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Validating the Instrument of Parents' Knowledge and Attitudes towards Giving Antibiotics for Children in two Hospitals at South Sulawesi

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ABSTRACT

To translate, adapt and validate the instrument of Parents' Knowledge and Attitudes towards giving Antibiotics for Children. Participants were recruited from two hospitals in South Sulawesi, one private and one government hospital. The study started with the translation of the instrument from English to Indonesian (forward and backward translation was carried out). The translation result was tested on 40 participants. The final stage was validation involving 300 participants. The analysis used known group validity, construct validity, product-moment correlation, and factor analysis. Internal consistency between items used Cronbach Alpha. A total of 300 participants (200 in the private hospital and 100 in the government hospital) took part. Of the participants, 113 were outpatients and 187 were inpatients. In the adaptation stage, some vocabulary changes were made to sentences that were not understood by participants in instrument items using words easily understood by the participants. For example, in the knowledge domain, the word "pathogen" was changed to 'disease-causing bacteria'. In the validation stage, the significance value was 5%, and the *r*-table value was 0.113. Based on the validity test on 14 items in the knowledge domain, the *r*-count value was 0.256-0.589, while on 12 items in the attitude domain, the *r*-count value was 0.375-0.662. From the knowledge domain, 3 factors were extracted. The Cronbach alpha value of each domain was >0.6, knowledge was 0.759 and attitude 0.744. The instrument's reliability for outpatients and inpatients was 0.768 and 0.752 for knowledge, and 0.740 and 0.744 for attitude respectively. The results of this study indicate that the instrument of Parents' Knowledge and Attitudes towards giving Antibiotics to Children are reliable and valid. This instrument can be used for both outpatients and inpatients.

Keywords: Antibiotics in children, hospital, inpatient/outpatient, knowledge and attitude

INTRODUCTION

Antibiotics have been widely used to treat infections caused by bacteria. However, this has become a threat not only to the environment but also to society (Oh *et al*, 2011). Globally, children consume a considerable amount of antibiotics. This is due to their susceptibility to infections leading to unnecessary antibiotic use (WHO, 2014). According to the World Health Organization (WHO), only about 30-40% of antibiotic use is appropriate, especially in children; the rest is inappropriate antibiotic use including irrational use of antibiotics such as self-medication by parents, over-prescribing by doctors, easy access to antibiotics,

limited parental knowledge about antibiotics, socioeconomic status, and lack of parental education. When antibiotics are obtained incorrectly, children will be at risk of health problems including dangerous antibiotic resistance (Savadogo *et al*, 2014; Al-Ayed, 2019).

Based on WHO data, antibiotic use has increased by 91% globally and continues to increase in developing countries, making antibiotic resistance one of the top ten most dangerous global health threats in the world. Asia is one of the regions that has a high prevalence of resistance (WHO, 2014). A global analysis revealed that antibiotic resistance caused 4.95 million deaths in 2019 worldwide, including in the Southeast Asian Region. One of the main causes is the use of antibiotics, including their overuse and misuse (Limat *et al,* 2022). A study involving 854 participants in China found that 39% of parents had good knowledge about the use of antibiotics in children and 61% had poor knowledge (Yu *et al*, 2014). Similar research conducted in Indonesia showed that 46 participants (53%) had poor knowledge about the use of antibiotics in children, and 41 participants (47%) had good knowledge (Putri, 2018). This shows that parents' knowledge about antibiotics in Indonesia is also still low.

Indonesia is the fourth most populous country in the world (274 million) with socioeconomic conditions and health indicators varying widely across the archipelago (Agustina, R. 2019). A study employing mixed-methods design in urban (West Java) and rural (South Kalimantan) drug outlets in Indonesia reported 69% non-prescription sales of antibiotics based on patient demand, sales of medicines dispensed by unqualified persons, business interests and weak regulatory enforcement (Limato, *et al,* 2022). These sales also include antibiotics for children at the request of parents. Initially, resistance occurred at the hospital level, but gradually it also developed in the community (Permenkes RI, 2011). A study conducted at Wahidin Sudirohusodo Hospital showed that based on the quality assessment of antibiotic use using the Gyssens method, there was still irrational use of antibiotics in pediatric patients (Putri, 2020).

A study on the quality of antibiotic use in various parts of hospitals revealed that 30% - 80% were not based on indications (Permenkes RI, 2011). According to WHO data, about 50% of antibiotics for children are prescribed empirically. Parents who consider their child's treatment successful will continue to use it if the same condition reoccurs. Knowledge is the understanding gained when individuals learn or observe an object and apply it in everyday life. Attitude has a key role in shaping behaviour. In this case, it can be seen from an individual's point of view in giving value to something that happens. Parents' knowledge and attitudes are factors associated with the frequency of treatment for their children (Dewi, *et al*, 2020).

A valid instrument to measure parents' knowledge and attitudes towards the use of antibiotics in children is needed (Alili *et al*, 2014). Several relevant research instruments in English (Yu, *et al*, 2014; Wang *et al*, 2019; Atif *et al*, 2018 and Stella *et al*, 2019) were obtained to measure knowledge and attitudes; however, they have not been validated in the Indonesian language. Therefore, we selected one instrument (Yu *et al*, 2014) to assess parents' knowledge and attitudes.

From the results of our literature search, we did not find a valid instrument to measure the level of knowledge and attitudes of parents towards giving antibiotics to their children. Therefore, this study aimed to translate, adapt, and validate the instrument for outpatients and inpatients at one private hospital and one public/government hospital in South Sulawesi.

MATERIALS AND METHODS

Study Setting

This study employed a cross sectional method. The ethical approval number 30922092251 of 12 October 2022 was obtained from the Ethics Committee of the Faculty of Public Health, Hasanuddin University. The study was conducted from October 2022 to January 2023 in the inpatient and outpatient rooms of Primaya Hospital, Makassar, and Arifin Numang Hospital, Sidenreng Rappang, South Sulawesi.

Participants

The participants of the study were parents who brought their children to the hospital and received a prescription for antibiotics or had given antibiotics to their children. The participants were parents we met at the hospital's inpatient and outpatient services and gave verbal consent and signed the informed consent form.

The minimum number of participants in the validation stage was the total instrument items (n) x 10 (Heale & Alison, 2015). The sample size was based on the minimum sample size adjusted 5 to 10 times the number of instrument variables or items to be validated (Krabbe, 2016). The total number of

items in the instrument was 26. So, the minimum number of participants was (26 x 5), which is 130 participants. Other references state that the instrument validation stage must involve at least 100 participants (Gorsuch, 1983).

Instrument

The research instrument was adapted from Yu *et al*'s article, which was developed at the School of Public Health of Fudan University in China and has been validated by Prof. Biao Xu (Yu *et al*, 2014). The instrument was obtained from the additional file in the journal published by Springer Nature. Permission to use the instrument was previously obtained from Prof. Biao Xu through email on February 15, 2022.

The instrument of Parents' Knowledge and Attitudes towards giving Antibiotics to Children consists of four parts: first, participants' socio-demographic characteristics such as gender, relationship to children, age of parents, age of children, educational level, health educational background, and monthly income; second is antibiotic use history of their children; third is knowledge about antibiotics which consists of 14 statements to evaluate. The participants were asked to choose between three options provided: "Agree", "Disagree" or "Unsure". The fourth is the participants' attitudes towards antibiotic use. A five-point Likert scale ranging from "Strongly Disagree", "Disagree", "Agree", "Strongly Agree" and "Unsure" was used to rate the statements of the participants (Supplement Data I).

Data collection

Prior to data collection, a research permit was submitted to the appropriate Government body in South Sulawesi. Then, ethical clearance was submitted to the Faculty of Public Health, Hasanuddin University, Makassar. The research began with translation, followed by adaptation and validation.

Translation

The translation process consisted of two stages, forward and backward translation. In the forward translation, the original instrument was translated from English to Bahasa Indonesia by two Indonesian sworn translators working independently. The two translations were compared with the original and discussed with all researchers. The result from this stage was called version 1. Then, version 1 was translated. In the backward translation, version 1 was backward translated from Indonesian to English by two professional translators (native English speakers) working independently who are fluent in the Indonesian language. The resulting version of the backward translation was called version 2. Although the Indonesian version 1 was translated back into English, the results of the backward translations were still used to adjust the Indonesian version, because the purpose of this stage was to ensure that the forward translated document was correct (i.e., was in accordance with the original version). The process produced an instrument in Bahasa Indonesia to be adapted, called version 3 (Arifin, *et al.*, 2017).

Adaptation

Version 3 in Bahasa Indonesia was then tested on two groups of participants. The first group consisted of 10 people with a university degree, five with health education backgrounds, and five with non-health education backgrounds. The second group was participants without a university degree consisting of five people who graduated from high school and five people who did not graduate from high school. All participants were informed about the research procedure and allowed to ask questions if there was anything they did not understand. At this stage, the researcher explained to the participants the purpose and procedure of the study, and if they agreed to participate, they had to sign an informed consent form. Then, a set of instruments was given for completion (Arifin, *et al.*, 2017).

In this phase, there were two important things to note, whether the two groups of participants would have the same difficulty in understanding the questions in the instrument and the most frequent problems in filling out the instrument. The final instrument produced from this stage was used in the validation stage (Arifin, *et al.*, 2017).

Validation

The final version of the instrument was then used with participants in the validation stage. All participants involved were given information and the opportunity to ask questions. At this stage, the researcher explained to each parent or potential participant the purpose and procedures of the research to be carried out. If they agreed to participate, they were asked to sign a consent form. Then, a set of instruments was given to the participants. The instruments were then collected for data analysis (Arifin *et al.*, 2017). In the validation stage, we distributed text instruments or instruments with online links (Microsoft forms) by sharing links or scanning QR codes.

Data Analysis

Instrument validation was carried out using construct validity, namely the extent to which the instrument measured the target constructs, knowledge, and attitudes by applying a statistical model of factor analysis. The first step in this analysis was univariate analysis, where the data analyzed had only one variable. The purpose of univariate analysis is to provide an overview of statistical distribution and characteristics of single data e.g., descriptive statistics to see mean, median, mode values, also to summarize the demographic characteristics of participants. Fourteen statements on the questionnaire were used to assess parents' knowledge of antibiotics. The Antibiotic Knowledge score (0-14) was based on the number of correct answers for 14 statements. The Attitude score was calculated based on the Likers scale (strongly disagree, disagree, unsure, agree, strongly agree) for positive statements scored (1 to 5), and negative statements (5 to 1). Because the data were not normally distributed, the tests for significancy value used were the Mann-Whitney test for variables with two groups (e.g., sex), and Kruskal-Wallis for variables with more than two groups (e.g., education level).

The validity test of the research instrument can be declared valid if each question item on the instrument can be used to reveal something that will be measured by the instrument. Indicators in the instrument can be said to be valid if the calculated *r* value is greater than *r* table value (Dewi *et al*, 2020). In the reliability test, Cronbach alpha was used to analyze the consistency of the instrument using the Statistical Package for Social Sciences (SPSS) version 26.0 program.

Cronbach's alpha is the most used test to determine the internal consistency of an instrument. Instruments with statements that have more than two responses can be used in this test. Cronbach's result is a number between 0 and 1. An acceptable reliability score is one of 0.7 or higher (Heale & Alison, 2015).

RESULTS AND DISCUSSIONS

This study involved 300 participants, with some of demographic characteristics (Table I). The 51 males consisted of 49 fathers, 1 grandfather and 1 uncle. A total of 249 females consisted of 2 grandmothers, 4 aunts, while the most participants were mothers. Grandparents, uncles, and aunts were considered parents in this study because they took care of the children who were brought to the hospital for treatment.

Almost 60% of the participants were aged between 31 and 40 years. The lowest age group was <20 years old with 2 people (0.7%). In children, the highest age percentage wise was 0-2 years with 91 (30.3%) participants. A total of 95% of parents received information about antibiotic use from doctors or pharmacists when antibiotics were prescribed to their children. Parents' sources of information about antibiotic use was doctors (44.29%), followed by pharmacists (32.03%), friends/family/neighbours (11.41%), the internet (11.41%), advertisements/television (0.68%) and magazines/newspapers (0.17%).

Translation

The translation stage started with forward translation and continued with backward translation. In the forward translation stage, two professional Indonesian translators translated the original instrument into Bahasa Indonesia. Translation differences between the two translators. For example, in the knowledge domain, item 14, translator 1's Indonesian translation read (if translated to English) "**If the pathogen becomes resistant to antibiotics, it will be harmful to children**" and translator 2's translation read "**It is dangerous for children if the pathogen becomes resistant to antibiotics**". In the attitude domain, item number 5, translator 1's translation read "**I had to have my son take antibiotics as a precaution at a time when other children around him showed flu symptoms**" while translator 2's translation read "**I had to have my son take antibiotics immediately as a precaution, as soon as other children around him caught a cold**". Although some differences were found between the translations, the differences were only in the choice of words where the words had the same meaning as the original version. A comparison was made, and the most appropriate words and sentence structure was discussed based on correct and understandable Indonesian grammar.

After developing the vocabulary, the result was called version 1 and made available for backward translation. Then, Version 1 of the instrument was translated into English by two translators who are native English speakers. The purpose of backward translation was to identify initial translation errors. After consensus, the instrument that had been translated in the backward translation was called version 2 which was used for the research, namely the adaptation process.

Table I. Demographic characteristics summary and antibiotic use

Characteristics	**n (%)**
Gender	
Male	51 (17)
Female	249 (83)
Relationship to children	
Father	49 (16.3)
Mother	243 (81)
Grandfather	1 (0.3)
Grandmother	2 (0.7)
Other	5 (1.7)
Age of Parents (years)	
≤ 20	2 (0.7)
21 – 30	65 (21.7)
31 – 40	175 (58.3)
41 – 50	51 (17.0)
> 50	7 (2.3)
Age of Children (years)	
0 – 2	91 (30.3)
2.1 – 4	66 (22)
4.1 – 6	54 (18)
6.1 – 8	36 (12)
> 8	53 (17.7)
Educational Level	
No School to High School	69 (23)
Diploma	47 (15.7)
Bachelor's degree	134 (44.6)
Professional	37 (12.3)
Master	13 (4.3)
Health educational Background	
Yes	85 (28.3)
No	215 (71.6)
Monthly Income*	
Rp 0 – Rp 3.000.000	99 (33)
> Rp 3.000.000	201 (67)
Antibiotic Use in the Last One Month	
Didn't use antibiotics in the last 1 month	57 (19)
in the last 1-2 weeks	14 (4.7)
in the last 3-4 weeks	21 (0.7)
Using antibiotics	208 (69.3)
Inpatients	167 (55.67)
Outpatients	133 (44.33)

***Provincial minimum wage of South Sulawesi

Table II. Knowledge product moment correlation result

No	Knowledge Statements		*r* Table	*r* Count	Conclusion
	English	Indonesian			
1	Antibiotics and anti-inflammatory drugs are the same drug.	Antibiotik dan antiinflamasi adalah obat yang sama	0.113	0.530	Valid
2	Antibiotics can cure infections caused by viruses.	Antibiotik dapat menyembuhkan infeksi yang disebabkan oleh virus.	0.113	0.531	Valid
3	Antibiotics should be given in all cases of fever in children.	Antibiotik harus diberikan dalam semua kasus demam pada anak.	0.113	0.505	Valid
4	Antibiotics have no side effects.	Antibiotik tidak memiliki efek samping.	0.113	0.493	Valid
5	Scientists can always produce new antibiotics.	Ilmuwan selalu dapat menghasilkan antibiotik baru.	0.113	0.504	Valid
6	If a child has a cough, runny nose, and sore throat, he will get better faster if he gets antibiotics as early as possible.	Jika seorang anak menderita batuk, pilek, dan sakit tenggorokan, ia akan lebih cepat sembuh jika mendapat antibiotik sedini mungkin.	0.113	0.579	Valid
7	Antibiotics should be stopped as soon as the symptoms disappear.	Antibiotik harus dihentikan segera setelah gejala hilang.	0.113	0.489	Valid
8	Overuse of antibiotics increases the risk of antibiotic resistance.	Penggunaan antibiotik secara berlebihan meningkatkan resiko resistensi antibiotik.	0.113	0.576	Valid
9	Antibiotics can only be obtained by prescription from a doctor.	Antibiotik hanya bisa diperoleh dengan resep dokter.	0.113	0.256	Valid
10	In most cases, the common cold need not be treated with antibiotics.	Dalam kebanyakan kasus, flu biasa tidak perlu diobati dengan antibiotik.	0.113	0.530	Valid
11	Administration of several antibiotics at once is more efficacious than just one antibiotic.	Pemberian beberapa antibiotik sekaligus lebih manjur daripada hanya satu antibiotik.	0.113	0.589	Valid
12	Consuming/drinking antibiotics earlier can protect children from the common cold	Mengkonsumsi/meminum antibiotik lebih awal dapat melindungi anak dari flu biasa	0.113	0.545	Valid
13	The more expensive the price of antibiotics, the more effective efficacy	Semakin mahal harga antibiotik, semakin efektif khasiatnya	0.113	0.395	Valid
14	If a disease-causing bacterium becomes resistant or resistant to an antibiotic, it will harm the children.	Jika suatu bakteri penyebab penyakit menjadi resisten atau kebal terhadap antibiotik, akan membahayakan bagi anak-anak.	0.113	0.475	Valid

Adaptation

Version 2 of the instrument was then adapted and tested on 40 participants, consisting of 20 participants with a university degree and 20 participants without a university degree who volunteered to provide their opinions on the instrument. Based on the findings at the adaptation stage, some word changes were made, so that the sentences in the instrument items were easier for participants to understand. These changes included feedback from some participants at the adaptation stage who did not understand the sentences in the instrument. For example, in the knowledge domain item 5 "**Scientists can always produce new antibiotics"** was changed to **"Scientists can produce new antibiotics"**. Similarly, item 14 "**If the pathogen becomes resistant to antibiotics, it will be harmful to children"**. Some participants did not know what **"pathogen"** was, so it was changed to **"If a disease-causing bacterium becomes resistant or resistant to an antibiotic, it will harm the children"**. The final result of the validation test was called Version 3 and was further used in the validation process.

Table III. Attitude product moment correlation result

No	Attitude Statements		*r* Tabel	*r* Count	Conclusion
	English	Indonesia			
1	I have very little knowledge about antibiotic resistance	Saya memiliki sedikit pengetahuan tentang resistensi antibiotik	0.113	0.520	Valid
2	In my opinion, there is too much use of antibiotics in our country	Menurut saya, penggunaan antibiotik di negara kita terlalu banyak	0.113	0.375	Valid
3	Parents must receive education about the use of antibiotics so that children use antibiotics wisely	Orang tua harus memperoleh edukasi tentang penggunaan antibiotik sehingga penggunaan antibiotik anak lebih bijaksana	0.113	0.395	Valid
4	I can decide which antibiotic my child should take according to his condition	Saya dapat memutuskan antibiotik mana yang harus dikonsumsi anak saya sesuai dengan kondisinya	0.113	0.561	Valid
5	I always ask my child to take antibiotics as a precaution for other children around him who show flu symptoms	Saya selalu meminta anak saya minum antibiotik sebagai upaya pencegahan terhadap anak-anak lain disekitarnya yang menunjukkan gejala flu	0.113	0.483	Valid
6	The pediatrician must determine the cause of the disease based on a physical or laboratory examination before prescribing antibiotics for my child	Dokter anak harus memastikan penyebab penyakit berdasarkan pemeriksaan fisik atau laboratorium sebelum meresepkan antibiotik untuk anak saya	0.113	0.332	Valid
7	If my child is sick, I would prefer him to receive intravenous infusion antibiotics over oral antibiotics	Jika anak saya sakit, saya lebih suka dia menerima antibiotik infus intravena daripada antibiotik oral	0.113	0.582	Valid
8	I would prefer to choose more expensive antibiotics	Saya lebih suka memilih antibiotik yang lebih mahal	0.113	0.546	Valid
9	I must comply with the pediatrician's advice and there is no need to make further requests	Saya harus mematuhi saran dokter anak dan tidak perlu untuk membuat permintaan lebih	0.113	0.433	Valid
10	When I want antibiotics for my child, I will be disappointed if the pediatrician refuses to accept my request for antibiotics	Pada saat saya menginginkan antibiotik untuk anak saya, saya akan merasa kecewa jika dokter anak menolak permintaan antibiotik saya	0.113	0.573	Valid
11	I feel that my knowledge of the proper use of antibiotics is sufficient	Saya merasa pengetahuan saya tentang penggunaan antibiotik yang tepat sudah cukup	0.113	0.616	Valid
12	I prefer to use broad spectrum antibiotics like Cefixime etc., because they can kill a wide range of bacteria	Saya lebih suka menggunakan antibiotik spektrum luas seperti Cefixime dll, karena bisa membunuh berbagai bakteri	0.113	0.662	Valid

Validation

The validation stage involved 300 participants. They were parents who brought their children to the hospital for treatment. Validation was conducted using the Moment Product Test and Construct Validity. Based on the results of the product-moment correlation, a research instrument can be declared valid if each statement item in the instrument can state something that will be measured by the instrument. To assess the validity of statement items, product-moment correlation can be used to correlate the score of each statement item with the total score. Items in the instrument are said to be valid if the r-count value is greater than the *r* table value. The *r* table value can be obtained from the degree of freedom (df) value. The number of participants in the study was 300 so that the df value (300) was obtained with a significance of 5% and an *r* table value of 0.113. Based on the results of the validity test on the 14 statement items in the knowledge domain, the r-count value was 0.256-0.589 (Table II and Table III).

Table IV. Factor analysis

Item	Domain	Description	Loading Factor		
			1	2	3
P2	IBA	Antibiotics can cure infections caused by viruses.	0.637		
P3	IBA	Antibiotics should be given in all cases of fever in children.	0.600		
P6	IBA	If a child has a cough, runny nose and sore throat, he will get better faster if he gets antibiotics as early as possible.	0.790		
P7	IBA	Antibiotics should be stopped as soon as the symptoms disappear.	0.580		
P10	IBA	In most cases, the common cold need not be treated with antibiotics.	0.594		
P11	IBA	Administration of several antibiotics at once is more efficacious than just one antibiotic.	0.548		
P4	GKA	Antibiotics have no side effects.		0.726	
P5	GKA	Scientists can produce new antibiotics.		0.519	
P9	GKA	Antibiotics can only be obtained by prescription from a doctor.		0.584	
P12	GKA	Consuming/drinking antibiotics earlier can protect children from the common cold		0.609	
P13	GKA	The more expensive the price of antibiotics, the more effective efficacy		0.424	
P1	AR	Antibiotics and anti-inflammatory drugs are the same drug.			0.556
P8	AR	Overuse of antibiotics increases the risk of antibiotic resistance.			0.793
P14	AR	If a disease-causing bacterium becomes resistant or resistant to an antibiotic, it will harm the children.			0.791

IBA; Indication-based Antibiotic Use, GKA; General Knowledge of Antibiotics, AR; Antibiotic Resistance

Table V. Cronbach α for domains of the Parents' Knowledge and Attitudes toward giving Antibiotics Instrument

Domain	Cronbach α
Knowledge	0.759
Attitudes	0.744
Inpatient	
Knowledge	0.752
Attitudes	0.744
Outpatient	
Knowledge	0.768
Attitudes	0.740

The results of the validity test on the 12 attitude domain items obtained an r-count value of 0.375-0.662 (Table IV). All items are said to be valid because the r-count is greater than the r-table value (0.113).

The construct validity used was Exploratory Factor Analysis (EFA) (Krabbe, 2016). Factor analysis is a statistical analysis used to reduce factors that influence a variable. EFA was used in this study because we did not have initial information about which items/indicators should be grouped into certain variables. When the factor loading value of an indicator is greater than one factor, then the indicator can be grouped into that factor. The first step of factor analysis is to determine the KMO (Kaiser-Meyer-Olkin) value to determine the feasibility of a variable for factor analysis. The KMO value obtained is expected to be (>0.5). Because the KMO value was 0.793 (>0.5), factor analysis was able to be used (Artaya, 2018). Based on Eigenvalues, four factors were extracted but one factor only had one item. So, we continued using the Rotate Component Matrix Analysis Method with Varimax.

From the Rotated Component Matrix, P2, P3, P6, P7, P10 and P11 are included in component 1 because they have the largest loading factors (of 0.637, 0.600, 0.790, 0580, 0.594 and 0.548) forming the largest component value among the components. The items forming loading factor 1 are the items answered most correctly by participants and did not require a long explanation because participants understood them. Meanwhile, P4, P5, P9, P12 and P13 are included in component 2 with loading factor values of 0.726, 0.519, 0.584, 0.609 and 0.424. P1, P8 and P14 belong to component 3 with loading factor values of 0.556, 0.793, and 0.79. Unlike factor 1, the items forming at factor 3 were the statement items that participants least understood (Table IV). Based on construct theory, components 1 to 3 form separate constructs. The factor that contributes most to the construction is factor 1. The naming of the factor is based on a careful examination of most items in a domain, where factor 1 represents the domain 'Indication-based Antibiotic Use', factor 2 'General Knowledge of Antibiotics' and factor 3 'Antibiotic Resistance'.

Reliability

An instrument can be said to be quite reliable if it has a Cronbach alpha value of 0.4 - 0.6, reliable if it has a value of more than 0.6 - 0.8, and very reliable if the value is 0.8 - 1 (Krabbe, 2016). Cronbach alpha scores from both domains were >0.6. The highest score was in the knowledge domain (Table V). The outpatient reliability in the knowledge domain was 0.752 and attitude was 0.768, while the inpatient reliability in the knowledge domain was 0.744 and attitude was 0.740. This shows that all domains have good reliability values. The results of this study indicate that the instrument is reliable and valid to be used in Indonesia.

Parents' Knowledge

In this study, we also distinguished between outpatient and inpatient participants, with 133 participants from outpatient and 167 from inpatient care. The participants in the private hospital (Primaya Hospital) gave more correct answers than participants in the public/ government hospital (Arifin Numang Hospital) (Table VI). There were differences in the answers of participants in the outpatient and inpatient departments. The best level of knowledge in the two hospitals was from 99 inpatients (33%).

Based on gender, females had better knowledge (59.8%) than males (47.1%). Similarly, in terms of parental relationships, mothers had the best knowledge (60.3%). For age, the largest group was 31-40 (65.1%). Based on income, parents with income of more than Rp 3,000,000 per month had higher knowledge (70.6%) than parents with income of Rp 0 - Rp 3,000,000 (31.3%). As for the level of education, knowledge in professional graduates (97.3%), knowledgeable enough (2.7%) and parents with a health education background (77.9%) had a higher level of knowledge than those who do not have a health education background (46.3%). All group characteristics have significant values ($P < 0.05$) except for the gender, relationship to children and hospital group (Table VI). The values (Table VI) are the knowledge levels with the highest values in each group. Overall, 56.3% participants had a good attitude and 43.7% had a bad attitude. But this was different from the knowledge level and attitude (Table VI) shows that all group characteristics have non-significant values ($p>0.05$) except educational level and monthly income.

Based on the results of the study, it can be concluded that the instrument is valid and reliable to assess the knowledge and attitudes of parents about giving antibiotics to children in Indonesia. Therefore, this instrument can be used for further research. To our knowledge, our study is the first where this instrument has been translated and validated in Bahasa Indonesia. Good consistency was obtained in the reliability test for each domain with an overall reliability value of 0.754 for knowledge and 0.759 for attitude. In addition, we also conducted reliability tests on inpatient participants with a reliability value of knowledge of 0.752 and attitude of 0.744, while reliability values in outpatient participants in the knowledge domain were 0.768 and 0.740 for attitude.

Several similar studies on parents' knowledge and attitudes towards antibiotic use in children, including the study of Panagakau et al (2009) in Greece had a reliability value of the questionnaire that was 0.68 lower than the reliability of our study. The questions in the study were factor analysed and 10 out of the 21 factors were extracted. The reliability of the questionnaire was 0.55. However, only items that increased the Cronbach alpha when added were eventually included in the final scales, raising the internal consistency to 0.68. Limitations of the study included the vocabulary and form of the questionnaire.

Table VI. Level of Knowledge and Attitude of Participants Toward Giving Antibiotics for Children

Characteristics	Level of Knowledge			P Value	Level of Attitude		P Value
	Good	Moderate	Poor		Good	Bad	
Gender				0.098			0.312
Male	24 (47.1)	22 (43.1)	5 (9.8)		**32 (62.7)**	19 (37.3)	
Female	**149 (59.8)**	82 (32.9)	18 (7.2)		137 (55.0)	112 (45.0)	
Relationship to with children				0.426			0.161
Father	24 (48)	21 (42)	5 (10)		**32 (64.0)**	18 (36.0)	
Mother	**146 (60.3**)	78 (32.2)	18 (7.4)		132 (54.5)	110 (45.5)	
Grandfather	0 (0)	1 (100)	0 (0)		0 (0.0)	1 (100.0)	
Grandmother	1 (50)	1 (50)	0 (0)		1 (50.0)	1 (50.0)	
Other	2 (50)	2 (50)	0 (0)		3 (60.0)	2 (40.0)	
Age of Parents				0.001			0.329
≤ 20	0 (0)	2 (100)	0 (0)		1 (50.0)	1 (50.0)	
21 – 30	33 (50.8)	26 (40)	6 (9.2)		46 (70.8)	19 (29.2)	
31 – 40	**114 (65.1)**	49 (16.3)	12 (6.5)		88 (50.3)	87 (49.7)	
41 – 50	26 (51.0)	22 (43.1)	3 (5.9)		29 (56.9)	22 (43.1)	
> 50	0 (0)	5 (71.4)	2 (28.6)		**5 (71.4)**	2 (28.6)	
Educational Level				0.000			0.013
High School	14 (20.6)	45 (64.7)	10 (14.7)		**45 (65.2)**	24 (34.8)	
Diploma	35 (74.5)	11 (23.4)	1 (2.1)		28 (59.6)	19 (40.4)	
Bachelor's degree	80 (59.7)	43 (32.1)	11 (8.2)		76 (56.7)	58 (43.3)	
Professional	**36 (97.3)**	1 (2.7)	0 (0)		13 (35.2)	24 (64.9)	
Master	8 (61.5)	4 (30.8)	1 (7.7)		7 (53.8)	6 (46.2)	
Health educational Background				0.000			0.474
Yes	**67 (78.8)**	11 (12.9)	7 (8.2)		44 (53.0)	39 (47.0)	
No	106 (46.3)	93 (43.3)	16 (7.4)		**125 (57.6)**	92 (42.4)	
Monthly Income				0.000			0.000
Rp 0 – Rp 3.000.000	31 (31.3)	54 (26.9)	5 (2.5)		**75 (75.8)**	24 (24.2)	
> Rp 3.000.000	**142 (70.6)**	50 (50.5)	18 (18.2)		94 (46.8)	107 (53.2)	
Inpatient	**99 (33)**	52 (17.3)	16 (5.3)	0.580	74 (55.6)	59 (44.4)	0.907
Outpatient	77 (25.6)	52 (17.3)	7 (2.3)		**95 (56.9)**	72 (43.1)	

Research conducted by Alumran *et al* (2014), knowledge and beliefs scale include 10 items that measure the extent of parents' knowledge and beliefs with regards to antibiotics use. Knowledge and beliefs items include questions such as: measuring the parents' perceptions regarding the necessity to use an antibiotic for: the common cold, and/or a sore throat. This construct shows good internal consistency in this sample (Cronbach's α = 0.836). In another study, adopted from Kim et al (2011) Cronbach alpha of knowledge research questionnaire reported α = 0.80 and attitude α = 0.64, where Cronbach alpha of knowledge was higher than our study and lower than our Cronbach alpha of attitude. The value was different from our study because the total items of the instrument, and the characteristic of participants, emerged during the analysis. The instrument was shown to have good internal consistency, and good discriminant and convergent validity. The instrument we used was previously tested on a Chinese population. The study was conducted by Yu *et al* (2014) in two vaccination clinics, while we involved participants in the outpatient and inpatient departments of a private and a public/government hospital, so that the participants were more varied. Yu *et al* used the median score as a cut-off for assessing good or poor parental knowledge. The mean score of the 14 questions measuring antibiotic knowledge was 8 and 39% of parents were judged to have good knowledge on antibiotic use, whereas we categorized the level of knowledge as Poor, Moderate and Good to measure the extent to which participants understood antibiotics and could provide a distinction between good and moderate.

Good knowledge describes a deep understanding, moderate indicates participants have a basic understanding of antibiotics, whereas poor describes a participant's lack of understanding of antibiotics. The average score of the 14 questions measuring antibiotic knowledge was 10 and 57.6% of parents were rated as having good knowledge, and 34.6% as having moderate knowledge.

At the translation stage, there were some differences in the words used by the translators. After discussion, we found that the words used had the same meaning so that a sentence could be used in the Indonesian language. The instrument adaptation stage showed that adding a few words to explain the context of each item was beneficial for participants' understanding. This has also been applied in other adaptation and validation studies in Indonesia (Arifin *et al.,* 2017). For example, the item **"If pathogens become resistant to antibiotics, it will be dangerous for children"** was not understood by some participants at the adaptation stage. So, we changed the sentence to **"If a bacterium that causes disease becomes resistant or resistant to antibiotics, it will be harmful to children"**. At the validation stage, based on Eigenvalues, four factors were formed, but one factor consisted of only one item so we decided to use only three factors, Finally, the item 'Antibiotics can only be obtained with a doctor's prescription' was retained with the consideration that if the item was removed it would reduce the reliability value of statements in the knowledge domain.

The validation of the instrument has important implications for clinical practice. This valid and reliable instrument can be used to identify deficient knowledge and attitudes in parents, so that appropriate educational interventions can be made. This may improve parents' understanding of pediatric antibiotic administration and potentially reduce inappropriate or excessive antibiotic use.

The results of known group validity showed that participants with a higher education level and health science education background had higher antibiotic knowledge than participants with a lower education level and without a health science education background. Similarly, in the attitude domain about antibiotic administration in children, participants with higher education levels and a health science education background had a better attitude towards the rational use of antibiotics than participants with lower education levels and without a health science education background. This is similar to the results of a study by Yu *et al* (2014) which revealed that parental educational status is the only factor significantly associated with antibiotic knowledge. The higher their education, the better their awareness about antibiotics.

The findings showed that participants lacked knowledge regarding the indications of antibiotics for the treatment of viral infections. Only 95 participants answered that they disagreed if antibiotics could cure infections by viruses. A possible reason for their ignorance of this statement was because their knowledge was limited to the term 'bacteria'. The term usually used during counselling is 'bacteria' which they consider as viruses or germs. On the other hand, 77.3% of participants agreed to continue taking antibiotics after symptoms disappeared. This is higher than Oh *et al*'s (2014) study in Malaysia, where 59.8% of participants agreed that they would continue antibiotic treatment when they started to feel better.

In the attitude domain, 37% of parents answered that they had good knowledge about antibiotic resistance, 4% "strongly agreed" and 33% "agreed". Most participants agreed that the use of antibiotics in Indonesia is extremely high, to which about 21.33% strongly agreed, and 69.33% agreed. Most parents (96.7%) would like to be educated about the more judicious use of antibiotics in children, 45.33% strongly agreed and 51.33% agreed. As most participants did not have a health education background, they considered their antibiotic knowledge to be limited. A survey in Europe reported that limited prescription-only antibiotic dispensing means that antibiotics are often kept at home by people (Radosević N, *et al*. 2009). However, our results showed that 88% of participants agreed that antibiotics should be obtained by prescription. This study also showed that 51% of participants disagreed that antibiotics have no side effects. Our findings are supported by a previous study conducted in 2018 by Hammour *et al*, which concluded that 50% of participants disagreed that antibiotics have no side effects.

The results showed that the level of knowledge of parents in the private hospitals was higher (64%) than those in the government hospitals (45%). During the study, the polyclinic atmosphere in the private hospital was quieter because there were several pediatricians practicing so patients were free to choose a doctor, while in the public hospital, because there were fewer pediatricians, patients tended to accumulate.

However, inpatient care in government hospitals is more controlled because there is special care for children, while in private hospitals there is not yet so that children's care is not centralized. During the data collection process, some participants agreed to continue research related to antibiotics, one of the mothers said that as a parent she was very wary of antibiotics, according to her experience she was often prescribed antibiotics even though her child only had a common cold.

In this study, the knowledge of participants in the inpatient department was better than participants in the outpatient department in both hospitals. This is because when inpatients arrive at the hospital, they will immediately receive treatment and receive drugs. Inpatients will be guided by nurses who administer drugs in treatment. However, in the outpatient department, patients will leave the polyclinic or hospital after treatment is complete and only get information about drugs when collecting drugs at the pharmacy. During data collection, we also observed an interaction in the form of knowledge transfer between pharmacists and nurses in the inpatient wards, where pharmacists provided drug information services not only to patients, but also to nurses. In addition, there were also visits by pharmacists. However, the practice of visitation in private hospitals is more optimal compared to government hospitals. This further strengthens our opinion that collaboration between health workers in private hospitals is better and has a positive impact on the knowledge of outpatients and inpatients. Despite the independent visits, we have not seen any daily joint visits by Professional Care Providers. Based on this point, we recommend that it is time for the hospital management to pay attention to 'interprofessional collaboration' in private and government hospitals in Indonesia.

Our research has strengths and limitations. While the stages of translation, adaptation and instrument validation made important contributions to the study, the methods used also have strengths and weaknesses. The strengths of this study include the use of a thorough translation process and collaboration with linguists. In addition, the validity of the instrument has been comprehensively tested. The study also involved a significant number of participants to provide statistical power to the research findings. The larger the number of participants, the more reliable the generalizability of the research findings to the population of parents.

Other strengths of this study include Diverse Representation. In this study, we collected data from two types of hospitals, namely private and public hospitals. This provided us with a broader representation of the population of parents who bring their children to hospital. By including both types of hospitals, our study was able to reflect variations in pediatric antibiotic prescribing practices across different hospital settings. In addition, our study also collected data from both inpatients and outpatients. This gave us an opportunity to see the perspectives and practices of pediatric antibiotic prescribing across different care settings. By involving both groups, our study was able to provide a more comprehensive insight into pediatric antibiotic use in hospitals. Our research findings can also be used to develop more thorough and effective education programs for parents, medical personnel, and the general public. Through proper education, parents' awareness and knowledge can be improved, thereby reducing unnecessary antibiotic use and minimizing the risk of antibiotic resistance.

This study also has some limitations. First, it was conducted in only two hospitals, so the results may not be generalizable. Future research should include more hospitals and a wider population to increase the generalizability of the findings. Furthermore, in Indonesia, especially in South Sulawesi Province, there are many regional languages. We were unable to assess the different responses that may have been given by parents who could not understand the language we used on the instrument as some parents only understood the local language they speak daily.

CONCLUSION

The findings of our study indicate that the instrument we have created demonstrates favourable validity within the specific setting of South Sulawesi Province, encompassing both outpatient and inpatient participants. The results of our study suggest that this instrument demonstrates promise for use in many regions of Indonesia. However, it is important to note that these generalizations require additional empirical validation. We extend an invitation for research collaboration to explore more studies that encompass a broader range of geographic variances. This will enhance the usability of the instrument on a national level. Our findings have the potential to serve as empirical data for future investigations.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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