



Article

# Development and Validation of a Psychometric Questionnaire to Measure Knowledge and Attitudes Towards Traditional Male Circumcision and the Links with HIV Transmission in Indonesia

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## Highlights

### Public health relevance—How does this work relate to a public health issue?

- HIV remains a major public health issue in Indonesia; thus, a valid and reliable questionnaire is needed to measure knowledge, intention, and attitudes regarding traditional male circumcision (TMC) and HIV risk factors.
- We developed and validated a questionnaire to measure knowledge and attitudes towards TMC in a setting in Indonesia where TMC is widely practised.

### Public health significance—Why is this work of significance to public health?

- TMC in the study setting is performed using a shared knife among initiates, who are also required to engage in multiple occurrences of unprotected sexual intercourse following TMC.
- The practice of TMC and unprotected sex poses an increased risk of HIV transmission.

### Public health implications—What are the key implications or messages for practitioners, policy makers and/or researchers in public health?

- Having a valid and reliable questionnaire will enable local public health practitioners to generate evidence on people's knowledge and understanding of HIV risks associated with TMC and unprotected sexual intercourse following TMC.
- Our newly developed questionnaire can be used to guide the development and implementation of targeted HIV prevention programs by identifying knowledge and attitudes related to TMC and HIV risk.

## Abstract

Traditional male circumcision (TMC) is viewed as a rite of passage from childhood to manhood. In the Atoni Meto tribe in Indonesia, this practice requires initiates to engage in unprotected sexual intercourse with unrelated women following circumcision, thereby exposing both men and women to the risk of HIV transmission. However, there is a lack of validated questionnaires in Indonesia to measure knowledge and attitudes towards TMC and the associated risk of HIV transmission. This study aimed to develop and validate a questionnaire aimed at measuring the knowledge and attitudes of men aged 18 to 49 years in West Timor, Indonesia, regarding TMC and the risk of HIV transmission linked to the practice and subsequent sexual intercourse. A series of validations was conducted, including content validity, face validity, test-retest reliability, exploratory factor analysis,



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and inter-item correlation. The EFA was conducted with 140 participants. The Kaiser–Meyer–Olkin test for the knowledge factor was 0.759, and the attitudes factor was 0.797, with Bartlett’s test of sphericity  $p$ -value  $< 0.001$  indicating that the data were suitable to proceed with further factor analysis. Cronbach’s alpha values for knowledge and attitudes were 0.861 and 0.824, respectively, suggesting good internal consistency. The questionnaire provides preliminary evidence of its validity and reliability in assessing Indonesian men’s knowledge and attitudes on TMC and HIV transmission.

**Keywords:** traditional male circumcision; HIV; knowledge; attitudes; Indonesia

## 1. Introduction

Male circumcision is one of the oldest and most common surgical procedures in the world [1,2]. It entails the removal of all or part of the foreskin [3] for cultural, religious, social, and public health reasons [4,5]. Medical circumcision is the removal of the foreskin performed by health professionals in clinical settings. In contrast, TMC is the removal of the foreskin by traditional circumcisers using traditional methods [6,7]. Throughout history, male circumcision has been practised by diverse cultures, including the Ancient Egyptians, Incas, Aztecs, South Sea Islanders, Aboriginal communities, and Sumatrans [8]. Within certain religious communities, such as Muslim and Jewish groups, male circumcision holds religious significance based on scriptural teachings [9]. Similarly, in some communities in Malawi and South Africa, male circumcision, often referred to as traditional male circumcision (TMC), is a cultural practice.

It is noted that there have been more than 60 studies exploring the potential correlation between male circumcision and HIV transmission since the 1980s, but these studies failed to establish causal links between the two factors [10]. Randomized Controlled Trials (RCTs) conducted in Africa, along with follow-up studies in the same settings, identified a significant protection of up to 60% in the risk of HIV acquisition among circumcised men [10,11]. These trials were conducted between 2002 and 2006. This evidence prompted the World Health Organisation (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) to recommend male circumcision as a strategy for reducing HIV transmission, particularly in areas with high HIV prevalence [12]. Both the American Academy of Paediatrics and the Centers for Disease Control and Prevention (CDC) have asserted that the health benefits of male circumcision outweigh the risks, and recommended it for males of any age for health reasons [13,14]. Additionally, previous findings highlight various health benefits of male circumcision, including reduced rates of penile cancer, urinary tract infections, and protection against HIV transmission and other sexually transmitted infections (STIs) [15–17].

In addition to medical circumcision for the prevention of HIV and other STI transmission, as recommended by the WHO and CDC, it is widely recognised that communities in many countries engage in TMC performed by traditional circumcisers using traditional methods [18]. This traditional practice serves as a cultural initiation ritual, signifying the transition of newly circumcised males into manhood and their acceptance into the community with elevated familial and societal status and responsibilities for becoming a role model [7,19,20]. Furthermore, TMC imparts greater social responsibilities on new initiates towards their families and communities, positioning them as mediators in community disputes and providing opportunities to engage with and assist with communal issues. Often conducted in secluded areas such as mountains and bushland of Africa, TMC rituals are shrouded in secrecy and exclusivity [18,21]. The rite of passage also bestows authority

within the community, granting circumcised men power over uncircumcised men and those who have not undergone traditional circumcision [6,22]. However, the sacred nature of TMC practice poses a challenge for health intervention programs, as its intricacies and consequences may resist external intervention efforts. Resistance to health interventions could contribute to dehydration and the spread of HIV, for example, through the use of a single knife for several initiates during TMC ceremonies, which could lead to morbidity and mortality [6,21]. Additionally, HIV transmission risks could also arise from non-sterile surgical equipment, unsafe wound care practices, and risky sexual behaviors following circumcision [6,21,23].

A systematic review underscored the need for health interventions for safe circumcision in communities practising TMC and safe sexual behaviors following TMC [7]. This review highlighted that individuals who practised TMC tended to perceive it as a more prestigious practice than medical circumcision, and those undergoing TMC believed the procedure could protect them against HIV, which contributed to engagement in risky sexual behaviours. Furthermore, the review identified several knowledge gaps, including the limited studies on TMC in Asian countries, insufficient research exploring the perspectives of traditional practitioners regarding TMC and HIV risks, and a lack of studies examining the impacts of TMC-related HIV risks on men and their families. To address these knowledge gaps, it is important to assess people's knowledge and attitudes regarding TMC and the risk factors associated with HIV transmission. Research aimed at evaluating men's knowledge and attitudes towards TMC practice and its association with the risk of HIV transmission is essential for informing the development of effective health intervention programs in communities where TMC is practised. While previous studies have assessed knowledge and attitudes regarding male circumcision in general and HIV in African countries, none have specifically focused on knowledge and attitudes towards TMC and HIV [9,24–26]. Notably, there is a lack of a validated questionnaire to measure knowledge and attitudes towards TMC practice and the risk of HIV transmission in the Indonesian context. Typically, questionnaires are the standard method employed in the evaluation of knowledge and attitudes [27]. An existing questionnaire developed in Swaziland focused on knowledge, attitudes, and practice (KAP) of circumcised men towards safe sex [9], and another questionnaire in South Africa focused on KAP related to medical male circumcision [25]. The available questionnaire to measure knowledge and attitudes towards medical circumcision, TMC, and HIV transmission was developed by WHO [28]. However, such a questionnaire needs to be contextualised to the TMC practices in the study area.

Given the absence of validated questionnaires, there is a need to develop and validate a robust knowledge and attitudes questionnaire specific to the Indonesian context to facilitate the assessment of TMC and HIV risk factors. This questionnaire is expected to contribute to future epidemiological research and the evaluation of public health interventions. This psychometric study aimed to develop and validate a questionnaire aimed at measuring the knowledge and attitudes of men aged 18 to 49 years in West Timor, Indonesia, regarding TMC and the risk of HIV transmission linked to the practice and subsequent sexual intercourse. This age group was chosen as the majority of people living with HIV in Indonesia are aged between 20 and 49 years old [29].

## 2. Methods

### 2.1. Framework for the Development of the Questionnaire

The questionnaire was developed using the Knowledge, Attitudes, and Practices (KAP) framework [30]. This framework has been widely used in health-related research, including questionnaire development. This framework is used to explore what is known (knowledge), what is opinion (attitudes), and what is practised (practice) [31]. It posits

that knowledge serves as the foundation for behaviour change. Attitudes refer to whether individuals view something positively or negatively and influence their decisions to engage in behaviours. Practice refers to the actions individuals take, which may or may not reflect their knowledge and attitudes. These domains were selected because they align with the structure of the questionnaire, which assesses knowledge and attitudes towards the practice of TMC and the risk of HIV transmission associated with the practice.

## 2.2. The Development and Validation

The development and validation of the questionnaire consist of two main steps. The first step was the literature review and item development. In this step, a meticulous literature review was conducted to identify available resources that measure knowledge, attitudes, and practice of TMC, as well as to discover relevant items existing in previously published surveys. The second step was questionnaire development. The second step was psychometric validation, including (i) content validity using items-content validity index (I-CVI) technique in which experts were invited to provide feedback on the content of the questionnaire, (ii) face validity involving 10 participants, (iii) test-retest in 57 respondents within 14 days apart with Indonesian male participants in South Australia, (iv) exploratory factor analysis (EFA) to explore the pattern of domains and also to serve as a pilot study involving 140 participants in West Timor and internal coherence. Data were analysed using SPSS version 29 (SPSS, Chicago, USA).

## 2.3. Stage I: Literature Review and Item Development

A literature search was conducted to identify available resources regarding knowledge and attitudes to pinpoint relevant items in existing questionnaires on TMC. Item development was based on the systematic review of TMC and HIV risk factors in men [7] existing literature on male circumcision, and the male circumcision services quality assessment questionnaire kits developed by the WHO [28]. A literature search regarding knowledge and attitudes was conducted to identify potential items using several keywords: “knowledge”, “attitudes”, “questionnaire”, “circumcision”, “HIV” and “traditional male circumcision”, which have been used in previous studies [7]. The eligibility criteria for the data search included studies published in English or Bahasa, regardless of publication year, and employing any study design. The data search was conducted in English databases, including PubMed, CINAHL, Scopus, and MEDLINE. The researcher (GAA) identified questions from other surveys in the literature, including WHO questionnaire kits that measured knowledge, attitudes, and practice, and created a list of items. We also searched for data published in Bahasa through Google Scholar. Questions from WHO questionnaire kits were contextualised to align with the Indonesian cultural context regarding traditional circumcision. Other authors assessed the listed items (NKF, HAG, PRW). Some items were modified because they were unclear, potentially because they were originally developed for use in different countries, such as those in Africa. The researcher (GAA) iteratively revised and contextualised the items to the study setting, based on feedback from the other authors. The revised version underwent further discussion among the authors before being evaluated for content validity by experts or panels.

## 2.4. Stage II: Psychometric Validation

### 2.4.1. Content Validity

Content validity refers to assessing the relevance and representation of content, specifically whether the items effectively assess knowledge and attitudes on TMC and HIV risk transmission in the targeted population. It also provides preliminary evidence of construct validity. This study employed the most widely used method, known as the content validity index (CVI), which assesses the level of agreement among experts or panels [32]. The num-

ber of panels that rated each item is divided by the total number of panels. Scale Content Validity Index (S-CVI) average is calculated by taking the sum of the I-CVIs divided by the total number of items. It is suggested that the number of panels for the CVI range between 5 and 10 [32]. CVI value  $> 0.79$  signifies that the items are relevant; between 0.70 and 0.79 indicates that some revisions are necessary, and a value  $< 0.70$  suggests that the item should be eliminated [33].

To evaluate content validity, we invited experts to validate the questionnaire. The inclusion criteria for experts/panels include having published papers on traditional male circumcision or male circumcision. These experts were selected based on their publications via Google Scholar. The authors conducted a literature search on male circumcision and TMC using Google Scholar. We identified the authors and their email addresses through their published papers. We then reached out to the authors and invited several of these authors to join the panel. In the end, we invited 8 experts with publications on male circumcision to participate as panel members. Of the 8 panels, 1 is from a university in Australia, 3 are from universities in Africa, 1 is from a university in Canada, 2 are from universities in the US, and 1 is from a university in Switzerland. Of the first-round invitations, 2 panels provided feedback. The second-round invitation was sent out two months after the first round to reach at least 6 panels for CVI purposes. The other 5 panels, consisting of 4 panels from the US and 1 from Denmark, were invited for the CVI. All panels were asked to evaluate each item's relevancy, clarity, and simplicity. Of the 4 panels, 1 panel provided feedback by the deadline. Therefore, 3 panels provided feedback for the CVI. All the authors (GAA, NKF, HAS, PRW) agreed to have 3 panels for the CVI. All panels were asked to evaluate each item's relevancy, clarity, and simplicity. Of the 4 panels, 1 panel provided feedback by the deadline. Therefore, 3 panels provided feedback for the CVI. All the authors (GAA, NKF, HAS, PRW) agreed to have 3 panels for the CVI. All the panels were asked to rate each item on a 5-point Likert scale, such as 1 = highly irrelevant, 2 = not relevant, 3 = neither irrelevant nor relevant, 4 = relevant, and 5 = highly relevant. The CVI was calculated as follows. The value 1 was assigned if the item was rated 4 or 5, indicating the item is relevant, and the value 0 if the item was rated less than 4, indicating the item is not relevant. The I-CVI was based on the proportion in agreement about relevance, computed as the number of experts giving a specific rating from the Likert scale divided by the total number of experts. The item proceeds to the next validity if the majority of the experts rate 4 or 5 (relevant) on the Likert scale. Meanwhile, the item does not proceed to the next validity if the majority of the experts rate  $< 4$  (irrelevant). Responses for the knowledge items are "Don't know," "No," and "Yes," whereas responses for the attitude items are "Strongly disagree," "Disagree," "Undecided," "Agree," and "Strongly agree". The responses "no" and "don't know" were valued as 0, and "yes" was valued as 1. Responses "agree" and "strongly agree" were valued as 1, while "strongly disagree", "disagree", and "neutral" were valued as 0.

#### 2.4.2. Face Validity

Face validity is the response process of validity from targeted participants [34]. In this step, all participants were asked to evaluate the items with respect to problems, ambiguity, proper terms and grammar, and understandability using a 5-point Likert scale. Likert scores of 4–5 were categorized as very clear and understandable and were recorded as 1. The other scales were categorized as 0, indicating the items were not understood. The recommended FVI for 10 participants is 0.83 [34]. Items with ambiguous meanings or interpretations detected by face validity were deleted or reformulated. In this phase, items validated in the content validity step were translated into Bahasa. Participants for the face validity were purposively selected in the study settings. The inclusion criteria for participants involved

in face validity were (i) living in West Timor for at least 5 years, (ii) having an educational background of at least primary education, and (iii) aged 18–49 years old. Ten Indonesian men from different educational backgrounds were asked to evaluate the translated items, as the validated questionnaire will be used to assess knowledge and attitudes among men, particularly in communities practicing TMC in Indonesia.

#### 2.4.3. Test-Retest Reliability

Test-retest reliability was measured using the same questionnaire on the same sample at two different times on the assumption that there would be no significant change in the construct under study between the two sampling time points [35]. A high correlation between the scores at the two time points indicates the questionnaire was stable over time [35]. The test-retest reliability was assessed by intra-class correlation coefficients (ICCs). An ICC below 0.5 indicated poor reliability, 0.5 to 0.75 indicated moderate reliability, 0.75 to 0.9 indicated good reliability, and greater than 0.90 showed excellent reliability [36]. In this study, a test-retest reliability was conducted with Indonesian men living in South Australia. This was because the researcher was studying in South Australia, pursuing his PhD degree, and this validation questionnaire was part of his PhD project. The inclusion criteria for test-retest reliability were (i) Indonesian men who have lived in South Australia in the last 5 years, (ii) aged 18–49 years old, and (iii) completion of a Google Form-based questionnaire. Participants were selected using snowball and purposive sampling. The researcher and supervisors agreed to conduct a test-retest reliability test with Indonesian men in South Australia using the translated questionnaire before the researcher went to the field study in Indonesia. Additionally, as the questionnaire was developed for use in the Indonesian context, we focused on recruiting Indonesian participants who have TMC practice in their communities or culture. We distributed the first test on 16th November 2023, and disseminated the second test two weeks later. Of the 60 participants, 57 completed the second survey. Three incomplete questionnaires were excluded. A non-parametric statistical test was applied as the scale was not continuous. To analyze the significant difference between test and retest, the Wilcoxon test and the intraclass correlation coefficient (ICC) were employed.

#### 2.4.4. Exploratory Factor Analysis and Inter-Item Correlation

Factor Analysis is a statistical method commonly used during questionnaire development to identify factors and summarise the items into a small number of factors [37]. The aim of using exploratory factor analysis (EFA) is to discover the correlations between items and to examine their internal reliability. The researcher applied EFA to ensure that all the items reflect the same factors in both the knowledge and attitudes domains. Before conducting EFA, we ensured that the correlation matrix was factorable by using Bartlett's test of sphericity to check that the correlation matrix was not random, and then used the Kaiser–Meyer–Olkin measure of sampling adequacy, which was required to be above 0.5 for all variables [38]. EFA is a factor analysis method used to examine relationships among variables without specifying a particular hypothetical model [37].

The returned questionnaires were entered into SPSS. EFA was used to assess the multidimensional structure of the questions and statements. The *p*-value from the Kolmogorov–Smirnov test was used to assess the normality of the data. It was suggested that the sample size for EFA be between 2 and 5 respondents per item, and can range from 2 to 20 respondents per item [39]. The sample size was calculated using the sample-to-variable ratio (N:p ratio, where N refers to the number of participants and P refers to the number of variables or items) recommended for questionnaire validation studies. For this study, the ratio was 10:1 (10 participants per item). Cronbach's alpha was used to measure internal

consistency. The questionnaire used a Cronbach's alpha range of 0.60 to 0.95 [40]. Items with a factor loading of 0.5 or above were considered acceptable [41]. Principal Axis Factoring was used as the extraction method, whereby factors were extracted based on the common variance among variables, and Varimax rotation was applied to maximize the variance of factor loadings and improve interpretability [42].

Data collection for the pilot test was carried out from 12 January to 10 April 2024 using a face-to-face survey. The inclusion criteria for this analysis were men aged 18–49 years, regardless of their circumcision status, living in West Timor. Participants were recruited using the snowball sampling technique. The translated questionnaire was hosted through Google Forms and was exported to Excel spreadsheets for analysis. Consent was obtained via the Google Form, and each participant was informed that their participation was voluntary and that they could withdraw before, during, and after the survey. After validation, no participants were required to withdraw.

Inter-item correlations were used as supporting evidence for homogeneity and internal consistency [43]. This demonstrates items' homogeneity and internal coherence within each scale. The correlation coefficient ( $r$ ) determines the strength of the linear relationship between two variables. The  $r$  value, which is closer to 1, shows the strongest relationship [43]. Some scholars stated that a correlation between 0.0 and 0.25 shows a weak relationship, 0.26 and 0.50 a moderate relationship, 0.51 and 0.75 a strong relationship, and above 0.75 a very strong relationship [44]. Others stated that an  $r$  between 0.0 and 0.3 is a weak relationship, 0.3 to 0.7 is a moderate relationship, and  $>0.7$  is a strong relationship [44].

### 3. Results

#### 3.1. Characteristics of Respondents

Different phases of the study have different respondent characteristics. Participants for the content validity were experts who had publications on male circumcision. Of the three experts, one is a senior professor, and the other two are assistant professors. We did not have their background details, such as age, because we identified them through Google Scholar and emailed them to help the researcher evaluate the content of the items. Participants who were involved in the face validity step were recruited from the study setting. They were purposively recruited from different districts in West Timor. Test-retest reliability involved Indonesian men living in South Australia, aged 18–49, regardless of their circumcision status. Participants for the pilot test (EFA) were men from West Timor, irrespective of their circumcision status, aged 18 to 49 years. Data from 140 respondents were used for the EFA. Table 1 presents the participants' characteristics.

**Table 1.** Participant characteristics for different phases of the study.

| Demographic Characteristics | Phases                                |                                     |                                   |                               |
|-----------------------------|---------------------------------------|-------------------------------------|-----------------------------------|-------------------------------|
|                             | Content Validity Index (CVI), $n = 3$ | Face Validity Index (FVI), $n = 10$ | Test-Retest Reliability, $n = 56$ | Construct Validity, $n = 140$ |
| Age, mean (SD)              | -                                     | 30.20 (8.46)                        | 29.39 (5.073)                     | 31.35 (78.75)                 |
| Education                   | Doctoral                              | Yunior high school (30.0%)          | Diploma (14.3%)                   | Elementary school (21.4%)     |
|                             |                                       | Senior high school (40.0%)          | Undergraduate (62.5%)             | Yunior high school (15.0%)    |
|                             |                                       | Undergraduate (30.0%)               | Master (23.2%)                    | Senior high school (63.6%)    |
|                             |                                       | Jobs                                |                                   | Farmer or carpenter (62.0%),  |
|                             |                                       |                                     |                                   | Student (22.0%)               |
|                             |                                       |                                     |                                   | Motorbike driver/ojek (12.0%) |
|                             |                                       |                                     |                                   | Government worker (4.0%)      |

SD: Standard deviation;  $n$  = sample size.

### 3.2. Item Development

The researcher (GAA) generated 26 items (Table 2) based on the literature search. Some items were taken from WHO guidelines, some were modified from previous studies in Africa, and some were generated by the researcher (GAA) based on the Indonesian context. The items from WHO guidelines and previous studies in Africa were contextualised in the Indonesian context. Thus, this questionnaire was developed and validated for use in the Indonesian context. Additional validation would be required before use in other populations.

**Table 2.** Initial development of 26 items.

| KNOWLEDGE       |                                                                                                                                                                                                                                |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.              | Is there an association between traditional male circumcision and a reduced risk of HIV transmission?                                                                                                                          |
| 2.              | Do traditionally circumcised men still need to use a condom to prevent or reduce the risk of HIV or sexually transmitted infection transmission when having sex?                                                               |
| 3.              | Can traditionally circumcised men get HIV infection when having unprotected sexual intercourse?                                                                                                                                |
| 4.              | Do you think men should have HIV testing before seeking traditional circumcision?                                                                                                                                              |
| 5.              | Are traditionally circumcised men still recommended to use condoms?                                                                                                                                                            |
| 6.              | What is the best age for traditional circumcision?                                                                                                                                                                             |
| 7.              | Does traditional male circumcision increase genital hygiene?                                                                                                                                                                   |
| 8.              | Do you think men should have HIV testing after having sex without a condom following traditional male circumcision?                                                                                                            |
| 9.              | Why did you decide to be traditionally circumcised? If you did not go through traditional circumcision, skip this question and continue to question 7.                                                                         |
| 10.             | Why did you refuse traditional circumcision?                                                                                                                                                                                   |
| 11.             | Can HIV be transmitted through sharing or re-using a knife among more than one initiate who undergo traditional circumcision?                                                                                                  |
| 12.             | Can men and women get infected with HIV or sexually transmitted infections due to inconsistent condom use (sometimes using a condom and sometimes not using a condom) when having sex following traditional male circumcision? |
| 13.             | Can an HIV negative woman contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive traditionally circumcised man?                                                                |
| 14.             | Can an HIV negative traditionally circumcised man contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive woman?                                                                |
| ATTITUDES       |                                                                                                                                                                                                                                |
| 15.             | I believe it is acceptable for a traditionally circumcised man to have sex without a condom following the traditional circumcision ritual and before the wound fully recovers.                                                 |
| 16.             | Uncircumcised men and medical circumcision are more likely to contract HIV/STI than TMC                                                                                                                                        |
| 17.             | I believe a traditionally circumcised man is completely protected from HIV or sexually transmitted infection transmission.                                                                                                     |
| 18.             | I believe an HIV-positive man who is traditionally circumcised cannot transmit HIV when having sex without a condom.                                                                                                           |
| 19.             | I believe an HIV infected man should be traditionally circumcised.                                                                                                                                                             |
| 20.             | I believe rituals performed by traditional circumcisers protect new initiates from HIV transmission when having sex prior to wound healing.                                                                                    |
| 21.             | I believe traditionally circumcised men are required to know their HIV status following unprotected sexual intercourse.                                                                                                        |
| 22.             | I believe men who are uncircumcised or medically circumcised experience stigma from friends or the community.                                                                                                                  |
| 23.             | Women prefer traditionally circumcised men to medical or uncircumcised men                                                                                                                                                     |
| RISK PERCEPTION |                                                                                                                                                                                                                                |
| 24.             | What is the level of risk of contracting HIV after having sex without a condom following traditional male circumcision?                                                                                                        |
| 25.             | What is the level of risk of contracting HIV after sharing one knife among several initiates during the traditional male circumcision ritual?                                                                                  |
| 26.             | What do you think the level of risk of contracting HIV is after having multiple sex partners following TMC?                                                                                                                    |

Of the 26 items, 7 items (item #5, #6, #7, #16, #19, #23, #26) were removed due to context incompatibility after discussion with other authors, leaving 19 items.

### 3.3. Content Validity

The 19 items agreed in the item development phase proceeded to the content validity phase. The I-CVI ranged from 0.30 to 1 (Table 3). The S-CVI for knowledge after removing item 4 was 0.83, and the S-CVI for the attitudes factor was 0.89, indicating acceptable content validity. Scale item K4 in the knowledge section and item P19 in the risk perception section had a low score (0.30) (Table 3), showing they were not relevant as items in the questionnaire, leaving 17 items to proceed to the next phase (face validity).

**Table 3.** I-CVI.

| Item Descriptions                                                                                                                                                                                                                  | N <sup>1</sup> | I-CVI <sup>2</sup> | S-CVI <sup>3</sup> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|
| Knowledge towards traditional male circumcision practice and HIV transmission                                                                                                                                                      |                |                    |                    |
| K1. Is there an association between traditional male circumcision and a reduced risk of HIV transmission?                                                                                                                          | 3              | 1                  | 0.83               |
| K2. Do traditionally circumcised men still need to use a condom to prevent or reduce the risk of HIV or sexually transmitted infection transmission when having sex?                                                               | 2              | 0.67               |                    |
| K3. Can traditionally circumcised men get HIV infection when having unprotected sexual intercourse?                                                                                                                                | 2              | 0.67               |                    |
| K4. Do you think men should have HIV testing before seeking traditional circumcision?                                                                                                                                              | 1              | 0.33               |                    |
| K5. Do you think men should have HIV testing after having sex without a condom following traditional male circumcision?                                                                                                            | 2              | 0.67               |                    |
| K6. Why did you decide to be traditionally circumcised?                                                                                                                                                                            | 3              | 1                  |                    |
| K7. Why did you refuse traditional circumcision?                                                                                                                                                                                   | 3              | 1                  |                    |
| K8. Can HIV be transmitted through sharing or re-using a knife among more than one initiate who undergo traditional circumcision?                                                                                                  | 2              | 0.67               |                    |
| K9. Can men and women get infected with HIV or sexually transmitted infections due to inconsistent condom use (sometimes using a condom and sometimes not using a condom) when having sex following traditional male circumcision? | 2              | 0.67               |                    |
| K10. Can an HIV negative woman contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive traditionally circumcised man?                                                               | 3              | 1                  |                    |
| K11. Can an HIV negative traditionally circumcised man contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive woman?                                                               | 3              | 1                  |                    |
| Attitudes towards traditional male circumcision practice and HIV transmission                                                                                                                                                      |                |                    |                    |
| A12. I believe it is acceptable for a traditionally circumcised man to have sex without a condom following the traditional circumcision ritual and before the wound fully recovers.                                                | 2              | 0.67               | 0.89               |
| A13. I believe a traditionally circumcised man is completely protected from HIV or sexually transmitted infections.                                                                                                                | 3              | 1                  |                    |
| A14. I believe an HIV-positive man who is traditionally circumcised cannot transmit HIV when having sex without a condom.                                                                                                          | 3              | 1                  |                    |
| A15. I believe ritual performed by traditional circumcisers protects new initiates from HIV transmission when having sex before wound healing.                                                                                     | 2              | 0.67               |                    |
| A16. I believe traditionally circumcised men are required to know their HIV status following unprotected sexual intercourse.                                                                                                       | 3              | 1                  |                    |
| A17. I believe men who are uncircumcised or medically circumcised experience stigma from friends or the community.                                                                                                                 | 3              | 1                  |                    |
| Perception risk level on HIV transmission through having sex without a condom following TMC and unsafe practice of TMC                                                                                                             |                |                    |                    |
| P18. What is the level of risk of contracting HIV after having sex without a condom following traditional male circumcision?                                                                                                       | 2              | 0.67               |                    |
| P19. What is the level of risk of contracting HIV after sharing one knife among several initiates during the traditional male circumcision ritual?                                                                                 | 1              | 0.33               |                    |

<sup>1</sup> Number of agreements; <sup>2</sup> Item Content Validity Index; <sup>3</sup> Scale Content Validity Index.

### 3.4. Face Validity

A total of 17 items proceeded to the face validity phase, consisting of 10 items for knowledge, 6 items for the attitudes domain, and 1 item for risk perception. For FVI, the 10 knowledge items ranged from 0.8 to 1, and for the attitudes section, the FVI ranged from 0.9 to 1; risk perception was rated at 1, suggesting satisfactory face validity. No item scored below 0.8. Based on the results, all the items were clear and easy to understand (Table 4). These 17 items proceeded to the next phase (Test-Retest reliability).

**Table 4.** Face validity index.

| Item Description                                                                                                                                                                                                                   | N <sup>4</sup> | I-FVI <sup>5</sup> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|
| Knowledge towards traditional male circumcision practice and HIV transmission                                                                                                                                                      |                |                    |
| K1. Is there an association between traditional male circumcision and a reduced risk of HIV transmission?                                                                                                                          | 10             | 1                  |
| K2. Do traditionally circumcised men still need to use a condom to prevent or reduce the risk of HIV or sexually transmitted infections when having sex?                                                                           | 10             | 1                  |
| K3. Can traditionally circumcised men get HIV infection when having unprotected sexual intercourse?                                                                                                                                | 9              | 0.9                |
| K4. Do you think men should have HIV testing after having sex without a condom following traditional male circumcision?                                                                                                            | 10             | 1                  |
| K5. Why did you decide to be traditionally circumcised?                                                                                                                                                                            | 10             | 1                  |
| K6. Why did you refuse traditional circumcision?                                                                                                                                                                                   | 10             | 1                  |
| K7. Can HIV be transmitted through sharing or re-using a knife among more than one initiate who undergoes traditional circumcision?                                                                                                | 8              | 0.8                |
| K8. Can men and women get infected with HIV or sexually transmitted infections due to inconsistent condom use (sometimes using a condom and sometimes not using a condom) when having sex following traditional male circumcision? | 9              | 0.9                |
| K9. Can an HIV negative woman contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive, traditionally circumcised man?                                                               | 8              | 0.8                |
| K10. Can an HIV negative traditionally circumcised man contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive woman?                                                               | 10             | 1                  |
| Attitudes towards traditional male circumcision practice and HIV transmission                                                                                                                                                      |                |                    |
| A11. I believe it is acceptable for a traditionally circumcised man to have sex without a condom following the traditional circumcision ritual and before the wound fully recovers.                                                | 9              | 0.9                |
| A12. I believe a traditionally circumcised man is completely protected from HIV or sexually transmitted infections.                                                                                                                | 10             | 1                  |
| A13. I believe a HIV-positive man who is traditionally circumcised cannot transmit HIV when having sex without a condom.                                                                                                           | 10             | 1                  |
| A14. I believe ritual performed by traditional circumcisers protects new initiates from HIV transmission when having sex before wound healing.                                                                                     | 10             | 1                  |
| A15. I believe traditionally circumcised men are required to know their HIV status following unprotected sexual intercourse.                                                                                                       | 9              | 0.9                |
| A16. I believe men who are uncircumcised or medically circumcised experience stigma from friends or the community.                                                                                                                 | 10             | 1                  |
| Perception risk level of HIV transmission through having sex without a condom following TMC and unsafe practice of TMC                                                                                                             |                |                    |
| P17. What is the level of risk of contracting HIV after having sex without a condom following traditional male circumcision?                                                                                                       | 10             | 1                  |

<sup>4</sup> Number of agreements; <sup>5</sup> Item-level face validity index.

### 3.5. Test-Retest Reliability

Intraclass correlation coefficient (ICC) (Table 5) was used in a test-retest among 57 participants. A total of 17 items were used in this test. The results showed that the ICC for the knowledge domain was 0.938 (95%, 0.889–0.965), and the ICC for the attitudes domain was 0.800 (95%, 0.654–0.883), indicating good reliability of the ICC values, with all items achieving values above 0.5 (values < 0.5 are considered poor reliability), signifying acceptable reliability [45].

**Table 5.** Intraclass correlation coefficient of knowledge and attitudes domain.

| Intraclass Correlation Coefficient Knowledge Domain |                        |             |        |
|-----------------------------------------------------|------------------------|-------------|--------|
| Measures                                            | Intraclass Correlation | (95% CI)    | Sig.   |
| Single Measures                                     | 0.884                  | 0.799–0.932 | <0.001 |
| Average Measures                                    | 0.938                  | 0.889–0.965 | <0.001 |
| Intraclass Correlation Coefficient Attitudes Domain |                        |             |        |
| Single Measures                                     | 0.666                  | 0.486–0.791 | <0.001 |
| Average Measures                                    | 0.800                  | 0.654–0.883 | <0.001 |

### 3.6. Construct Validity

Three factors (knowledge, attitudes, and risk perception, with a total of 17 items) were generated before EFA, but the risk perception factor was removed as it had only one item, which could not be used for factor analysis, leaving 16 items. Items K6 (reasons to be traditionally circumcised) and K7 (reasons not to be traditionally circumcised) in the knowledge section were removed in EFA due to the nature of responses being different from other knowledge items. Hence, 14 items were included in the EFA. Knowledge and attitudes factors were extracted from 14 items in this validation questionnaire process. To assess the suitability of items for factor analysis, we confirmed that the items for each factor or scale loaded highly or significantly on the component, where the *p*-value of Bartlett's Test of Sphericity was <0.001. The eigenvalues for all scales were well greater than 0, implying that none of the items had multicollinearity.

The EFA results showed a Kaiser–Meyer–Olkin (KMO) value of 0.759 for the knowledge factor and 0.797 for the attitudes factor, and Bartlett's test of sphericity ( $p < 0.001$ ) indicated that the data were suitable for further factor analysis (Table 6). The Cronbach's alpha for the knowledge domain (0.861) was excellent, and the Cronbach's alpha for the attitudes domain (0.824) was also excellent, indicating that there was no need for item deletion. In terms of EFA, items with factor loading values  $\geq 0.3$  were considered acceptable [39]. The results showed that none of the items had a factor loading below 0.3.

**Table 6.** Cronbach's alpha, KMO, and Bartlett's test of sphericity among men in West Timor, Indonesia.

| Factor    | Number of Items | Cronbach's Alpha | Eigenvalue (Total, by Component) * | KMO and Bartlett's Test of Sphericity |                        |
|-----------|-----------------|------------------|------------------------------------|---------------------------------------|------------------------|
|           |                 |                  |                                    | KMO <sup>1</sup>                      | BTS <sup>2</sup> (Sig) |
| Knowledge | 8               | 0.861            | 8.001                              | 0.759                                 | <0.001                 |
| Attitudes | 6               | 0.824            | 6.001                              | 0.797                                 | <0.001                 |

\* = the component is above 0 for all scales. <sup>1</sup> Kaiser–Meyer–Olkin Measures of Sampling Adequacy;

<sup>2</sup> Bartlett's test of Sphericity.

The validity of the 2-factor model was further confirmed by the communalities of each attribute, as all the communalities (factor loadings) were more than 0.5. The two factors shown in Table 7 are the final questionnaire.

**Table 7.** EFA and reliability of knowledge and attitudes.

| Item                                                                                                                                                                                                                               | Communality | Factor Loading | Cronbach Alpha |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|----------------|
| Knowledge                                                                                                                                                                                                                          |             |                |                |
| K1: Is there an association between traditional male circumcision and a reduced risk of HIV transmission?                                                                                                                          | 0.980       | 0.989          | 0.861          |
| K2: Do traditionally circumcised men still need to use a condom to prevent or reduce the risk of HIV or sexually transmitted infection transmission when having sex?                                                               | 0.784       | 0.833          |                |
| K3: Can traditionally circumcised men get HIV infection when having unprotected sexual intercourse?                                                                                                                                | 0.695       | 0.832          |                |
| K4: Do you think men should have HIV testing after having sex without a condom following traditional male circumcision?                                                                                                            | 0.764       | 0.874          |                |
| K5: Can HIV be transmitted through sharing or re-using a knife among more than one initiate who undergoes traditional circumcision?                                                                                                | 0.688       | 0.791          |                |
| K6: Can men and women get infected with HIV or sexually transmitted infections due to inconsistent condom use (sometimes using a condom and sometimes not using a condom) when having sex following traditional male circumcision? | 0.575       | 0.757          |                |
| K7: Can an HIV negative woman contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive traditionally circumcised man?                                                                | 0.615       | 0.767          |                |
| K8: Can an HIV negative traditionally circumcised man contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive woman?                                                                | 0.713       | 0.810          |                |
| Attitudes                                                                                                                                                                                                                          |             |                |                |
| A1: I believe it is acceptable for a traditionally circumcised man to have sex without a condom following the traditional circumcision ritual and before the wound fully recovers.                                                 | 0.501       | 0.620          | 0.824          |
| A2: I believe a traditionally circumcised man is protected from HIV or sexually transmitted infections.                                                                                                                            | 0.871       | 0.932          |                |
| A3: I believe an HIV-positive man who is traditionally circumcised cannot transmit HIV when having sex without a condom.                                                                                                           | 0.846       | 0.920          |                |
| A4: I believe ritual performed by traditional circumcisers protect new initiates from HIV transmission when having sex before wound healing.                                                                                       | 0.806       | 0.850          |                |
| A5: I believe traditionally circumcised men are required to know their HIV status following unprotected sexual intercourse.                                                                                                        | 0.592       | 0.744          |                |
| A6: I believe men who are uncircumcised or medically circumcised experience stigma from friends or the community.                                                                                                                  | 0.826       | 0.908          |                |

### 3.7. Inter-Item Correlation

Inter-item correlation was calculated using the Pearson Correlation. The 8 items of the knowledge factor were moderately correlated with each other, with coefficients ranging from  $r = 0.262$  ( $p < 0.01$ ) to  $r = 0.703$  (Table 8). The 6 items of the attitudes factor (Table 9) were moderately to strongly correlated, with coefficients ranging from  $r = 0.266$  ( $p < 0.01$ ) to  $r = 0.823$  ( $p < 0.01$ ).

**Table 8.** Inter-item correlation of knowledge factor (effect size 0.30–0.70).

| Item                                                                                                                                                                                                                               |                     | K1     | K2                           | K3                           | K4               | K5               | K6               | K7               | K8 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------|------------------------------|------------------------------|------------------|------------------|------------------|------------------|----|
| K1: Is there an association between traditional male circumcision and a reduced risk of HIV transmission?                                                                                                                          | Pearson Correlation | 1      |                              |                              |                  |                  |                  |                  |    |
|                                                                                                                                                                                                                                    | Sig. (1-tailed)     |        |                              |                              |                  |                  |                  |                  |    |
| K2: Do traditionally circumcised men still need to use a condom to prevent or reduce the risk of HIV or sexually transmitted infections when having sex?                                                                           | Pearson Correlation | −0.071 |                              |                              |                  |                  |                  |                  |    |
|                                                                                                                                                                                                                                    | Sig. (1-tailed)     | 0.201  |                              |                              |                  |                  |                  |                  |    |
| K3: Can traditionally circumcised men get HIV infection when having unprotected sexual intercourse?                                                                                                                                | Pearson Correlation | 0.094  | <b>0.701 **</b> <sup>3</sup> |                              |                  |                  |                  |                  |    |
|                                                                                                                                                                                                                                    | Sig. (1-tailed)     | 0.136  | <b>&lt;0.001</b>             |                              |                  |                  |                  |                  |    |
| K4: Do you think men should have HIV testing after having sex without a condom following traditional male circumcision?                                                                                                            | Pearson Correlation | 0      | −0.178 *                     | 0.026                        |                  |                  |                  |                  |    |
|                                                                                                                                                                                                                                    | Sig. (1-tailed)     | 0.499  | 0.018                        | 0.381                        |                  |                  |                  |                  |    |
| K5: Can HIV be transmitted through sharing or re-using a knife among more than one initiates who undergo traditional circumcision?                                                                                                 | Pearson Correlation | −0.007 | −0.408 **                    | <b>0.262 **</b> <sup>4</sup> | <b>0.435 **</b>  |                  |                  |                  |    |
|                                                                                                                                                                                                                                    | Sig. (1-tailed)     | 0.467  | <0.001                       | <b>&lt;0.001</b>             | <b>&lt;0.001</b> |                  |                  |                  |    |
| K6: Can men and women get infected with HIV or sexually transmitted infections due to inconsistent condom use (sometimes using a condom and sometimes not using a condom) when having sex following traditional male circumcision? | Pearson Correlation | 0.005  | 0.541 **                     | −0.08                        | −0.162 *         | <b>0.544 **</b>  |                  |                  |    |
|                                                                                                                                                                                                                                    | Sig. (1-tailed)     | 0.475  | <0.001                       | 0.182                        | 0.028            | <b>&lt;0.001</b> |                  |                  |    |
| K7: Can an HIV negative woman contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive traditionally circumcised man?                                                                | Pearson Correlation | 0.086  | 0.507 **                     | 0.475 **                     | −0.13            | −0.205 **        | <b>0.521 **</b>  |                  |    |
|                                                                                                                                                                                                                                    | Sig. (1-tailed)     | 0.157  | <0.001                       | <0.001                       | 0.068            | 0.008            | <b>&lt;0.001</b> |                  |    |
| K8: Can an HIV negative traditionally circumcised man contract HIV or sexually transmitted infections after having sex without a condom with an HIV-positive woman?                                                                | Pearson Correlation | 0.071  | <b>0.703 **</b> <sup>5</sup> | 0.563 **                     | −0.182 *         | −0.305 **        | 0.447 **         | <b>0.677 **</b>  |    |
|                                                                                                                                                                                                                                    | Sig. (1-tailed)     | 0.204  | <b>&lt;0.001</b>             | <0.001                       | 0.016            | <0.001           | <b>&lt;0.001</b> | <b>&lt;0.001</b> | −  |

\* Correlation is significant at the 0.05 level (1-tailed); \*\* Correlation is significant at the 0.01 level (1-tailed).<sup>3</sup> The bold ones were all statistically significant; <sup>4</sup> The lowest coefficient; <sup>5</sup> The highest coefficient.

**Table 9.** Inter-item correlation of attitudes factor (effect size 0.30–0.70).

| Item                                                                                                                                                                               |                     | A1                           | A2                           | A3               | A4                           | A5      | A6 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------|------------------------------|------------------|------------------------------|---------|----|
| A1: I believe it is acceptable for a traditionally circumcised man to have sex without a condom following the traditional circumcision ritual and before the wound fully recovers. | Pearson Correlation | 1                            |                              |                  |                              |         |    |
|                                                                                                                                                                                    | Sig. (1-tailed)     |                              |                              |                  |                              |         |    |
| A2: I believe a traditionally circumcised man is protected from HIV or sexually transmitted infections.                                                                            | Pearson Correlation | <b>0.325 **</b> <sup>6</sup> |                              |                  |                              |         |    |
|                                                                                                                                                                                    | Sig. (1-tailed)     | <b>&lt;0.001</b>             |                              |                  |                              |         |    |
| A3: I believe a HIV-positive man who is traditionally circumcised cannot transmit HIV when having sex without a condom.                                                            | Pearson Correlation | 0.339 **                     | <b>0.823 **</b> <sup>7</sup> |                  |                              |         |    |
|                                                                                                                                                                                    | Sig. (1-tailed)     | <0.001                       | <b>&lt;0.001</b>             |                  |                              |         |    |
| A4: I believe ritual performed by traditional circumcisers protect new initiates from HIV transmission when having sex before wound healing.                                       | Pearson Correlation | 0.357 **                     | 0.785 **                     | <b>0.762 **</b>  |                              |         |    |
|                                                                                                                                                                                    | Sig. (1-tailed)     | <0.001                       | <0.001                       | <b>&lt;0.001</b> |                              |         |    |
| A5: I believe traditionally circumcised men are required to know their HIV status following unprotected sexual intercourse.                                                        | Pearson Correlation | 0.281 **                     | 0.629 **                     | 0.569 **         | <b>0.583 **</b>              |         |    |
|                                                                                                                                                                                    | Sig. (1-tailed)     | <0.001                       | <0.001                       | <0.001           | <b>&lt;0.001</b>             |         |    |
| A6: I believe men who are uncircumcised or medically circumcised experience stigma from friends or the community.                                                                  | Pearson Correlation | 0.266 **                     | 0.05                         | 0.006            | <b>0.266 **</b> <sup>8</sup> | 0.165 * |    |
|                                                                                                                                                                                    | Sig. (1-tailed)     | <0.001                       | 0.28                         | 0.473            | <0.001                       | 0.026   | -  |

\* Correlation is significant at the 0.05 level (1-tailed); \*\* Correlation is significant at the 0.01 level (1-tailed). <sup>6</sup> The bold ones were all statistically significant; <sup>7</sup> The lowest coefficient; <sup>8</sup> The highest coefficient.

#### 4. Discussion

Our study marks the first validation of a knowledge and attitudes questionnaire on TMC and HIV in Indonesia, aiming to evaluate attitudes and understanding regarding TMC and the risk of HIV transmission in Indonesia. This study uses rigorous methods, including content validity, face validity, test-retest reliability, construct validity, and inter-item correlation, to assess knowledge and attitudes toward TMC and the risk of HIV transmission.

The questionnaire development and validation process used intensive methods, unlike previous studies on knowledge and attitudes toward male circumcision. For example, a questionnaire on male circumcision as an HIV prevention method among males [24] did not report content validity, face validity, and test-retest reliability. Similarly, a questionnaire used to measure attitudes, practices, and acceptability of medical male circumcision in South Africa did not report the results of the development and validation of the questionnaire used [25]. Existing validated questionnaires on male circumcision tended only to report pretest and internal validity [9,24,25]. This study used content validity, face validity, and test-retest reliability before conducting EFA and inter-item correlation to ensure the items were clear and relevant for measuring knowledge and attitudes on TMC and its link to HIV transmission in Indonesia. However, the psychometric properties in this study could not be compared with previous studies on knowledge and attitudes on medical circumcision because of different underlying constructs, item content, and target populations.

The findings showed acceptable values for the validity and reliability tests, providing preliminary evidence that the knowledge and attitude items adequately captured the intended content [46]. Regarding content validity, although the S-CVI score is acceptable, the number of panels is relatively small. Similarly, the absence of panels from Indonesia may have limited the breadth of perspectives represented. It is suggested to use larger panels and include Indonesian experts to strengthen the questionnaire's socio-cultural relevance. For the test-retest reliability, although the test was administered to Indonesian men living in South Australia rather than among the target population in West Timor due to practical reasons, their experiences and perceptions may differ from those of West Timor or Atoni Men living in West Timor because of differences in social, cultural, and healthcare contexts. Therefore, the reliability of the findings should be interpreted with caution.

The construct validity was determined using the EFA model, and all items of the knowledge and attitudes presented good factor loadings  $> 0.5$ , indicating a close relationship between factors and items [47]. However, although EFA is the most appropriate method for analysing the questionnaire's underlying structure and developing a new questionnaire, the absence of CFA limits the definitive stability of the questionnaire's structure. Therefore, it is recommended to conduct CFA if the questionnaire is to be used in future studies or with different populations. Similarly, inter-item correlation showed a moderate correlation, indicating that the tests support item homogeneity and internal coherence [44]. The final questionnaire, as shown in Table 7, consisted of 8 items on the knowledge domain and 6 items on the attitudes domain, and the results confirmed good reliability and validity of the developed questionnaire. This questionnaire can be used for further studies, including a cross-sectional study to measure the prevalence of men who underwent TMC and understand the determinants of health, including unprotected sexual intercourse following this cultural practice as a cultural rite, as well as to describe the future health of the population in West Timor. As such, this questionnaire can serve as a valuable resource for assessing similar cultural practices across diverse settings in Indonesia.

This study adds to the existing literature by presenting a rigorous methodology for validating a questionnaire in Bahasa. This study also contributes by providing a scientific approach to validating a questionnaire in a language other than English. The questionnaire

will enable us to interpret the acceptance of TMC by assessing men's knowledge and attitudes related to TMC and HIV transmission. These insights are crucial for developing and implementing targeted health intervention programs in Indonesian communities where TMC is practised.

#### *Limitations and Strengths of the Study*

A limitation of the questionnaire is that it was validated in Bahasa and thus can only be used in populations that understand this language. This questionnaire is specifically applied in communities practising TMC; thus, it could not be used in communities that do not practice TMC. The use of purposive and snowball sampling methods in several phases of the study may have limited the generalizability of the findings, as the participants may not fully represent the target population. Accordingly, this questionnaire should be considered as having demonstrated preliminary evidence of validity. This non-probability sampling method may introduce selection bias and limit the representativeness of the validation sample. Also, the findings should be interpreted with caution when considering its use in broader public health settings. The study did not measure convergent validity, and future tools should be examined by correlating the instrument with an externally validated instrument or a theoretically related construct. Despite this limitation, there are several strengths of the questionnaire. The first is that its adaptability makes it suitable for use in other settings across Indonesia and can be modified to assess knowledge and attitudes towards medical circumcision in Indonesia. Secondly, it can facilitate rapid assessment of TMC acceptance in the country. Thirdly, the findings from the questionnaire may help healthcare providers better understand community knowledge and attitudes towards TMC and medical circumcision.

## 5. Conclusions

Although this questionnaire has satisfactory internal consistency, its structural stability is limited. Therefore, this study only presents preliminary evidence of the validity and reliability of the questionnaire to assess knowledge and attitudes towards TMC and the risk of HIV transmission in Indonesia. The final questionnaire consisted of 8 items in the knowledge domain and 6 items in the attitudes domain. This questionnaire may serve as a valuable resource for future research and may help inform the development of culturally appropriate health intervention programs.

**Author Contributions:** G.A.A. was involved in the conceptualisation, project administration, investigation, development of the methodology, conducting formal analysis, writing of the original draft of the paper, and reviewing and editing the paper critically for important intellectual content. N.K.F., H.A.G. and P.R.W. were involved in the conceptualisation, development of the methodology, supervision, and reviewing and editing the paper critically for important intellectual content. All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The study received ethical approval from Torrens University Australia Human Research Ethics Committee (HREC), code: 0264 on 3 August 2023. Participants signed a consent form prior to being involved in the study. Data or information provided during the interviews were treated confidentially.

**Informed Consent Statement:** Informed consent was obtained before the participants were involved in the study.

**Data Availability Statement:** Data available upon request.

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