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Adaptation and Refinement of the HIV Knowledge Questionnaire for Use With Adolescent Girls

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Abstract

The number of adolescent girls becoming infected with HIV has dramatically escalated to the point where they now represent one of the groups most at risk for this infection. As a component of addressing this pandemic, there is a need for psychometrically sound, tailored measures to assess an adolescent girl's level of knowledge regarding transmission and prevention of HIV. The purpose of this research was to modify an existing HIV knowledge measure used in the general adult population (brief HIV Knowledge Questionnaire [HIV-KQ]) and increase its utility by making it developmentally- and gender-specific for adolescent girls. The revised version with additional items underwent item and scale analysis to confirm psychometric properties with a sample of 62 adolescent girls. HIV-related knowledge is assessed extensively in clinical practice and educational settings and is an important component for monitoring change in successful HIV risk-reduction interventions. The final HIV-KQ for adolescent girls is a practical, specific, and appropriate instrument for use with adolescent girls in these settings.

Keywords

adolescent girls; HIV; knowledge measure; sexual behavior; information; AIDS; scale; questionnaire

Females are increasingly affected by the AIDS epidemic. From 1999 to 2003, although the estimated AIDS diagnoses increased 1% among men, it increased by 15% among women, with heterosexual contact accounting for the majority (79%) of all HIV infections in females (Centers for Disease Control and Prevention [CDC], 2003). Adolescents' infection rates are also on the rise. In 2003, nearly 12% of newly diagnosed HIV/AIDS cases were in persons aged 13 to 24 years (CDC, 2003). At highest risk are girls, who represented 89% of all recent heterosexually acquired HIV infections among adolescents (CDC, 2004). Girls also continue to carry a high burden of other sexually transmitted infections, with those aged 15 to 19 years having the highest rates of gonorrhea and chlamydia of any age group (CDC, 2001). These are important statistics considering the evidence that the presence of these sexually transmitted infections facilitates HIV transmission, thereby increasing an infected person's risk for acquiring HIV (CDC, 2000).

The alarming increase in rates of HIV in adolescent girls clearly illustrates the urgent need for community and clinical interventions. Reviews of adolescent HIV risk reduction literature conclude that interventions should be tailored to specific gender and developmental levels to maximize effectiveness (Pedlow & Carey, 2004; Stanton, Kim, Galbraith, & Parrott, 1996). Interventions and clinical interactions targeting adolescent girls should address relevant knowledge, developmental issues, and other risk-related factors and behaviors relevant to this age and gender group (Bachanas et al., 2002; Nation et al., 2003; Stanton et al., 1996). Gender-

and age-specific interventions must be a priority in current and future HIV risk reduction research and practice efforts.

When developing HIV prevention interventions and clinical strategies, it is imperative to assess knowledge and knowledge change related to HIV and HIV risk-related behaviors, and as such, knowledge measures are used extensively (Fisher & Fisher, 1992). Morrison-Beedy, Carey, and Aronowitz (2003) reported that among adolescent girls, HIV-related knowledge was not adequate regarding specific sexual risk behaviors, transmission, and prevention strategies. Other studies suggest that HIV-related knowledge mediates HIV risk behaviors in adolescents (Jemmott, Jemmott, & Fong, 1998). Despite nurses' demands for clinical practice tools based on sound evidence, many HIV knowledge measures are not published in sufficient detail to assess psychometric soundness. In addition, current HIV knowledge measures lack gender or age specificity, both in design and testing, despite documented need (Carey & Schroder, 2002; Loue, Cooper, & Fielder, 2003; Seha, Klepp, & Ndeki, 1995; Xinying, Wenbin, & Chun, 2004). The importance of HIV knowledge assessment for prevention research and practice, the lack of adequate measurement tools, and the increasing incidence of HIV among adolescent girls underscore the need for an HIV knowledge measure that is psychometrically sound, specific to female adolescents, and accessible to clinicians and researchers.

A psychometrically sound measure of HIV knowledge that is commonly used in the general adult population is the HIV Knowledge Questionnaire (HIV-KQ) (Carey, Morrison-Beedy, & Johnson, 1997). It was hypothesized that the commonly used HIV-KQ could be modified to measure pertinent HIV knowledge in adolescent girls while maintaining the validity and reliability of the original scale. The objective in modifying the HIV-KQ was to develop a concise version that was tailored to adolescent girls and could be used in research and clinical settings. The purpose of this report is to describe the development and testing of a revised, brief HIV knowledge questionnaire that was tailored specifically to the unique and highly relevant gender- and age-related concerns of adolescent girls (AG), the HIV-KQ AG.

Review of 45-Item HIV Knowledge Questionnaire Development

The original HIV-KQ was developed and evaluated for use as an adult HIV prevention program evaluation tool in a diverse community (Carey et al., 1997). A thorough literature review of HIV knowledge measures showed that existing measures lacked strong psychometric evaluations or were too specific, limiting their use in a general heterosexual population. Scale construction, item analysis, factor analysis, and cross-validation resulted in a 45-item knowledge questionnaire. Reliability studies showed an internal consistency ($\alpha = .91$) that was stable over time and across populations. Validity was assessed by administering the HIV-KQ to known groups and conducting a treatment outcome analysis, a correlational analysis to established knowledge measures, and an analysis of discriminant measures (Carey et al., 1997). Results from focus groups and expert input strongly suggest that the HIV-KQ is also a practical tool for low-literacy adults (Carey et al., 1997).

The instrument was reported to be a reliable and valid measure of HIV knowledge. It has also been successfully used in several intervention studies to measure pre- and postintervention levels of HIV knowledge, and it has shown sensitivity to changes in knowledge after respondents' participation in education components of HIV prevention programs (Carey et al., 1997; Carey et al., 2004; Morrison-Beedy et al., 2003). However, the instrument was developed using a sample of men and women from a broad age range and tests general HIV-related information. It may also be associated with higher participant burden because it consists of 45 items (Carey & Schroder, 2002).

Development of the HIV Knowledge Questionnaire 18-Item (Brief) Version

To reduce participant burden and focus on sexual transmission of HIV, the original 45-item HIV-KQ was modified into a brief 18-item version (Carey & Schroder, 2002). This 18-item version was evaluated and showed strong and stable item association (internal consistencies alphas .75-.89). It also showed a sound association with the original HIV-KQ, capturing an approximately equal amount of knowledge variance (Carey & Schroder, 2002). Nevertheless, these modifications mainly address the issue of participant burden by shortening questionnaire length and narrowing the transmission topic domain to sexual behavior transmission and prevention versus, for example, HIV/AIDS treatment. Thus, even this version of the HIV-KQ is limited in its appropriateness for use with adolescent girls because it lacks specificity to unique gender- and age-related concerns regarding HIV transmission.

Methods

Development of HIV Knowledge Questionnaire for Adolescent Girls: An Overview

The first phase of scale modification began with the validated 18-item brief version of the HIV-KQ. Using the brief version as the foundation for the scale revision, the goal was to increase the questionnaire's relevance to adolescent girls. This resulted in the addition of three selected items from the original HIV-KQ that specifically pertained to female or adolescent issues. The first was, "Are women always tested for HIV during their Pap smears?" This item was added because of common misperceptions among women about when HIV tests are conducted (Morrison-Beedy, 1996). The second item was, "Does douching after sex keep a woman from getting HIV?" This item was based on content experts' clinical experience and studies regarding common myths about douching as a prevention method (Morrison-Beedy et al., 2003; Morrison-Beedy, Carey, Lewis, & Aronowitz, 2001). The third item was, "Is it possible to get HIV when a person gets a tattoo?" This item was added because of increasing prevalence of tattooing and its association with other high-risk behaviors in adolescents (Roberts & Ryan, 2002). These three additions resulted in a 21-item instrument that was named the *HIV-KQ AG*.

The second phase of scale development was to evaluate the proposed HIV-KQ AG item and scale properties. The HIV-KQ AG was psychometrically assessed and compared with the original HIV-KQ using an independent sample of adolescent girls participating in a gender-specific HIV prevention intervention. A total of 62 single, sexually active adolescent girls aged 15 to 19 years were recruited from a community-based reproductive health care site in western New York. The mean age of the sample was 17.3 years (SD 1.4). The samples' racial and ethnic breakdown was 29% Black, 59% White, 10% Hispanic, and 2% Asian/Pacific Islander.

The final phase of scale development was to further refine and evaluate the HIV-KQ AG. After initial item and scale analyses, it was determined that three of the original HIV-KQ items related to HIV transmission did not contribute to variance in the measure. Consequently, those three items were removed, and thus the total number of items on the HIV-KQ AG was reduced to 18. This further refined HIV-KQ AG was then reevaluated for reliability and validity. The HIV-KQ AG was administered preintervention and 1 week postintervention (approximately 5 weeks after initial testing) and analyzed for measure sensitivity and stability.

Data Analyses

To identify the psychometric properties of the HIV-KQ AG, the sample data set was analyzed and evaluated for (a) item mean and standard deviation, (b) individual item and total scale consistency, (c) item-to-scale correlations, and (d) test correlations between the original 45-item HIV-KQ and the extracted brief gender- and age-specific 18-item HIV-KQ AG.

The HIV-KQ AG's sensitivity to change and stability over time was assessed comparing baseline (preintervention) HIV-KQ AG scores to post-HIV risk reduction intervention scores and post-general health (control) condition scores. *T*-tests were conducted to compare the baseline (Time 1) mean scores and postintervention (Time 2) mean scores between both the intervention and the control groups to assess HIV-KQ AG sensitivity to changes in knowledge. The HIV-KQ AG's stability over time was analyzed using *t*-tests comparing control group means at baseline and postcontrol condition.

Results

Scale Statistics

In the sample of 62 girls, the mean total score at baseline on the original HIV-KQ was 74.2 ($SD = 16.4$). The mean total score for the HIV-KQ AG was 68.7 ($SD = 19.0$), showing the scale's increased potential to capture participant knowledge variances and detect change after an HIV education intervention. Both scales showed good reliability with Cronbach's alpha equaling .89 on the original HIV-KQ and .75 on the HIV-KQ AG. Because the original 45-item HIV-KQ had a greater number of items, it was expected that it would also have a higher level of internal consistency than the HIV-KQ AG.

Individual Item Means and Statistics

The individual item statistics for the final HIV-KQ AG version with 18 items are listed in Table 1. An item mean range of .30 to .80 for correct responses is considered appropriate because it permits variance, avoids high ceiling effects, and allows for score increases to capture knowledge gains after an intervention (Anastasi & Urbina, 1997; DeVellis, 2003). Four items on the proposed HIV-KQ AG (21 items) had means above .90, which showed an inability to capture participant variance and knowledge change after intervention. The decision was made to remove three of these items ($m = .94$ each) because of the high means on this respondent pool being consistent with other studies using the HIV-KQ items (Carey et al., 1997; Carey & Schroder, 2002). All other items, including the three items added for gender and age specificity, were retained. Item and scale correlations were recalculated after the items were removed. Item-test correlations showed better scale convergence after removal of the three items, with the change in internal consistency if an item was removed remaining above .70. Table 1 also illustrates the item-to-scale correlations of the HIV-KQ AG. Item-scale correlations ranged from .16 to .52. The item-test correlations show convergence among the items and also the unique contribution of the items maintained.

Gender- and Age-Specific Item Analysis

Item analyses for the three gender-specific questions (Table 1) revealed means ranging from .42 to .92. These means are adequate for a dichotomous knowledge test (DeVellis, 2003). The three item-to-test correlations were .38, .34, and .27. These additional items did not significantly change the internal reliability of the total test, alpha change being .73, .73, and .74.

Test Correlations

A test correlation was analyzed on the data set ($n = 62$) using representations of the different HIV-KQ test versions: the original 45-item and the final 18-item AG version. The 45-item version of the HIV-KQ contained all the items included on the 18-item version. (The 18-item version was reconstructed by extracting those pertinent items from the 45-item version.) The test correlation between the original 45-item and the final 18-item AG version was .95, suggesting that both versions comparably assessed knowledge, with the shorter version decreasing participant burden for completion.

Test Sensitivity and Stability

T-tests comparing the intervention and control groups' pre- and postintervention knowledge scores were conducted to assess both the questionnaire's sensitivity to knowledge gains after an HIV prevention intervention and score stability over time without intervention. *T*-tests comparing preintervention knowledge scores showed no significant differences ($p = .61$) between the control and intervention groups. Postintervention mean scores on the HIV-KQ were .92 for the intervention group and .68 for the control group. *T*-tests comparing postintervention knowledge scores between the groups revealed a significant difference ($p < .5$) in knowledge, with the intervention group showing higher test score means for postintervention HIV-KQ AG. Although paired *t*-tests also showed significant ($p = .00$) changes in pre- and posttest scores for the intervention group, no similar difference ($p = .94$) was noted in the control group, providing evidence of the measure's validity as well as stability over time with no intervention

Further Refinement of the HIV Knowledge Questionnaire, Adolescent Girls

As a last stage in its refinement, verbal descriptors used in the HIV-KQ AG were modified to improve comprehension (Table 1). Colloquial terms were added to explain potentially difficult terms such as *anal sex* ("penis in the buttocks") and *vaccine* ("shot"). Text analysis of the final revision of HIV-KQ AG was then conducted; its reading ease was assessed to be 78.5%, and the Flesch-Kincaid grade level was 5.8. These scores may be inflated because, for example, HIV-related terms such as *antibiotics* and *latex* might have been assessed by the Flesch-Kincaid scale as grammatically complex even though the words are commonly used and easily understood by many adolescent girls. This analysis suggests that the HIV-KQ AG can be administered with relative ease even to adolescent girls with low literacy levels.

Discussion

This report discusses the psychometric evaluation of a modified, brief HIV knowledge questionnaire (HIV-KQ AG) that can be used to assess HIV-related knowledge in adolescent girls. It is well established that knowledge alone does not change behavior but remains an important prerequisite for behavior change (Fisher & Fisher, 1992). Accurate information assessment is especially important among adolescents, because they often make decisions about sexual health with inadequate knowledge bases (Stanton et al., 1996). Because information continues to be a critical construct in the effort to prevent the spread of HIV, it is necessary to accurately measure HIV-related knowledge to assess the effectiveness of HIV prevention programs. The HIV-KQ AG can serve as an efficient, accurate, targeted measure for adolescent girls.

The HIV-KQ AG showed high internal consistency similar to the original version, illustrating that scale reliability is not compromised with the brief, more focused measure. Item analyses for the three gender-specific questions revealed a broad range of means, providing evidence that researchers and clinicians can use this tool to capture variance in HIV-related knowledge and to help guide interventions to target knowledge gaps. The item, "Does douching after sex keep a woman from getting HIV?" had an item mean of .92 but was retained because there is evidence from research with young women and adolescents that this is an area of considerable knowledge deficit (Morrison-Beedy et al., 2001; Morrison-Beedy et al., 2003). This item will be reanalyzed in future work to determine if it captures a deficit in knowledge. The item-to-test correlations of the three gender- and age-specific items indicated appropriate convergence with the total scale and did not significantly change the internal reliability of the total test. Therefore, the addition of these items increases the measure's validity for adolescent girls and maintains the reliability of the original tool. Test correlations between the original HIV-KQ and the HIV-KQ AG were high enough to indicate that knowledge assessment can be done

more efficiently with a shorter, more specific version with appropriate populations. Additionally, score results were analyzed at baseline and after interventions, showing the HIV-KQ AG's stability across time and sensitivity to knowledge change.

Limitations of the evaluation of the HIV-KQ AG should be considered. Although the sample size was limited ($n = 62$), results correlated well with an analysis of another sample data set of adolescent girls ($n = 156$). The girls included in the scale development study were recruited from family planning centers and other community locations as part of a health behavior study. Their ethnic breakdown was 64% White, 24% Black, 8% Hispanic, and 4% other. Since the similar scales were compared on different populations, scale psychometrics can be safely generalized to a broader population of adolescent girls, including older adolescents. Last, although the measure includes relevant gender- and age-specific items, it does not include all possible relevant gender- and age-specific items. Thus, these items do not reflect the universe of gender- and age-specific HIV information-related items pertinent to adolescent girls.

The HIV-KQ AG is practical, specific, and appropriate for use with adolescent girls in a variety of clinical, research, and educational settings. This scale has shown reliability and validity and has been shown to be stable across time and sensitive to knowledge change. This brief version improves test-taking efficiency and specificity while increasing utility for girls with low levels of literacy. The final version of the HIV-KQ AG can be obtained through a request to the authors to encourage its use in future intervention research studies and HIV prevention clinical practice to accurately measure HIV-related information as well as knowledge change.

The agenda for the United Nations General Assembly special session on HIV/AIDS included expanding quality, youth-friendly information, and sexual health education (United Nations, 2001). The HIV-KQ AG is an appropriate tool for assessing HIV knowledge as part of this critical agenda. It is appropriate for use in group interventions but can also be used to assess knowledge at the individual level in health care settings, including reproductive, school-based, and primary care centers.

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Table 1
HIV Knowledge Questionnaire, Adolescent Girls (HIV-KQ AG)

Item	HIV-KQ AG (<i>n</i> = 62) Maintaining HIV Prevention Gains in Adolescent Girls (18 Items) (Ages 15-19)			
	<i>m</i>	<i>SD</i>	<i>r</i> _{i-it}	<i>α</i> change
1. Can a person get HIV by sharing a glass of water with someone who has HIV?	.81	.398	.326	.735
2. Does pulling out the penis before a man climaxes (cums) keep a woman from getting HIV during sex?	.85	.355	.294	.737
3. Can a woman get HIV if she has anal sex (penis inside the buttocks) with a man?	.81	.398	.300	.737
4. Will all pregnant women infected with HIV have babies born with HIV?	.40	.495	.190	.747
5. Do all people who have been infected with HIV quickly show serious signs of being infected?	.79	.410	.351	.732
6. Is there a vaccine (shot) that can stop people from getting HIV?	.77	.422	.276	.738
7. Are people likely to get HIV by deep kissing (putting their tongue in their partner's mouth) if their partner has HIV?	.68	.471	.524	.716
8. Can a woman get HIV if she has sex during her period?	.81	.398	.432	.726
9. Is there a female condom that can help decrease a woman's chance of getting HIV?	.55	.502	.302	.737
10. Does a natural skin condom work better against HIV than a latex condom?	.56	.500	.409	.726
11. Can a person get HIV if she or he is taking antibiotics?	.63	.487	.371	.730
12. Will taking a test for HIV one week after having sex tell a person if she or he has HIV?	.71	.458	.444	.724
13. Can a person get HIV by sitting in a hot tub or a swimming pool with a person who has HIV?	.84	.371	.346	.733
14. Can a person get HIV by having oral sex (mouth on penis) with a man?	.71	.458	.155	.750
15. Does using Vaseline or baby oil with condoms increase the chance of getting HIV?	.31	.465	.164	.749
16. Are women always tested for HIV during their Pap smears?	.42	.497	.375	.730
17. Does douching after sex keep a woman from getting HIV?	.92	.275	.341	.736
18. Is it possible to get HIV when a person gets a tattoo?	.81	.398	.274	.739