporting, adults should assist the children in understanding instructions clearly and providing accurate responses. An earlier study on time and knowledge among children between 6 and 11 years old highlighted the need for a simple dichotomous scale, pictures, and explicit instruction to acquire accurate participant responses [30]. Despite the promising outcomes, CAB-Zoonoses-IHBR-01 reflects several limitations. In the validation processes, the instrument lacks comprehensive reliability and validity, such as exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), which can be attributed to the limited selection of comprehensive scales and items that are age-appropriate for children under 12.

5. Conclusion

The CAB-IHBR-Zoonoses C-01 comprises acceptable items and is suitable to measure Malaysian children's knowledge and behaviour while handling pets, particularly hygiene practices. As a useful tool in zoonoses' knowledge and practice studies, this questionnaire offers a sound understanding of Malaysian children's knowledge and behaviour patterns for education intervention. Future studies could utilise this on a larger scale and conduct other reliability tests to ensure the instrument feasibility.

Declaration of competing interests

All the authors declare no competing interests.

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Credit authorship contribution statement

Juatan N is the main author who wrote the first draft and compiled the written sections of this manuscript. Yong TSM, Panting AJ, Perilathan K, Ahmad M, Ahmad Sanusi NH, and Krishnan M interpreted part of the data, co-wrote sections of the manuscript and responsible for developing the items, validating the process, and performing part of the data analysis. MZ Johari was responsible for the complete analysis, interpretation, refinement, and revision of the final draft of the manuscript.

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