HIV/AIDS transmission knowledge among adolescents aged 11 years from Southern Brazil

Conhecimento sobre a transmissão de HIV/AIDS entre adolescentes com 11 anos de idade do Sul do Brasil

Helen Gonçalves[I]
David Alejandro González-Chica[II]
Ana MB Menezes[I]
Pedro C Hallal[I]
Cora LP Araújo[I]
Samuel C Dumith[III]

[I] Postgraduate Program in Epidemiology, Department of Social Medicine, *Universidade Federal de Pelotas*, Brazil.

[II] Postgraduate Program in Nutrition, Health Sciences Center. *Universidade Federal de Santa Catarina*. Florianópolis, Brazil.

[III] Departamento de Saúde e População, Universidade Federal do Rio Grande, Rio Grande, RS.

Corresponding author: Helen Gonçalves. Programa de Pós-graduação em Epidemiologia, Universidade Federal de Pelotas. Rua Marechal Deodoro 1160 – 96020-220 Pelotas, RS, Brazil. Telephone (fax): 55–53–3284-1300. E-mail: hdgs.epi@gmail.com

Abstract

Objective: To investigate the effect of demographic, socioeconomic, educational and family variables on HIV/AIDS knowledge among adolescents aged 11 years. **Methods**: 3,949 adolescents born in Pelotas (Brazil). HIV/AIDS knowledge was assessed through a self-administered questionnaire and measured through five questions about HIV transmission: heterosexual intercourse, homosexual intercourse, needle sharing, open-mouth kissing and hugging someone with AIDS. All the analyses were adjusted based on a hierarchical model, using Poisson regression with robust adjustment of variance. **Results**: Prevalence of wrong answers to the examined questions were 17.2% for heterosexual transmission, 44.1% for homosexual intercourse, 34.9% for needle sharing, 25.6% for kiss on the mouth and 16.2% for hugging someone with AIDS. In adjusted analysis, lower knowledge levels were more prevalent among boys, adolescents with lower socioeconomic status and with less maternal education level, among those who had not talked about sex with mother and without sexual education lessons at school. Knowledge was not associated with school type (public or private), skin color or talk about sex with father. **Conclusion**: Providing information to adolescents is essential to improve knowledge about HIV and other sexually transmitted infections, especially among young males, with lower socioeconomic status and with lower maternal education level. Public policies aimed to reducing HIV infection should consider maternal and school relevance to improve knowledge on adolescents.

Keywords: HIV. Acquired Immunodeficiency Syndrome. Adolescent. Knowledge. HIV Infections – transmission.

Resumo

Objetivo: Investigar o efeito de fatores demográficos, socioeconômicos, educacionais e familiares sobre o conhecimento acerca do HIV/AIDS em adolescentes com 11 anos de idade. **Métodos**: Foram estudados 3.949 adolescentes de Pelotas/RS. O conhecimento acerca do HIV/AIDS foi avaliado por meio de um questionário autoaplicado e mensurado através de cinco perguntas sobre relação heterossexual, relação homossexual, compartilhamento de seringas, beijo na boca e abraçar alguém com AIDS. As análises foram ajustadas com base em um modelo hierárquico, usando regressão de Poisson com ajuste robusto da variância. **Resultados**: Os percentuais de respostas erradas para as questões examinadas foram: 17,2% para transmissão em relações heterossexuais; 44,1% para relações homossexuais; 34,9% para compartilhar seringas; 25,6% para beijo na boca e 16,2% para abraçar pessoa com AIDS. Na análise ajustada, menor grau de conhecimento foi demonstrado pelos meninos, por adolescentes de menor nível econômico, cujas mães possuíam menor escolaridade, para os adolescentes que não haviam conversado sobre sexo com a mãe e entre os que não tiveram aula sobre educação sexual na escola. O grau de conhecimento não esteve associado com o tipo de escola, cor da pele, tampouco com a conversação com o pai sobre sexo. **Conclusão**: Fornecer informações aos adolescentes é fundamental para melhorar o conhecimento sobre o risco de transmissão de HIV e de outras infecções sexualmente transmissíveis, principalmente entre jovens do sexo masculino e de menor nível socioeconômico. As políticas públicas devem considerar o rol que a mãe e a escola desempenham no conhecimento sobre este tema por parte dos adolescentes.

Palavras-chave: HIV. Síndrome de Imunodeficiência Adquirida. Adolescente. Conhecimento. Infecções por HIV – transmissão.

Introduction

In 2009, the World Health Organization (WHO)* reported that there were approximately 33.3 million people living with the Human Immunodeficiency Syndrome (HIV) worldwide, of which 2.6 million were new infections and, of these, nearly 370,000 occurred in individuals younger than 15 years. In Brazil, it is estimated that 630,000 people are infected**. In recent years, the portion of the Brazilian population who has received more diagnoses of HIV is comprised of adolescents, women (especially between 13 and 19 years), and individuals with a low socioeconomic status and level of education***.

Protection during sexual intercourse continues to be the most efficient method against this infection. Two homonymous research projects entitled "*Pesquisa sobre Conhecimentos, Atitudes e Práticas relacionada às DST e AIDS*" (PCAP – Survey of Knowledge, Behavior and Practices Associated with STDs and AIDS), conducted in 2004 and 2008, interviewed individuals aged 15-64 years of all Brazilian regions and showed that 96.6% of them were aware that condoms prevented sexually transmitted diseases (STD) and the Acquired Immunodeficiency Syndrome (AIDS)****. Knowledge was assessed according to questions about healthy appearance, partner's fidelity, use of condoms, sharing needles and cure of AIDS. According to data from 2008, adolescents who reported having more sexual partners in general had high knowledge about how to prevent STDs and mentioned a more frequent use of condoms, compared to other age groups. This last result was similar to that found by Paiva et al. (2008)[1], who also assessed national data from the study entitled "*Comportamento Sexual e Percepções da População Brasileira Sobre HIV/Aids*"

*Available at: http://www.who.int/hiv/data/2009_global_summary.png
**Available at: http://sistemas.aids.gov.br/forumprevencao_final/index.php?q=numeros-da-aids-no-brasil
***Available at: http://www.aids.gov.br/pagina/aids-no-brasil
****Available at: http://www.aids.gov.br/pagina/pesquisa-de-conhecimentos-atitudes-e-praticas-relacionadas-dst-e-aids

(Sexual Behavior and Perceptions of HIV/AIDS among the Brazilian Population), conducted between 1998 and 2005. However, when comparing the results of the latter study* from 1998 with the 2008 PCAP information about the use of male condoms in the first sexual intercourse in adolescents aged 15-24 years, the prevalence of such use increased from 52.8% to 60.9%, thus showing that this practice is still low among adolescents**. Likewise, although the 2004 and 2008 PCAP studies revealed behavioral changes, the use of condoms was low in these two years for both "last sexual intercourse in the previous 12 months" (<40%) and "all sexual relations with any partner in the previous 12 months" (<30%). Thus, the results of these studies indicate that a higher level of knowledge about STDs and AIDS in the Brazilian population does not necessarily translate into safe sexual practices.

Another important aspect is that little is known about how younger individuals understand this disease, especially those aged less than 15 years, who are beginning their sexual life[1]. The majority of studies on this theme have been conducted in adolescents older than 15 years of age, among which STD and AIDS knowledge varies from average to very good[2-4].

Inappropriate knowledge about HIV/AIDS can lead to practices that affect the health of adolescents[5]. For this reason, the availability and quality of information before sexual initiation must be investigated[1]. Considering the early age of beginning of sexual intercourse – before the age of 15 years in the majority of cases, regardless of gender – it is essential to identify the factors associated with knowledge about HIV/AIDS transmission since the beginning of adolescence, because they can contribute to public policies aimed at reducing the advance of HIV infections[6].

Thus, the present study aimed to analyze the effect of demographic and socioeconomic factors and sexual education received at school and at home on the level of knowledge about HIV/AIDS transmission in a sample of adolescents aged 11 years of age living in Southern Brazil.

Methods

Research participants were part of a prospective cohort study in which hospital births that occurred in the city of Pelotas in 1993 were monitored (N=5,249). At the time of birth, a questionnaire was applied to mothers to obtain information about socioeconomic and demographic conditions, pregnancy and delivery, and newborns were weighed and measured[7]. In 2004-5, when adolescents were 11 years of age (mean=11.3±0.3), all cohort participants were sought for a new follow-up to investigate general health and socio-demographic conditions, family and social relationships, adolescent habits and knowledge about HIV/AIDS transmission, and a response rate of 87.5% was achieved. Knowledge about HIV/AIDS was assessed with a confidential questionnaire, completed by the adolescent exclusively, where there were five questions about this theme, to which the responses should be "yes" or "no". The questions in this instrument were as follows: "Do you think one can get AIDS…" 1) "by sharing a syringe with another person?"; 2) "when a man has sex with a woman?"; 3) "when a man has sex with another man?"; 4) "by open-mouth kissing?"; 5) "by hugging someone with AIDS?". The three first questions were included considering the main forms of HIV/AIDS transmission, whereas the other two referred to situations that could lead to discrimination against HIV-positive individuals and were selected from questionnaires used in other Brazilian studies that also investigated adolescents[2-4, ***].

Aiming to investigate the factors associated with knowledge about HIV/AIDS,

*Available at: http://bvsms.saude.gov.br/bvs/publicacoes/168comporamento.pdf
**Available at: http://portal.saude.gov.br/portal/aplicacoes/noticias/default.cfm?pg=dspDetalheNoticia&id_area= 124&CO_NOTICIA=11932
***Available at: http://www.aids.gov.br/pagina/pesquisa-de-conhecimentos-atitudes-e-praticas-relacionadas-dst-e-aids

adolescents' demographic, socioeconomic and sexual education characteristics were analyzed. The independent variables included in this study were as follows: sex (male/female); self-reported ethnicity (white, mixed, black); maternal level of education in years of school completed (0-4, 5-8, 9-11, ≥12); economic class analyzed with the assets index[8] (tertiles); type of school attended (municipal/state/private); whether the adolescent had ever had any sexual education classes (yes/no); and whether the father and/or mother had ever talked about sex with them (yes/no). Questions about sexual education were also included in the confidential questionnaire applied to adolescents. The remaining information was collected by interviewers who had been properly trained for this study, using a general questionnaire applied to the mothers that included questions about general health and socio-demographic questions. The "assets index" variable was constructed from the main component analysis, which considered the ownership of several household goods and characteristics. Only the first main component analysis factor was used to create this variable, as it explained 30% of the variance of the model. This factor was subsequently divided into tertiles (categorized in an increasing order where the 1st tertile included individuals with the lowest socioeconomic level) for the purposes of the analysis[9].

With regard to data analysis, each of the five questions about HIV/AIDS was considered as a different outcome. The following wrong responses to the five questions about forms of HIV/AIDS transmission were taken into consideration for the analyses: negative responses to the three situations in which one may be infected with HIV/AIDS (heterosexual intercourse, homosexual intercourse and sharing syringes) and affirmative responses to the two situations which involve no risk (hugging someone with HIV and open-mouth kissing). Blank responses were considered as ignored values. The chi-square test was used in the crude analysis to compare the prevalences of "wrong" responses to each question about HIV/AIDS knowledge. Poisson regression with robust variance adjustment[10] was used in the adjusted analysis. In addition, adjusted prevalences were estimated for each category of independent variables, using the margins command of Stata software. A conceptual model that makes the adjustment for possible confounding factors was developed for the multivariate analysis. In this model, variables are controlled for those on the same level or on higher levels[11]. On the first level are the socio-demographic variables (sex, ethnicity, maternal level of education and assets index) and on the second level are the type of school and sexual education variables (received from the parents and school). A p-value<0.20[12] was used as the cut-off point to maintain the variables in the multivariate model. A statistical significance level of 5% was adopted for two-tailed tests and analyses were performed in the Stata software, version 11.0[13].

The present study was approved by the *Universidade Federal de Pelotas* Medical School Research Ethics Committee. Parents or responsible adults authorized the participation of adolescents in this study.

Results

Of all 4,452 adolescents interviewed, information about the five outcomes considered was obtained from 3,949 of them, totaling 11.3% of losses for one or more questions about HIV/AIDS transmission. The response rate was higher among adolescents whose mothers had 12 years of school or more, with a higher socioeconomic level, who studied in private schools, and who had already received information about sex from their father, mother or school (Table 1). There were no differences according to sex or ethnicity. Half of the respondents were females, two thirds reported they were white, one fourth had mothers with less than five years of school and 11% studied in private schools. In 20% and 30% of cases, the father and mother, respectively, had already talked with adolescents about sex, and 45% had

had sexual education classes at school. With regard to sexual education at home, mothers had more contact with girls, whereas fathers had more contact with boys (Figure 1).

The information received at school was similar in both sexes. The percentages of wrong knowledge about the three situations in which HIV/AIDS can be acquired were 17.2% (95%CI 16.0-18.3) for heterosexual intercourse, 44.1% (95%CI 42.6-45.7) for homosexual intercourse, and 34.9% (95%CI 33.5-36.4) for sharing syringes. Of all participants, only 41% responded these three questions correctly, 17% responded two questions incorrectly and 10% responded all questions incorrectly (Figure 2A). With regard to open-mouth kissing, 25.6% of adolescents (95%CI 24.3-27.0) responded the question incorrectly, whereas 16.2% (95%CI 15.1-17.4) answered that HIV can be transmitted when hugging someone with HIV/AIDS. Only 64% of participants responded both questions correctly, while 6% answered them incorrectly (Figure 2B).

Table 2 shows the percentages of wrong responses to the three situations in which

Table 1 - Description of the sample and the percentage of responses to the Five questions about HIV/AIDS.
***Tabela 1** - Descrição da amostra e do percentual de respostas para as cinco questões sobre HIV/AIDS.*

Variable	Interviewed (N)	Respondents (%)	P-value*
Sex	**4,452**		*0.528*
Male	2,192	89.0	
Female	2,260	88.4	
Ethnicity	**4,212**		*0.961*
White	2,953	89.2	
Black	555	89.2	
Mixed	704	88.8	
Maternal level of education (in years)	**4,414**		*<0.001*
0 to 4	1,145	86.3	
5 to 8	1,901	88.2	
9 to 11	947	90.0	
12 or more	421	95.3	
Assets index (tertiles)	**4,284**		*<0.001*
1 (poor)	1,428	86.3	
2	1,429	89.4	
3 (rich)	1,427	91.2	
Type of school	**4,418**		*0.003*
Municipal	1,962	87.5	
State	1,971	89.5	
Private	485	92.6	
Sexual education classes at school	**4,241**		*<0.001*
No	2,395	89.3	
Yes	1,846	92.8	
Total	**4,452**	**88.7**	**-**

* Chi-square test. / ** Teste qui-quadrado.*

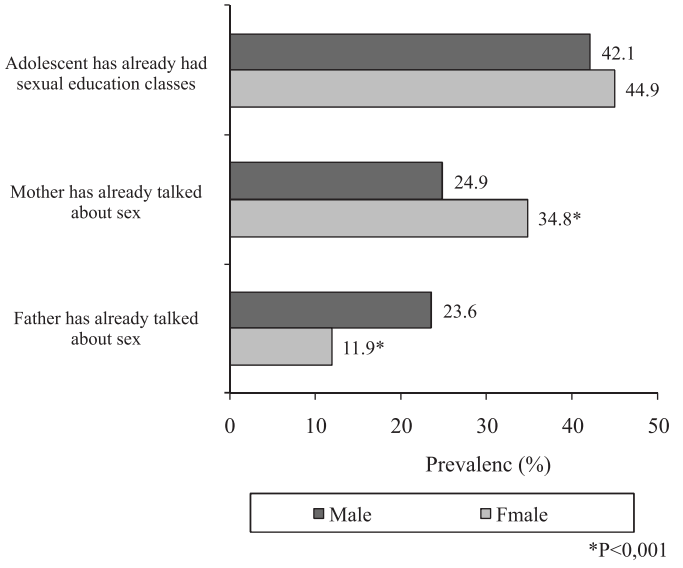

Figure 1 - Sources of sexual education received by adolescent, stratified by sex.
Figura 1 *- Fontes de educação sexual recebida pelo adolescente, estratificado por sexo.*

HIV/AIDS may be transmitted. The factors associated (and the direction of the associations) with the "heterosexual intercourse" and "sharing syringes" outcomes were the same in the crude analysis: higher percentage of errors among boys, mixed and black adolescents, those with a lower maternal level of education and socioeconomic level, those studying in public schools (municipal and state) and those who had not received sexual education at school or home. In the adjusted analysis, ethnicity, type of school and sexual education received from parents lost association with the two outcomes

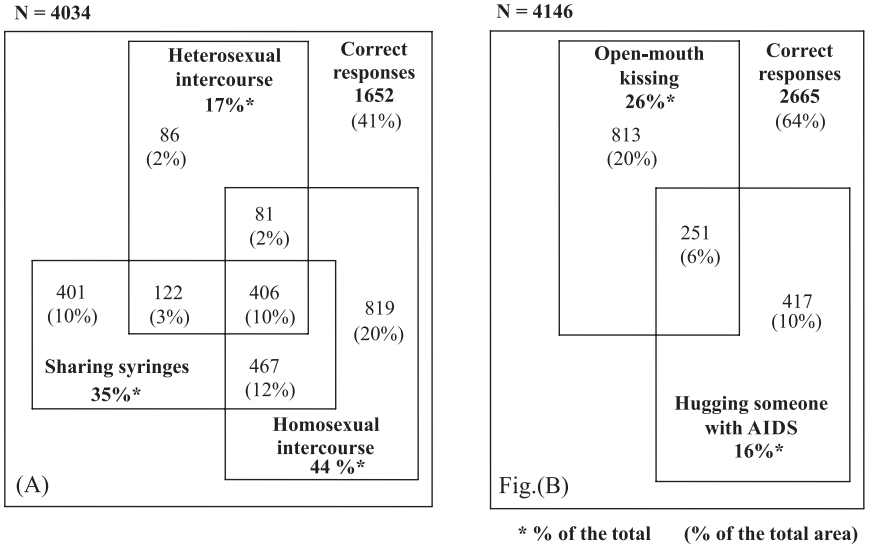

Figure 2 - Venn's diagram prevalence of wrong knowledge about HIV-AIDS transmission in three situations where it is possible to get infected (A) and in two situations where it is not possible to get infected (B).
Figura 2 - *Diagrama de Venn das prevalências de conhecimento errado sobre a transmissão de HIV-AIDS em três situações em que é possível contrair o vírus (A) e em duas situações em que não é possível contrair HIV/AIDS (B).*

in the adjusted analysis; the assets index remained inversely associated with wrong knowledge about heterosexual intercourse exclusively. With regard to HIV/AIDS infection through homosexual intercourse, the percentage of error in the crude analysis was higher among girls, those who had not had sexual education classes and those whose father or mother had not talked about sex with them. In the adjusted analysis, only sex, sexual education received at school and mother who had talked about sex with adolescent remained associated with this outcome.

Table 3 shows the crude and adjusted prevalences of wrong responses to the two

Table 2 - Crude and adjusted prevalences regarding the wrong knowledge about HIV-AIDS transmission in three situations where it is possible to get infected, according to socio-demographic and sexual education variables.
Tabela 2 - *Prevalências brutas e ajustadas sobre o conhecimento errado sobre a transmissão de HIV-AIDS através de três situações em que é possível contrair HIV-AIDS, de acordo com variáveis sociodemográficas e de educação sexual.*

	Heterosexual intercourse (%)			Homosexual intercourse (%)			Sharing syringes (%)		
	N	Crude	Adjusted	N	Crude	Adjusted	N	Crude	Adjusted
Sex		P<0.001*	P<0.001**		P=0.019*	P=0.019**		P<0.001*	P<0.001**
Male	2075	19.9	19.6	2045	42.3	42.3	2053	38.1	37.9
Female	2148	14.5	14.4	2117	45.9	45.9	2125	31.9	31.8
Ethnicity		P<0.001*	P=0.102**		P=0.833*	P=0.932**		P=0.039*	P=0.605**
White	2811	15.6	16.2	2765	43.7	43.7	2781	33.5	34.2
Mixed	677	20.1	18.4	672	44.4	44.5	667	36.6	35.3
Black	530	22.5	19.5	525	45.9	44.0	526	39.0	36.4
Maternal level of education (in years)		P<0.001†	P<0.001††		P=0.250†	P=0.265††		P<0.001†	P<0.001††
0 to 4	1071	22.9	20.7	1062	45.2	45.2	1064	41.8	40.3
5 to 8	1798	18.2	17.3	1764	44.7	44.7	1777	35.3	34.8
9 to 11	903	13.2	14.2	892	41.8	41.9	892	30.3	31.0
12 or more	416	7.7	9.2	410	43.9	43.9	412	26.9	28.3
Assets index (tertiles)		P<0.001†	P=0.001††		P=0.367†	P=0.698††		P<0.001†	P=0.023††
1 (poor)	1343	21.8	19.3	1343	44.7	44.3	1332	39.8	37.4
2	1357	17.5	16.8	1357	44.1	43.8	1340	34.2	33.8
3 (rich)	1373	11.7	14.0	1373	42.9	43.5	1360	30.4	32.8
Type of school		P=0.001*	P=0.624**		P=0.896*	P=0.993**		P<0.001*	P=0.172**
Municipal	1844	19.0	16.9	1829	43.9	44.0	1836	36.9	35.7
State	1885	16.6	15.7	1846	44.6	44.0	1852	34.9	33.9
Private	471	11.7	16.7	465	43.9	44.3	468	27.1	30.4
Sexual education classes		P<0.001*	P<0.001**		P<0.001*	P=0.026**		P<0.001*	P<0.001**
No	2291	19.9	18.5	2261	46.6	45.6	2268	40.2	38.2
Yes	1810	12.9	13.5	1796	40.8	41.9	1790	27.7	29.2
Mother has talked about sex		P<0.001*	P<0.001**		P<0.001*	P<0.001**		P<0.001*	P<0.001**
No	2900	19.8	18.2	2863	47.1	46.5	2867	39.8	37.6
Yes	1266	10.7	11.6	1249	37.3	38.1	1251	23.7	26.1
Father has talked about sex		P=0.006*	P=0.696**		P<0.001*	P=0.192**		P<0.001*	P=0.127**
No	3392	17.8	16.2	3352	45.7	44.6	3352	36.8	35.0
Yes	743	13.6	16.9	729	36.8	41.2	737	26.2	31.0

* Chi-square test for heterogeneity; ** Wald test for heterogeneity; † Chi-square test for linear trend; †† Wald test for linear trend
** Teste de Qui-quadrado de heterogeneidade; ** Teste de Wald de heterogeneidade; † Teste de Qui-quadrado de tendência; †† Teste de Wald de tendência*

situations in which HIV/AIDS cannot be transmitted. In the crude analysis, wrong knowledge about HIV/AIDS transmission through "open-mouth kissing" was only associated with maternal level of education and assets index, with an inverse trend in both cases. After adjustment for confounding factors, the association with maternal level of education remained practically the same, whereas the assets index lost its strength of association and statistical significance. When the "hugging someone with HIV/AIDS" outcome is considered, the percentage of wrong responses was higher among boys, those with a lower maternal level of education and socioeconomic level, those studying in public schools and those who had already had sexual education at school or talked about sex with any of their parents. In the adjusted analysis, only maternal level of education, assets index (both with an inverse relation) and sexual

Table 3 - Crude and adjusted prevalence regarding wrong knowledge about HIV-AIDS transmission by two situations where it is not possible to get infected, according to socio-demographic and sexual education variables.
Tabela 3 - *Prevalências brutas e ajustadas sobre o conhecimento errado sobre a transmissão de HIV-AIDS através de duas situações em que não é possível contrair HIV-AIDS, de acordo com variáveis sociodemográficas e de educação sexual.*

	Open-mouth kissing (%)			Hugging someone with HIV/AIDS (%)		
	N	Crude	Adjusted	N	Crude	Adjusted
Sex		P=0,101*	P=0,165**		P=0,016*	P=0,018**
Male	2072	24,5	24,6	2068	17,6	17,5
Female	2144	26,7	26,5	2140	14,9	14,7
Ethnicity		P=0,076*	P=0,010**		P=0,002*	P=0,055**
White	2809	24,6	25,1	2798	14,9	15,4
Mixed	677	26,1	24,5	670	17,2	15,9
Black	524	29,4	29,1	532	21,4	19,5
Maternal level of education (in years)		P<0,001†	P=0,001††		P<0,001†	P<0,001††
0 to 4	1070	29,4	28,5	1066	19,9	18,0
5 to 8	1794	26,3	26,2	1788	18,1	17,4
9 to 11	905	23,2	23,8	907	12,9	14,0
12 or more	414	18,1	19,4	411	6,6	8,0
Assets index (tertiles)		P<0,001†	P=0,124††		P<0,001†	P=0,001††
1 (poor)	1329	28,5	26,8	1331	20,4	18,3
2	1365	26,5	26,0	1357	17,0	16,3
3 (rich)	1368	21,9	23,8	1364	10,9	12,9
Type of school		P=0,074*	P=0,959**		P<0,001*	P=0,112**
Municipal	1847	26,6	25,3	1842	18,1	16,8
State	1878	25,7	25,6	1873	16,3	16,3
Private	470	21,5	24,8	472	8,5	11,6
Sexual education classes		P=0,059*	P=0,120**		P=0,041*	P=0,372**
No	2299	24,2	24,4	2295	17,0	16,4
Yes	1805	26,8	26,6	1803	14,6	15,3
Mother has talked about sex		P=0,742*	P=0,993**		P<0,001*	P<0,001**
No	2897	25,5	25,3	2898	18,3	17,8
Yes	1264	26,0	25,3	1256	11,5	12,1
Father has talked about sex		P=0,354*	P=0,065**		P=0,014*	P=0,772**
No	3395	25,4	24,8	3352	16,9	16,1
Yes	739	27,1	28,3	729	13,2	15,5

* Chi-square test for heterogeneity; ** Wald test for heterogeneity; † Chi-square test for linear trend; †† Wald test for linear trend
** Teste de Qui-quadrado de heterogeneidade; ** Teste de Wald de heterogeneidade; † Teste de Qui-quadrado de tendência; †† Teste de Wald de tendência*

education received by the mother remained associated.

Discussion

There are many controversies about the weight of knowledge on sexual behavior prevention[14, 15]. Several studies point out that knowledge does not guarantee continuing prevention in all sexual relations[16, 17]. In Brazil, seeking to include the largest number of adolescents possible, health and education policies were developed, in which schools, family members and health professionals are encouraged to raise the issue of STD prevention and adolescent pregnancy with this population. However, knowledge about this theme has been assessed and found not to be consistently sufficient for prevention in all sexual relations, as observed in several studies[2-4]. Nevertheless, effective education about HIV/AIDS with adolescents who are not sexually active or who are much younger (<14-15 years) has not been assessed[18]. This study obtained important results about the theme of adolescents aged 11 years from a population--based study by observing the influence of several demographic, socioeconomic and educational factors on knowledge about HIV/AIDS transmission among adolescents of an average-size city in Southern Brazil.

One of the findings that should be emphasized is who the adolescents with a lower level of knowledge about HIV/AIDS transmission are. They belong to families with a lower level of education and socioeconomic level. Probably, the more limited access to appropriate sources of information (such as books, magazines and newspapers) could partly explain the findings of this study. Similar results have been reported by other authors who worked with wider age groups, usually between 13 and 24 years[2, 3, 17], using questions about HIV/AIDS transmission knowledge similar to those of the present study. However, it should be emphasized that adolescents' understanding of certain questions, such as HIV transmission through sharing syringes, may have been influenced by the younger age of participants in this study. Nevertheless, the associations found for this form of transmission were consistent with the findings for infection through heterosexual and homosexual intercourse, thus suggesting that this limitation did not affect the results. Another possible limitation of this study, which could have somewhat interfered with the findings, is associated with the rate of non-respondents. However, the percentage of non-respondents was significantly higher among adolescents with a lower maternal level of education and socioeconomic level, which could be associated with a lower level of knowledge about this theme. Thus, the associations found here have probably been underestimated and, consequently, the measures of the effect must be even higher.

Another important fact refers to the source of sexual education received by adolescents. Talking about sex with the mother was consistently associated with adequate knowledge about forms of HIV/AIDS transmission, whereas the influence of paternal sex education was not associated with any of the outcomes in the adjusted analysis. It should be emphasized that only the information about "open-mouth kissing" showed no association with "talking about sex with the mother". Mothers seem to be more open to intimate conversations, creating an important family environment for issues such as adolescence, sexuality and DSTs, as observed in a recent systematic review[19]. Many studies have already shown how maternal care since birth can influence the health of a child. In addition, mothers are culturally responsible for feeding, hygiene and socialization[20]. The educational role of mothers has been maintained and reconstructed for years and their role in this process continues to be essential, despite the growing number of women present in the job market (with subsequent less time to spend at home)[21]. For this reason, the educational role of mothers in HIV/AIDS prevention must be emphasized and taken into consideration in public health education policies aimed at reducing this disease. Parents should not be

ignored in these policies, as their messages could raise knowledge about this issue and related practices[19].

The results of the present study are in agreement with other studies conducted in large cities of Brazil. A study performed with adolescents aged 15-19 years, living in an area of the city of São Paulo covered by a family health unit, revealed that the mother is the person who provides knowledge about these issues, especially in the case of girls, when parents are chosen as the main source of such knowledge[22]. According to the authors, the low participation of parents in these conversations and in the family prevents them from transmitting knowledge about issues considered to be more intimate and delicate by adolescents. However, parents were the most frequently mentioned source of knowledge in a study conducted by Romero et al.[3]. Nevertheless, these authors pointed out that, if conversations with adolescents are superficial, there will not be adequate explanation about the need for care prior to beginning one's sexual life and being aware of STD prevention.

In addition, two results refer to the lower level of knowledge by sex and that of adolescents who reported they were black and mixed. Girls reported a higher level of knowledge about almost all the questions asked, with the exception of HIV transmission through male-male homosexual intercourse, to which boys had more correct responses. However, the fact that girls knew more about the topics investigated cannot be a guarantee of the care required for all sexual relations. The literature consistently refers to the reduction in the use of condoms between the first and last sexual intercourse and points out that the decision to use condoms, essential to prevent HIV/AIDS, is influenced by socio-cultural, contextual and individual factors[23].

The associations found for HIV/AIDS knowledge and adolescent ethnicity lost their significance after the adjustment for socioeconomic level, suggesting that maternal level of education and family socioeconomic conditions determine adolescents' level of knowledge. However, even after the adjustment, the percentage of inadequate knowledge about heterosexual intercourse, open-mouth kissing and hugging someone with HIV/AIDS was higher among black participants, with borderline statistical associations. This is consistent with the study conducted by Ferreira et al. (2008), who analyzed knowledge about HIV/AIDS among adolescents and adults aged between 16 and 65 years in Brazil, in 1998 and 2005[24]. The same finding, a lower level of knowledge about HIV/AIDS among those who reported they were black, was also described by Martins et al.[2] in the city of São Paulo and by Trajman et al.[17] in the city of Rio de Janeiro.

Finally, with regard to the type of school where adolescents studied, those in private schools showed a higher level of knowledge in the crude analysis, although associations were not consistently found after adjustment, which suggests that the level of knowledge does not depend on the type of school, but rather on whether adolescents have sexual education classes. School classes were particularly found to be a protective factor for questions in which HIV/AIDS infection was possible, but they were not associated with knowledge about infection through open-mouth kissing or hugging someone with HIV/AIDS. This fact shows that the teaching and the information being transmitted at school should be further investigated and worked on in educational institutions and taken into consideration by public health policies. Information about STDs is available to public and private primary schools students, starting in the 4th or 5th grade, which coincides with the beginning of affective-sexual interests and practices. In these situations, there are several factors involved with prevention messages, causing the relation among information, knowledge, behavior and health to be much more complex, such as the nature of the questions, the teacher's/health professional's performance, the relationship among students and between students and teacher/health professional[25]. Additionally, it is essential

that adults and parents receive information about how to guide their children, so that knowledge can be translated into practices that are less vulnerable to STDs. Apart from these considerations, the need to understand how knowledge can be turned into preventive actions should be emphasized, in addition to assessing such knowledge. For this reason, new studies are required to deepen the knowledge about what the forms of education are (in the broadest sense) and how they can reduce adolescents' vulnerability to STDs, especially among those aged less than 15 years.

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