

University of Groningen

## Adaptation and Validation of The HIV-Kq-18 HIV Knowledge Questionnaire for Healthy Indonesian Population

Arifin, Bustanul; Rokhman, M. Rifqi; Zulkarnain, Zulkarnain; Perwitasari, Dyah Aryani; Manggau, Marianti; Rauf, Saidah; Noor, Rasuane; Padmawati, Retna Siwi; Postma, Maarten Jacobus; Massi, Muhammad Nasrum

DOI:

[10.21203/rs.3.rs-1064698/v1](https://doi.org/10.21203/rs.3.rs-1064698/v1)

**IMPORTANT NOTE:** You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

*Document Version*

Early version, also known as pre-print

*Publication date:*

2021

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Arifin, B., Rokhman, M. R., Zulkarnain, Z., Perwitasari, D. A., Manggau, M., Rauf, S., Noor, R., Padmawati, R. S., Postma, M. J., Massi, M. N., & van der Schans, J. (2021). *Adaptation and Validation of The HIV-Kq-18 HIV Knowledge Questionnaire for Healthy Indonesian Population*. Research Square Company. <https://doi.org/10.21203/rs.3.rs-1064698/v1>

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

# Adaptation and Validation of The HIV-Kq-18 HIV Knowledge Questionnaire for Healthy Indonesian Population

**Bustanul Arifin** (✉ [bustanul.arifin.ury@unhas.ac.id](mailto:bustanul.arifin.ury@unhas.ac.id))

Rijksuniversiteit Groningen <https://orcid.org/0000-0002-2303-310X>

**M. Rifqi Rokhman**

UMCG: Universitair Medisch Centrum Groningen

**Zulkarnain Zulkarnain**

Syiah Kuala University: Universitas Syiah Kuala

**Dyah Aryani Perwitasari**

Ahmad Dahlan University Faculty of Pharmacy: Universitas Ahmad Dahlan Fakultas Farmasi

**Marianti Manggau**

Universitas Hasanuddin Fakultas Farmasi

**Saidah Rauf**

Politeknik Kesehatan Kemenkes Maluku

**Rasuane Noor**

UM Metro: Universitas Muhammadiyah Metro

**Retna Siwi Padmawati**

Gadjah Mada University Faculty of Medicine: Universitas Gadjah Mada Fakultas Kedokteran Kesehatan Masyarakat dan Keperawatan

**Maarten Jacobus Postma**

UMCG: Universitair Medisch Centrum Groningen

**Muhammad Nasrum Massi**

Universitas Hasanuddin Fakultas Kedokteran

**Jurjen van der Schans**

UMCG: Universitair Medisch Centrum Groningen

---

## Research

**Keywords:** Infectious disease, Education, Psychometric properties, Healthy population, Instrumental study

**Posted Date:** December 9th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-1064698/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

# Abstract

**Background:** Indonesia does not have a validated instrument to assess HIV/AIDS knowledge. The HIV-KQ-18 is one of the most extensively used instruments for assessing HIV/AIDS knowledge, and it has been translated into various languages throughout the world. This paper describes the process of adapting and validating the HIV-KQ-18, an instrument to assess the level of HIV/AIDS knowledge.

**Methods:** In the adaptation phase, feedback for the initial Bahasa Indonesia version was gathered from two HIV activists, an obstetrician, two general practitioners, and 60 pilot participants from the physician. Additional descriptions (namely synonyms or examples) were added to the particular terms in the 6 items to make it more understandable.

**Results:** In the validation phase 1,249 participants were recruited. The online link of HIV-KQ-18 Bahasa Indonesia was distributed to participants from six major regions in Indonesia. Internal consistency was measured using Cronbach's alpha, while construct validity was determined using factor analysis. Based on visual observation of the scree tree in the factor analysis, one factor was preferable. The Cronbach's alpha was 0.82.

**Conclusion:** Therefore, HIV-KQ-18 Bahasa Indonesia is a valid and reliable instrument to assess the level of HIV/AIDS knowledge in Indonesia.

## Introduction

At the end of 2018, the United Nations Program on HIV/AIDS (UNAIDS) and the World Health Organization (WHO) reported that the number of HIV patients worldwide had reached 37.9 million of which 1.7 million were new cases <sup>1,2</sup>. The majority of HIV patients live in low to middle-income countries such as Indonesia <sup>2</sup>. In Indonesia, at the end of 2018, the number of people with HIV/AIDS was 640,000 cases of which 46,000 were new cases <sup>3</sup>. The top five provinces with the highest number of HIV/AIDS patients are DKI Jakarta, East Java, West Java, Papua, and Central Java <sup>4</sup>. The number of deaths due to HIV/AIDS increased by around 60% from 24,000 to 38,000 between 2010 and 2018 <sup>3</sup>.

The results of a study (RISet KESehatan DASar/RISKESDAS) conducted by the Ministry of Health of the Republic of Indonesia reported that one of the main factors causing the increase in the number of HIV cases in Indonesia is the low level of knowledge of HIV/AIDS <sup>5</sup>. Behavioural change provides the ultimate and cheapest protection against HIV infection since no cure or vaccine are available for HIV, and people with less HIV knowledge are more likely to engage in more risky sexual behaviours <sup>6</sup>. The Ministry of Health mapped the level of knowledge of Indonesians based on 34 provinces in Indonesia in 2018. Based on this mapping, the level of knowledge of HIV/AIDS in Indonesia was still very low: 67% scored below standard (<7 of 21 points) and only 1% scored high-level knowledge (>16 of 21 points) <sup>5</sup>. However, this report did not specify the type of instrument used to measure the level of knowledge.

Two studies have used the HIV Knowledge Questionnaire (HIV-KQ-18) instrument to assess the level of knowledge in Indonesia. These two studies focused on specific communities, namely on 120 women living with HIV/AIDS in Lampung <sup>7</sup> and 396 nurses who worked in four hospitals in Jakarta <sup>8</sup>. However, neither of these studies performed or reported a psychometric test on HIV-KQ-18, except for the study in Lampung reporting only on the reliability test with the Cronbach's alpha <sup>7</sup>. No studies exist to fully adapt and validate this instrument for the Indonesian healthy adult population.

The HIV-KQ-18 instrument has been proven to be a valid (good internal consistency, Cronbach's alpha at 0.75 - 0.89), stable, sensitive, and appropriate instrument for all people including low-literacy populations <sup>9</sup>. An instrument to assess the HIV/AIDS knowledge level is important to indicate in which specific aspects the public needs to improve, to develop content for effective campaigns, and to assess the knowledge trend from time to time as an indicator to measure the success of an HIV campaign. Therefore, the study aimed to conduct an adaptation, validation, and psychometric test of the HIV-KQ-18 instrument on a healthy adult population in Indonesia.

## Methods

### Research design

The study used a cross-sectional design. Data were collected from September 2020 to January 2021. The study was approved by the Research Ethics Committee of Universitas Ahmad Dahlan, Yogyakarta, with ethical approval number 012007028 on 22 September 2020 and was divided into two main phases, adaptation and validation.

### Instrument

The questionnaire consisted of sociodemographic characteristics and the HIV-KQ-18 instrument. HIV-KQ-18 is the short version of HIV-KQ-45 <sup>10,11</sup>. Permission to translate the HIV-KQ-18 instrument was obtained from Prof. Michael P. Carey, PhD (Director, Centers for Behavioral and Preventive Medicine, The Miriam Hospital) on February 11, 2020. The HIV-KQ-18 instrument is more focused on how to prevent infection and transmission of HIV/AIDS. This instrument consists of 18 items, and each item has 3 options, namely "true", "false" or "don't know". Five items (no 1, 4, 11, 14, 17) are true statements, while other 13 items are false. The correct response is scored 1, while 0 is used for wrong or "don't know" responses.

The original HIV-KQ-18 instrument was translated to Bahasa Indonesia using a forward-backward translation and adaptation processes (Figure 1). At the end of the questionnaire, we added a question "Out of the 18 items, which statement was the most difficult or took long time to answer?". This question was used to identify additional obstacles by participants to understand the HIV-KQ-18 Bahasa Indonesia instrument.

### Research sites

Participants involved in the study were sampled from six of Indonesia's main regions, namely: Sumatra, Java, Sulawesi, Kalimantan, 'Bali and Nusa Tenggara', and 'Maluku and Papua'.

## Participants

Participants were Indonesians at least 17 years old, who consented to participate in the study. Sociodemographic data such as gender, age, occupation, education level, marital status and monthly expenses were obtained from self-reports. We asked for monthly expenditure data instead of monthly income since participants indicated that they were more comfortable reporting expenses than income. Participants were classified concerning having an educational background in health sciences (medicine, pharmacy, nursing, midwifery, and public health) and whether they had attended a workshop about a HIV/AIDS education. To maintain confidentiality, participants were given the right to only write their name and age. Only researchers had the right to access the dataset.

## Sample size

The sample size calculation was based on a study suggesting at least 100 participants should be the minimum limit for psychometric study<sup>12</sup>. Two previous studies stated that the minimum number of participants should be 200 if the number of items in the instrument is not more than 40<sup>13,14</sup>. Another study recommends that the minimum number of participants involved in a psychometric study should be the number of items in the instrument to be validated multiplied by ten<sup>15</sup>. Therefore, the minimum number of participants for each region included in the study is 180 (18 items x 10). Ergo, the minimum total of participants in this study was set at 1,080 (180 x 6) participants.

## Data collection

The initial Indonesian version of HIV-KQ-18, after forward and backward translations, was evaluated by the Indonesian research team. After obtaining ethical clearance, in the adaptation phase we requested feedback for the initial version of the HIV-KQ-18 from HIV activists, an obstetrician, general practitioners and 60 pilot participants (10 participants from each region). Feedback was reviewed by the Indonesian research team to develop the final version of HIV-KQ-18 Bahasa Indonesia.

In the validation phase, we distributed the online link of the final version of HIV-KQ-18 Bahasa Indonesia through several social media from 29 September 2020 to 6 April 2021, namely: WhatsApp, Facebook inbox, email, Instagram, and Twitter. If participants joined through various media, we removed the duplicate participants based on the initials and date of birth. Figure 1 provides an overview of the study procedure.

## Data analysis

During the adaptation phase, we discussed all of the participants' suggestions. Furthermore, the Indonesian core research team compiled and analysed the pilot data for the best item structure through consensus. Notably, whenever differences emerged in this phase, these issues were resolved by consensus.

Participants' characteristics in the adaptation phase were analysed descriptively. Item analysis was conducted by calculating the percentage of the correct answers of each item and corrected item-total correlation. Items with the percentage of correct answers being between 30-80% were considered appropriate <sup>16</sup>, because it avoids floor and ceiling effects and allows for additional scores to capture knowledge gains after an education program. Items with a corrected item-total correlation lower than 0.3 were considered to indicate that the items were candidates for deletion <sup>17</sup>; however, an item with a corrected item-total correlation higher than 0.25 was still considered acceptable.

Validity and reliability tests were used to analyse the psychometric properties of HIV-KQ-18 Bahasa Indonesia. Factor analysis was carried out to assess the construct validity. The number of factors that could be extracted was determined by using two approaches: (i) eigenvalue of greater than 1, and (ii) visual inspection of scree tree by subtracting 1 from the number of factors in the point of inflexion <sup>15</sup>. A factor loading of 0.4 or higher is required to indicate a good relationship between each item and underlying factor <sup>15</sup>. Cronbach's alpha was used to analyse the internal consistency and a Cronbach's alpha of higher than 0.7 is considered as a reliable instrument <sup>17</sup>. All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version 26 (IBM Corp, Armonk, New York, USA). The level of statistical significance was set at  $p < .05$ . Atlas.ti (Scientific Software Development GmbH, Berlin, Germany) was used to analyse the feedback from the participants regarding the most difficult item in responding to the HIV-KQ-18 Bahasa Indonesia.

## Results

### Participant characteristics

In total, 1,249 participants were recruited from six regions in Indonesia during the validation phase. All participants were those in the productive age range, dominated by females, with the majority of participants' monthly expenses being <2 million rupiah (USD 137). The details of the sociodemographic characteristics of the participants are presented in Table 1.

#### Table 1.

*Participants' characteristics*

Variables	n	%
Total participants	1,249	100
Age		
18-25	728	58.3
25-35	336	26.9
35-45	185	14.8
Gender		
Female	715	57.2
Male	534	42.8
Education level		
Up to senior high school	315	25.2
Bachelor	804	64.4
Postgraduate	130	10.4
Marital status (n=1,201)		
No	812	67.6
Yes	389	32.4
Monthly expense (in Rupiah) (n=1,160)		
<2 million	718	61.9
2-3 million	168	14.5
3-4 million	100	8.6
4-5 million	72	6.2
>5 million	102	8.8
Having educational background in health sciences (n=1,242)		
No	578	46.5
Yes	664	53.5
Have attended workshop(s) about HIV (n=1,246)		
No	811	65.1
Yes	435	34.9
Location		



Sumatra	204	16.3
Java	217	17.4
Kalimantan	200	16.0
Bali and Nusa Tenggara	209	16.7
Sulawesi	209	16.7
Maluku and Papua	210	16.8

## Adaptation

After collecting feedback from participants during the adaptation phase, Table 2 indicates some improvements in the sentence structures or word selections. In total, there were 6 (six) items to which adjustments were made. The language patterns were adjusted by changing word selection, adding synonyms, or giving an example so that the item's context could be correctly interpreted by a broader range of participants. For example, some participants were more familiar with the term “climax”, while others did not understand that word and were more familiar with the term “orgasm”; therefore, we added the Indonesian term for orgasm.

### Table 2

*Revision of HIV-KQ-18 items according to adaptation phase*

Item	Original version	Results of forward and backward translation in Indonesian (original article)	The final Indonesian version (along with a note of the changes we have made)
3	Pulling out the penis before a man climaxes/cums keeps a woman from getting HIV during sex.	<i>Menarik penis sebelum seorang pria mencapai klimaks / mengeluarkan sperma mencegah wanita terkena HIV selama berhubungan seks.</i>	<i>Menarik penis sebelum seorang pria mencapai klimaks/orgasme (sebelum mengeluarkan sperma); akan dapat mencegah seorang wanita terkena HIV selama berhubungan seks.</i>  (We added the word orgasm and explained the meaning of the word cum as the process by which the sperm comes out.)
4	A woman can get HIV if she has anal sex with a man.	<i>Wanita dapat terkena HIV apabila dia berhubungan seks melalui anus dengan pria.</i>	<i>Seorang wanita dapat tertular HIV jika dia melakukan hubungan seks anal (melalui dubur/anus) dengan seorang pria.</i>  (We added the words anal sex and dubur/rectum)
6	A pregnant woman with HIV can give the virus to her unborn baby.	<i>Seorang wanita hamil dengan HIV dapat menularkannya kepada janinnya.</i>	<i>Seorang wanita hamil penderita HIV, dapat menularkan penyakitnya kepada janin yang sedang dikandungnya. Hal ini berdampak pada bayi yang lahir akan menderita HIV seumur hidup.</i>  (We clarify the Indonesian version of the sentence by adding a few words. In addition, we added one sentence to clarify the statement in the previous sentence, namely "This has the impact that the baby will suffer from HIV for life").
7	People who have been infected with HIV quickly show serious signs of being infected.	<i>Orang yang telah terinfeksi HIV dengan cepat menunjukkan tanda – tanda terinfeksi yang serius.</i>	<i>Orang yang telah terinfeksi HIV dengan cepat menunjukkan tanda-tanda serius sudah terinfeksi. Tanda-tanda serius ini, akan muncul maksimal 5 (lima) hari setelah terinfeksi.</i>  (We clarified the duration of the word quickly as 5 days or less.)
12	A natural skin condom works better against HIV than does a latex condom.	<i>Kondom berbahan kulit alami bekerja lebih baik dalam melawan HIV daripada kondom berbahan karet.</i>	<i>Kondom berbahan kulit alami (yang terbuat dari kulit domba atau lambskin) berfungsi lebih baik dalam melawan HIV dibandingkan dengan kondom berbahan karet.</i>  (We explained that a natural skin condom is a condom made of sheepskin/lambskin.)
13	A person will not get HIV if she or he is taking antibiotics.	<i>Seseorang tidak akan terkena HIV jika dia menggunakan antibiotik</i>	<i>Seseorang tidak akan tertular HIV selama dia menggunakan antibiotik. Contoh antibiotik: ampisilin, amoksisilin, dan sebagainya.</i>

(We included examples of the most commonly used antibiotics, such as ampicillin and amoxicillin.)

## Item analysis

Item number 14 was answered correctly by nearly all the participants (97.1%) (Table 3). On the other hand, based on our analysis, item number 12 was the most difficult item with less than 30% of participants correctly answering this item. This finding was in line with our Atlas.ti review that the fewest participants reported item number 14 as the most difficult statement to answer while the items about condoms (including item number 12) were the most difficult, according to participants. The other 16 items were acceptable since the percentage of correct answers was between 30-80%. Four items (no 4, 11, 14, and 17) had corrected item-total correlation lower than 0.3, and only two items (no 11 and 17) were lower than 0.25.

### Table 3

*Item analysis of HIV-KQ-18 Bahasa Indonesia*

Item		Percentage of correct answers	Corrected item-total correlation
1	Coughing and sneezing do not spread HIV.	70.1	0.340
2	A person can get HIV by sharing a glass of water with someone who has HIV.	69.6	0.441
3	Pulling out the penis before a man climaxes/cums keeps a woman from getting HIV during sex.	63.4	0.403
4	A woman can get HIV if she has anal sex with a man.	75.5	0.270
5	Showering, or washing one's genitals/private parts, after sex keeps a person from getting HIV.	57.8	0.476
6	All pregnant woman infected with HIV quickly show serious signs of being infected.	35.9	0.496
7	People who have been infected with HIV quickly show serious signs of being infected.	56.6	0.483
8	There is a vaccine that can stop adults from getting HIV.	63.4	0.497
9	People are likely to get HIV by deep kissing, putting their tongue in their partner's mouth, if their partner has HIV.	44.1	0.405
10	A woman cannot get HIV if she has sex during her period.	76.5	0.493
11	There is a female condom that can help decrease a woman's chance of getting HIV.	56.7	0.226
12	A natural skin condom works better against HIV that does a latex condom.	24.8	0.382
13	A person will not get HIV if she or he is taking antibiotics.	72.3	0.546
14	Having sex with more than one partner can increase a person's chance of being infected with HIV.	97.1	0.253
15	Taking a test for HIV one week after having sex will tell a person if she or he has HIV.	34.3	0.427
16	A person can get HIV by sitting in a hot tub or a swimming pool with a person who has HIV.	73.9	0.497
17	A person can get HIV from oral sex.	67.5	0.175
18	Using vaseline or baby oil with condoms lowers the chance of getting HIV.	49.5	0.416

# Validation

The reliability value of the 18 items of this instrument was 0.82. Based on eigenvalues, four factors could be retained from the 18 items of HIV-KQ-18; however, based on visual observation of the scree tree, one factor was preferable. Four items (no 4, 11, 14, and 17) had loading factors lower than 0.4. The details of the factor analysis are presented in Table 4.

## Table 4

*Factor analysis of HIV-KQ-18 Bahasa Indonesia*

Item	Description	Loading Factor	Cronbach's alpha
1	Coughing and sneezing do not spread HIV.	0.43	0.82
2	A person can get HIV by sharing a glass of water with someone who has HIV.	0.54	
3	Pulling out the penis before a man climaxes/cums keeps a woman from getting HIV during sex.	0.49	
4	A woman can get HIV if she has anal sex with a man.	0.32	
5	Showering, or washing one's genitals/private parts, after sex keeps a person from getting HIV.	0.58	
6	All pregnant woman infected with HIV quickly show serious signs of being infected.	0.60	
7	People who have been infected with HIV quickly show serious signs of being infected.	0.59	
8	There is a vaccine that can stop adults from getting HIV.	0.60	
9	People are likely to get HIV by deep kissing, putting their tongue in their partner's mouth, if their partner has HIV.	0.51	
10	A woman cannot get HIV if she has sex during her period.	0.59	
11	There is a female condom that can help decrease a woman's chance of getting HIV.	0.28	
12	A natural skin condom works better against HIV than does a latex condom.	0.46	
13	A person will not get HIV if she or he is taking antibiotics.	0.65	
14	Having sex with more than one partner can increase a person's chance of being infected with HIV.	0.31	
15	Taking a test for HIV one week after having sex will tell a person if she or he has HIV.	0.52	
16	A person can get HIV by sitting in a hot tub or a swimming pool with a person who has HIV.	0.60	
17	A person can get HIV from oral sex.	0.22	
18	Using vaseline or baby oil with condoms lowers the chance of getting HIV.	0.51	

## Participants' statements about the most difficult item to answer

Of the 1,249 participants, 915 participants (73% response rate) responded to the question regarding which items were the most difficult to answer. It was important to highlight that most of the participants mentioned more than 1 item. Nearly half of the participants (45%) said the questions regarding condoms (items 11, 12 and 18) were the most difficult for them to answer (Figure 2). Furthermore, 11% of those who answered said that the questions about the HIV/AIDS incubation period (items no 6, 7, and 15) were also difficult to answer. The most common reason given was a lack of HIV/AIDS education. Other findings in the study were 149 participants (16.3% from 915) stated that the instrument was very useful for determining a person's level of HIV/AIDS awareness because (i) to answer correctly, this instrument had to be read properly; and (ii) the sentence structure for each item was simple, clear and easy to understand.

## Discussion

Our findings suggest that the HIV-KQ-18 Bahasa Indonesia is a reliable and valid instrument for use in a healthy Indonesian population. The instrument's adaptation phase indicates that adding a few words or examples to explain the context of each item is extremely beneficial to participants' understanding. This approach has also been applied in other adaptation and validation studies in Indonesia<sup>18,19</sup>. Furthermore, based on factor analysis, we decided to prefer only one factor based on visual inspection of the scree tree.

This study is the first HIV-KQ-18 Bahasa Indonesia psychometric test study in Indonesia. Our results show that our adaptation test has expanded the use of the instrument in a broader general population compared to previous studies that used the instrument only for nurses<sup>8</sup> or people living with HIV<sup>20</sup>. In addition, participants were given an opportunity to report which statements were the most difficult for them. The majority of participants reported difficulty in responding to items regarding condoms, while others confessed to knowing little about HIV/AIDS. Other than sexual intercourse, some participants have ambiguity on how HIV/AIDS is transmitted and how to reduce the risk of getting HIV/AIDS. In the study, 97% of participants correctly answered item number 14, indicating that the majority of participants believed that HIV/AIDS is closely linked to sexual activity with more than one partner. However, more than half of the participants still believe that deep kissing with a partner with HIV did not transmit HIV, and using Vaseline or baby oil with condoms can be used to lower the risk of getting HIV.

In Indonesia, the use of condoms as an effort to prevent HIV/AIDS transmission poses a challenge. So far, health professionals and HIV/AIDS campaigners have struggled to balance the "pros and cons" of condom use from a public point of view. Most Indonesians hold strong religious beliefs. According to a previous survey, they were opposed to the advertising of condoms or any other kind of safe sex outside of marriage, which they saw as encouraging promiscuity and violating divine rules<sup>21</sup>. A previous study conducted in Uganda found that a campaign to encourage safe sex through the use of condoms has also provoked passionate debate in Uganda, with powerful religious leaders opposing activities they believe

will lead to sexual promiscuity<sup>22</sup>. Moreover, premarital sex is uncommon and taboo in Indonesia. This has an impact on people's understanding of condom use for health reasons. According to a study of 913 unmarried Indonesian men (15-24 years), from 33 provinces in 2007- 2012, 15% of them were unaware that condoms are used not only to prevent conception, but also to reduce the chance of developing sexually transmitted diseases<sup>22</sup>.

The study revealed that education about condoms is important for the public. Just 25% of the participants in the study correctly answered item number 12 regarding natural skin condoms. This is in contrast to the original study of HIV-KQ-18 in the US, in which approximately 60% of participants correctly answered this item<sup>11</sup>. Promoting condoms remains a challenge for Indonesians because condoms have not become a common topic to discuss. Anyone found carrying condoms will be judged for his/her negative behaviours. Therefore, in Indonesia, a limited number of people have understanding about natural skin condoms as a special material for condoms.

For construct validity, although four factors could be extracted based on eigenvalues, we decided to prefer only one factor based on visual inspection of the scree tree. In the four factors based on eigenvalues, two items have cross loadings, and the difficulty to interpret each factor as a unique factor. This finding is similar with the development of the original version HIV-KQ-45<sup>10</sup>. Four items (number 4, 11, 14, and 17) had loading factors lower than 0.4, and these items also had corrected item-total correlations lower than 0.3. Therefore, these items are candidates for deletion. However, other considerations are needed, since the development of HIV-KQ-18 also mandates that the instrument should also include items regarding misconceptions about HIV risks, sexual risk behaviours, and the ability to assess knowledge gained from educational programs<sup>10</sup>.

Our study has both strengths and limitations. The strengths of the study are that it is the first adaptation and validation study of HIV-KQ-18 with over 1,000 participants from all main islands in Indonesia, and data collection was obtained from six main regions in Indonesia. The study provides evidence of validity and reliability in the range of participants' educational backgrounds from low to high educational background. The limitation of the study is that since the instrument was distributed through an online link, there is a potential participant bias that people with lower education and poor literacy levels would not participate in it. This is indicated by most participants coming from people with a bachelor degree, while only 25.2% of participants have an educational background of up to senior high school. Since people with poor literacy levels may have lower knowledge about HIV/AIDS, our findings may be slightly higher than the real public knowledge of HIV/AIDS. However, the study covered the two age groups with the largest number of people infected with HIV in the last ten years, i.e. 25-49 years (roughly 70%) and 20-24 years (roughly 15%)<sup>23</sup>. Further studies are proposed to use the instrument in paper form to target participants with low literacy levels, especially those who are not connected to the internet or have low educational levels.

## Conclusion



Based on psychometric analysis, HIV-KQ-18 Bahasa Indonesia is a valid and reliable instrument to assess the level of HIV/AIDS knowledge in the Indonesian population. We encourage the use of this standard instrument in future research and its use as a reference for measuring HIV knowledge.

## Abbreviations

UNAIDS

The United Nations Program on HIV/AIDS

WHO

World Health Organization

RISKESDAS

RISet KESehatan DASar (Basic Health Research by the Ministry of Health of the Republic of Indonesia)

HIV-KQ-18

HIV Knowledge Questionnaire 18 items.

## Declarations

### Ethics approval

The ethical requirements of national research institutes and/or committees, as well as the 1964 Declaration of Helsinki and subsequent amendments or comparable ethical standards were followed in all studies involving human participants. The study was approved by the Research Ethics Committee of Universitas Ahmad Dahlan, Yogyakarta, with ethical approval number 012007028 on 22 September 2020.

### Consent to participate

All participants have read the material about the research, including knowing that the research has been authorized by the Ethics Committee. Willingness to participate was expressed by giving a tick of approval and completing the instrument.

### Consent for publication

All the authors have reviewed and approved the final version of the manuscript being submitted. The manuscript is not currently being considered elsewhere.

### Availability of data and material (data transparency)

The first and the corresponding author can be contacted for data for research purposes.

### Conflicts of interest

MJP reports grants and honoraria from various pharmaceutical companies, including those developing, producing and marketing diabetes drugs. However, all grants and honoraria were completely unrelated to

this specific study. The other authors declare that they have no conflicting interests related to this specific study and topic.

## **Funding**

The research was supported by Prof. Maarten J. Postma, University of Groningen, Groningen, the Netherlands. The work was also supported by the Indonesia Endowment Fund for Education or LPDP in the form of a Ph.D. scholarship to MRR with grand agreement number PRJ-1/LPDP.3/2019 (7 January 2019), and Universitas Gadjah Mada, Yogyakarta, Indonesia (Document number 6162/ UN1/ DITLIT/DITLIT/PT/202, Post-Doctoral Programme for Bustanul Arifn under supervised by Retna Siwi Padmawati). All authors also contributed to the funding.

## **Authors' contributions**

BA was the initiator of the research idea. All Indonesian authors carried out the data collection. MRR carried out the data analysis. MRR and BA drafted the manuscript. BA, MRR, JvdS, and MJP contributed to data interpretation. All authors were involved in the study's conceptualization and design, provided input, read and approved the manuscript.

## **Acknowledgements**

We acknowledge the help of all the participants, Prof. Michael P Carey, Ph.D (Director of Centers Behaviour and Preventive Medicine, the Miriam Hospital/ Professor of Psychiatry and Human Behaviour, Alpert Medical School/ Professor of Behavioural and Social Sciences, School of Public Health, Brown University), Sonia Ameilia Dewi Jaikishin, Muh Deni Kurniawan, Muhamad Rinaldhi Tandah, Mufida, Agung Winda Suarsih, Muh Ramlan Budikusuma, the Dean of the Pharmacy Faculty, Universitas Hasanuddin, Makassar, South Sulawesi, the Dean of the Pharmacy Faculty, Universitas Gadjah Mada Yogyakarta.

## **Code availability (software application or custom code)**

All data analysis software used in the study is licensed from the University of Groningen in the Netherlands.

## **References**

1. UNAIDS. Fact Sheet – World AIDS Day 2019, Global HIV Statistics. United Nations Programme on HIV/ AIDS.
2. WHO. Key Facts HIV/AIDS. World Health Organization.
3. UNAIDS. Indonesia. United Nations Programme on HIV/ AIDS.
4. Humas\_Provinsi\_Jawa\_Tengah. Jateng 5 Besar Provinsi Kasus HIV Tertinggi di Indonesia. Pemerintah Provinsi Jawa Tengah.

5. Kementrian\_Kesehatan\_RI. Pengetahuan tentang HIV/ AIDS menurut provinsi.
6. Peteet B, Staton M, Miller-Roenigk B, Carle A, Oser C. Rural Incarcerated Women: HIV/HCV Knowledge and Correlates of Risky Behavior. *Heal Educ Behav*. 2018;45(6):977–986. doi:10.1177/1090198118763879
7. Irmayati N, Yona S, Waluyo A. HIV-related stigma, knowledge about HIV, HIV risk behavior and HIV testing motivation among women in Lampung, Indonesia. *Enferm Clin*. 2019;29(xx):546–550. doi:10.1016/j.enfcli.2019.04.084
8. Waluyo A, Culbert GJ, Levy J, Norr K. Understanding HIV-related stigma among Indonesian nurses. *J Assoc Nurses AIDS Care*. 2015;26(1):69–80. doi:10.1016/j.jana.2014.03.001.Understanding
9. Carey MP, Schroder KEE. Development and psychometric evaluation of the brief HIV Knowledge Questionnaire. *AIDS Educ Prev*. 2002;14(2):172–182. doi:10.1521/aeap.14.2.172.23902
10. Carey MP, Morrison-Beedy D, Johnson BT. The HIV-Knowledge Questionnaire: Development and Evaluation of a Reliable, Valid, and Practical Self-Administered Questionnaire. *AIDS Behav*. 1997;1(1):61–74. doi:10.1023/A:1026218005943
11. Carey MP, Schroder KEE. HIV Knowledge Questionnaire (18 item version). *AIDS Educ Prev*. 2002;18:174–184.
12. Gorsuch RL. *Factor Analysis (2nd Ed)*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1983.
13. Comrey AL. Factor-analytic methods of scale development in personality and clinical psychology. *J Consult Clin Psychol*. 1988;56(754–61).
14. Reise SP, Comrey AL, Waller NG. Factor Analysis and Scale Revision. *Psychol Assess*. 2000;12(3):287–297. doi:10.1037//1040-3590.12.3.287
15. Krabbe PFM. *The Measurement of Health and Health Status: Concepts, Methods, and Applications from a Multidisciplinary Perspective*. Elsevier/Academic Press; 2016.
16. McCowan RJ, McCowan SC. *Item Analysis for Criterion-Referenced Tests*. Center for Development of Human Services; 1999.
17. Nunnally JC, Bernstein IH. *Psychometric Theory*. 3rd ed. McGraw-Hill, INC; 1994. doi:10.2307/1161962
18. Perwitasari DA, Faridah IN, Arifin B, Novitasari L, Niamuzisilawati E, Utami IN. Validation of the Perceived Neighborhood Environment Questionnaire for diabetes mellitus type 2 patients. *J Epidemiol Res*. 2018;4(2):28–34. doi:10.5430/jer.v4n2p28
19. Arifin B, Perwitasari DA, Thobari JA, Cao Q, Krabbe PFM, Postma MJ. Translation, revision, and validation of the Diabetes Distress Scale for Indonesian type 2 diabetic outpatients with various types of complications. *Value Heal Reg Issues*. 2017;12:63–73. doi:10.1016/j.vhri.2017.03.010
20. Pradnyani PE, Wibowo A, Mahmudah. The effects of sociodemographic characteristics on Indonesian women’s knowledge of HIV/AIDS: A cross-sectional study. *J Prev Med Public Heal*. 2019;52(2):109–114. doi:10.3961/jpmpmh.18.256

21. Francesca E. AIDS in contemporary Islamic ethical literature. *Med Law*. 2002;21(2):381-94 PMID: 12184613.
22. Rahmartani LD, Adisasmita A. Association between knowledge of condom functions and condom use among sexually-active unmarried male adolescents in Indonesia. *J Epidemiol Kesehat Indones*. 2019;2(2):43–48. doi:10.7454/epidkes.v2i2.3131
23. BPS. *Potret Pendidikan Indonesia. Statistik Pendidikan*.; 2020.

## Figures

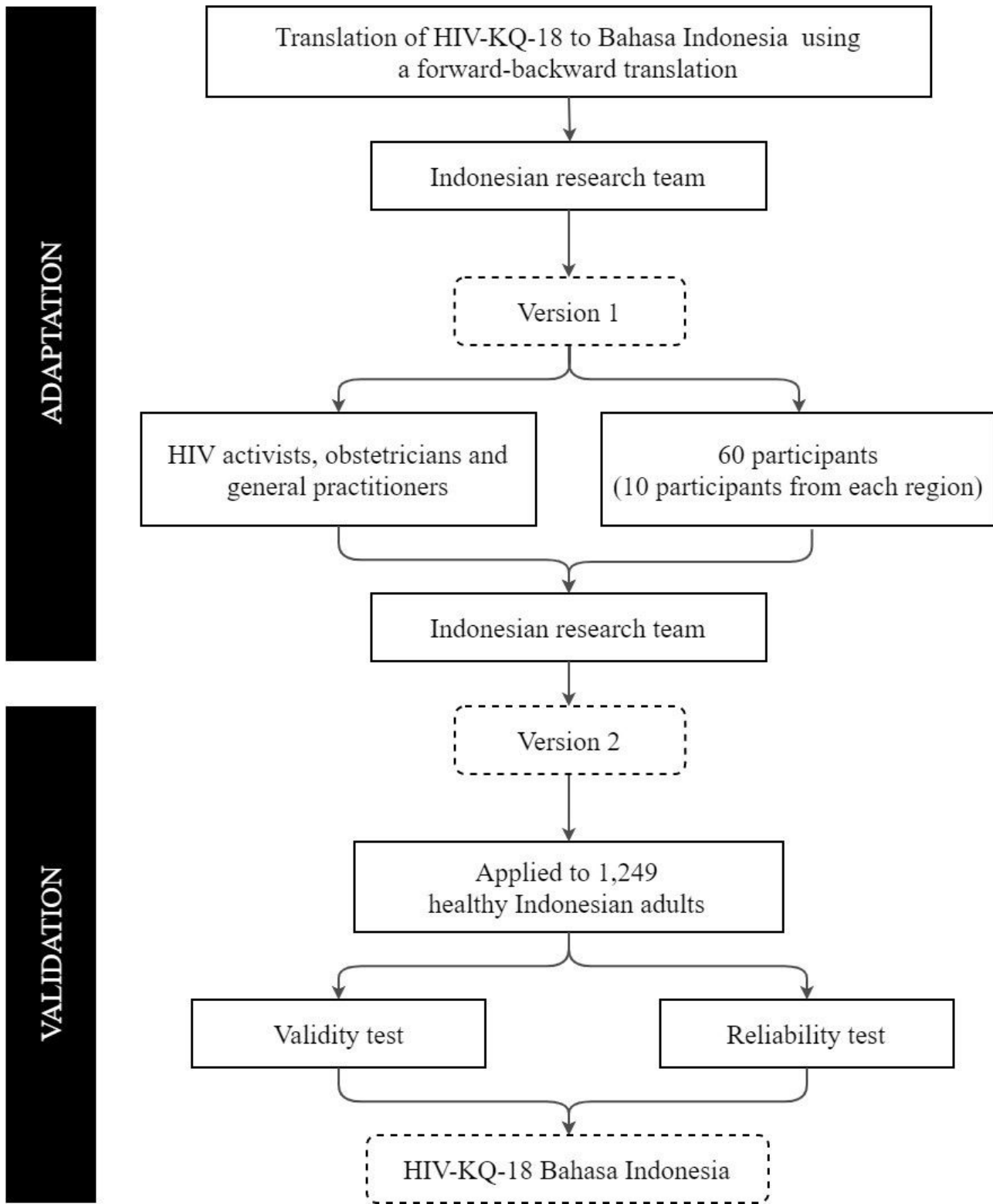
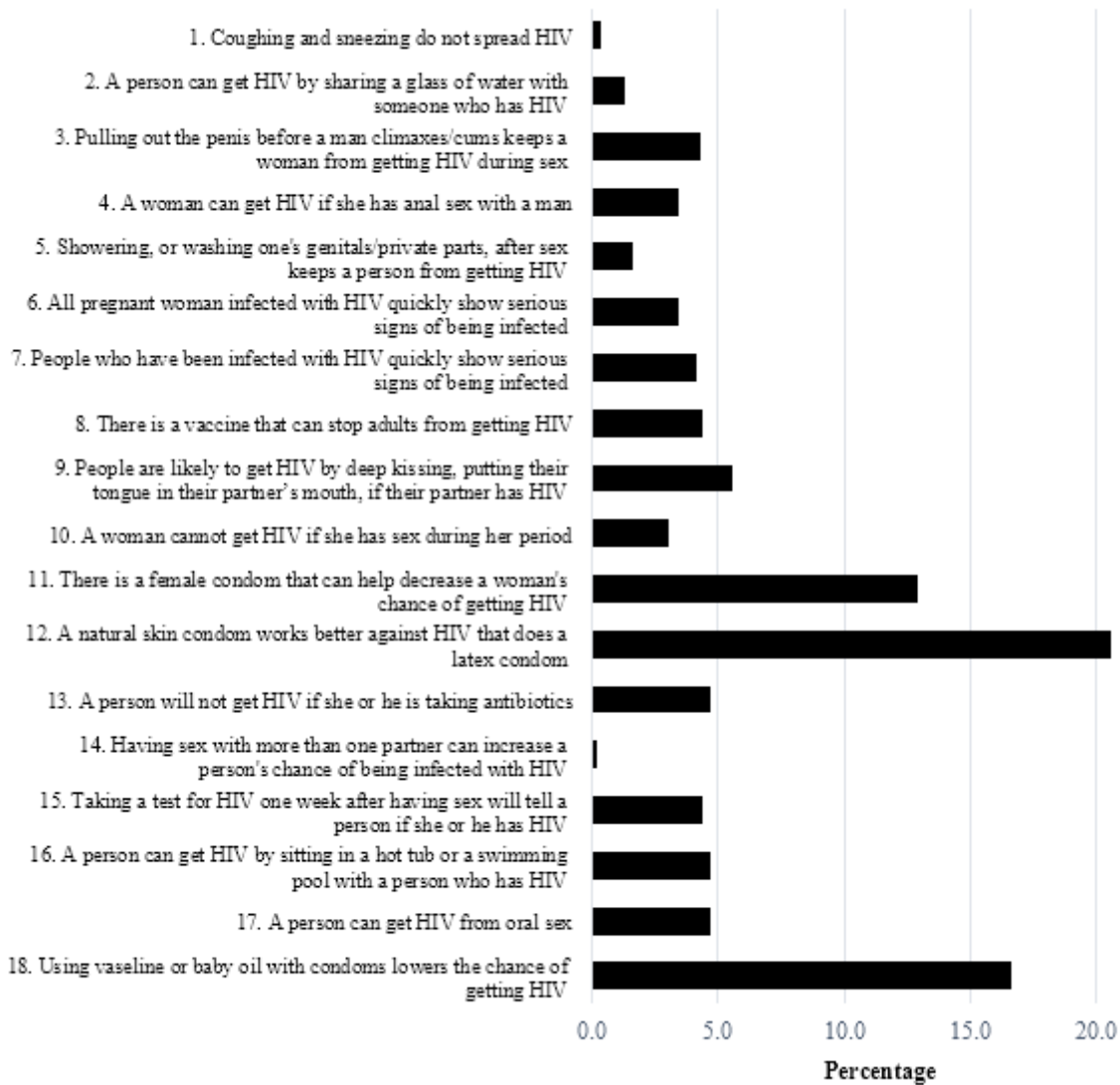


Figure 1

Adaptation and validation of HIV-KQ-18 for Indonesian population



**Figure 2**

Questions which were the most difficult for participants to answer according to Atlas.Ti analysis