

# COMPARISON BETWEEN EDUCATIONAL TECHNOLOGIES ADDRESSING THE HUMAN PAPILOMAVIRUS VACCINE AMONG ADOLESCENTS

## COMPARAÇÃO ENTRE TECNOLOGIAS EDUCACIONAIS SOBRE VACINAÇÃO CONTRA PAPILOMAVÍRUS HUMANO EM ADOLESCENTES

## COMPARACIÓN ENTRE TECNOLOGÍAS EDUCACIONALES SOBRE VACUNACIÓN CONTRA PAPILOMAVIRUS HUMANO EN ADOLESCENTES

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**Objective:** to compare the effect of the application of two educational technologies addressing the human papillomavirus vaccine among adolescents. **Method:** analytical study to compare two educational technologies implemented in eight public schools from May to November 2015. Adolescents aged from 9 to 13 years old participated in the study. A questionnaire was applied before and after the implementation of Educational Technologies to assess knowledge between groups (Intervention and Control). Data were analyzed using the Statistical Package for the Social Sciences and effect was measured using the Chi-square Student's *t* and tests. The level of significance was established at equal to or less than 0.05. **Results:** Nursing Educational Technology ( $p=0.001$ ) had a greater impact on level of knowledge in comparison to the Educational Technology proposed by the Brazilian Ministry of Health ( $p=0.388$ ). **Conclusion:** a positive influence of the nursing educational technology on knowledge concerning the human papillomavirus vaccine among adolescents was verified and dynamic technologies had a greater effect on the production of knowledge.

**Descriptors:** Papillomaviridae. Vaccination. Nursing. Health Education. Educational Technology.

*Objetivo:* comparar o efeito da aplicação de duas tecnologias educacionais sobre a vacinação contra o papilomavírus humano em adolescentes. *Método:* estudo analítico que comparou duas tecnologias educacionais aplicadas em oito

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*escolas públicas no período de maio a novembro de 2015. Participaram da pesquisa, adolescentes de 9 a 13 anos. Foi aplicado um questionário antes e após a aplicação das Tecnologias Educacionais para avaliação do conhecimento entre grupos (Intervenção e Controle). Os dados foram processados no Statistical Package for the Social Sciences, o efeito foi medido pelos testes t de Student e qui-quadrado. Fixou-se o nível de significância menor ou igual a 0,05. Resultados: a Tecnologia Educacional de Enfermagem (p=0,001) teve maior benefício no nível de conhecimento quando comparada à Tecnologia Educacional do Ministério da Saúde (p=0,388). Conclusão: a influência positiva da tecnologia educacional de enfermagem sobre a vacinação contra o papilomavírus humano em adolescentes foi evidenciada, e tecnologias dinâmicas tiveram maior efeito na produção do conhecimento.*

*Descritores: Papillomaviridae. Vacinação. Enfermagem. Educação em Saúde. Tecnologia Educacional.*

*Objetivo: comparar el efecto de la aplicación de dos tecnologías educativas sobre vacunación contra el papilomavirus humano en adolescentes. Método: estudio analítico que comparó dos tecnologías educativas aplicadas en ocho escuelas públicas, de mayo a noviembre de 2015. Participaron adolescentes de 9 a 13 años. Se aplicó cuestionario antes y después de la aplicación de las Tecnologías Educativas para evaluación del conocimiento entre grupos (Intervención y Control). Datos procesados en el Statistical Package for the Social Sciences, efecto medido por las pruebas t de Student y chi-cuadrado. Se fijó nivel de significancia menor o igual a 0,05. Resultados: la Tecnología Educativa de Enfermería (p=0,001) tuvo mayor beneficio en el nivel de conocimiento cuando comparada a la Tecnología Educativa del Ministerio de Salud (p=0,388). Conclusión: la influencia positiva de la tecnología educativa de enfermería sobre vacunación contra el papilomavirus humano en adolescentes fue evidenciada, y las tecnologías dinámicas tuvieron mayor efecto en la producción del conocimiento.*

*Descriptores: Papillomaviridae. Vacunación. Enfermería. Educación en Salud. Tecnología Educativa.*

## Introduction

Cervical cancer stands out in the third position among diseases that affect women worldwide. In Brazil there is a trend of declining numbers of deaths by 2030 as a response to the adoption of measures to reduce risk factors<sup>(1)</sup>.

The main risk factor for cervical cancer is exposure to the human papillomavirus (HPV), especially types 16 and 18, which present high oncogenicity. The prophylactic vaccine for HPV infection is an important preventive measure in immunization programs adopted by several countries around the world<sup>(2)</sup>.

Following the trend on the international scene, in 2014, the Brazilian Ministry of Health incorporated the recombinant HPV quadrivalent vaccine into the immunization schedule. The initial strategy was to vaccinate 9 to 13 year-old girls in schools and Family Health Strategy services. In 2016, the age group was enlarged and the vaccine became available to boys, as well<sup>(3-4)</sup>.

Even though this preventive measure was implemented at a national level, we need to consider that knowledge of HPV, especially among adolescents and their mothers, is

permeated with doubts and misconceptions<sup>(5)</sup>. Additionally, women lack knowledge regarding HPV infection and its direct relationship with cervical cancer<sup>(6)</sup>. One study emphasizes that most women have already heard about the disease, but are not able to relate its main symptoms to risk factors, nor are they aware it is a preventable disease<sup>(7)</sup>.

There is resistance against vaccination that is related to sexuality, especially among religious groups, because they believe that the vaccine encourages sexual initiation, which is coupled with negative publicity promoted by the media<sup>(4)</sup>. Several Brazilian cities have experienced a decrease in vaccine coverage from one dose to the next; coverage of the second dose reached less than 50%, revealing a significant lack of adherence<sup>(4)</sup>.

Such a low level of knowledge can also lead to poor adherence to vaccination on the international scene. The causes for poor adherence include low perceived personal risk of cervical cancer, doubts about the vaccine's effectiveness and safety, and a belief among parents that their daughters do not actually

need the vaccine because they are not sexually active<sup>(8-9)</sup>.

Given the previous discussion, we need to consider that barriers to knowledge regarding this subject need to be investigated. In an attempt to mitigate the effects of such a lack of knowledge, nurses can strengthen and implement health promotion actions by developing and promoting educational interventions<sup>(10)</sup> directed to HPV vaccination. The population needs to receive information about the HPV vaccine, considering its recent adoption by the Brazilian Unified Health System (SUS).

Educational technologies, defined as systematic sets of different types of knowledge intended to enable the planning, implementation, control and monitoring of the educational process, stand out among educational processes<sup>(11)</sup>.

Nursing workers can devise a set of systematic and planned innovative educational tools within the field of health education to promote the teaching and learning of health-related subjects. Nursing educational technologies employ dynamic actions that involve the participation of the target population<sup>(13)</sup> and are intended to provide essential information to minimize doubts and change risk behavior, the main effect of which is to improve knowledge<sup>(12)</sup>.

The educational technology proposed by the Brazilian Ministry of Health is an institutional campaign that employs resources from the television media and web environment (folder and blog), in addition to printed posters to promote knowledge on the subject. The media is considered a source of information but its messages are not always sufficient to encourage people to adopt preventive behaviors<sup>(14)</sup>. The educational technology produced within the nursing field is based on Nola Pender's<sup>(15)</sup> theory and employs a theater play and creating a dynamic to address what is real and what is myth regarding this subject<sup>(16)</sup>.

This study's relevance is the application of educational technologies that address the HPV vaccine, verifying whether these technologies contribute to improving knowledge on the topic.

This paper was extracted from the Master's dissertation defended for the Nursing Graduate Program at the Regional University of Cariri "Tecnologia Educacional de Enfermagem na Vacinação contra o Papilomavírus Humano: Ensaio Controlado Randomizado" [Nursing Educational Technology on Human Papillomavirus Vaccination: Randomized Controlled Trial].

This study's objective was to compare the effect of the application of two educational technologies addressing the human papillomavirus vaccine among adolescents.

## Method

This analytical study compared two educational technologies between an Intervention (IG) and a Control (CG) group. It was implemented in municipal schools linked to the Family Health Strategy through the *Programa de Saúde na Escola (PSE)* [School Health Program].

The interventions were randomly implemented through the School Health Program. Girls aged from 9 to 13 years old and attending primary and middle schools in the urban area of the city of Juazeiro do Norte (CE) were selected. This population was chosen because this was the population targeted by the vaccination schedule at the time of data collection, that is, from May to November 2015.

The coordinator of the School Health Program listed 18 schools that agreed to participate in the study. Inclusion criteria were schools with 100 to 200 adolescents, so that a total of 8 schools were included, totaling 1,179 adolescents who were eligible for the study. The Research Randomizer program, version 3.0, was used by an independent individual to assign participants to the Intervention and Control groups.

The sample was calculated using the following formula for comparative studies:

$$n = [(z\alpha + z\beta)2x2xp(1-p)]/d^2, \alpha = 5\%, \beta = 20\%, p = 50\% \text{ and } d = 15\%$$

The calculation resulted in 174 adolescents for each group.

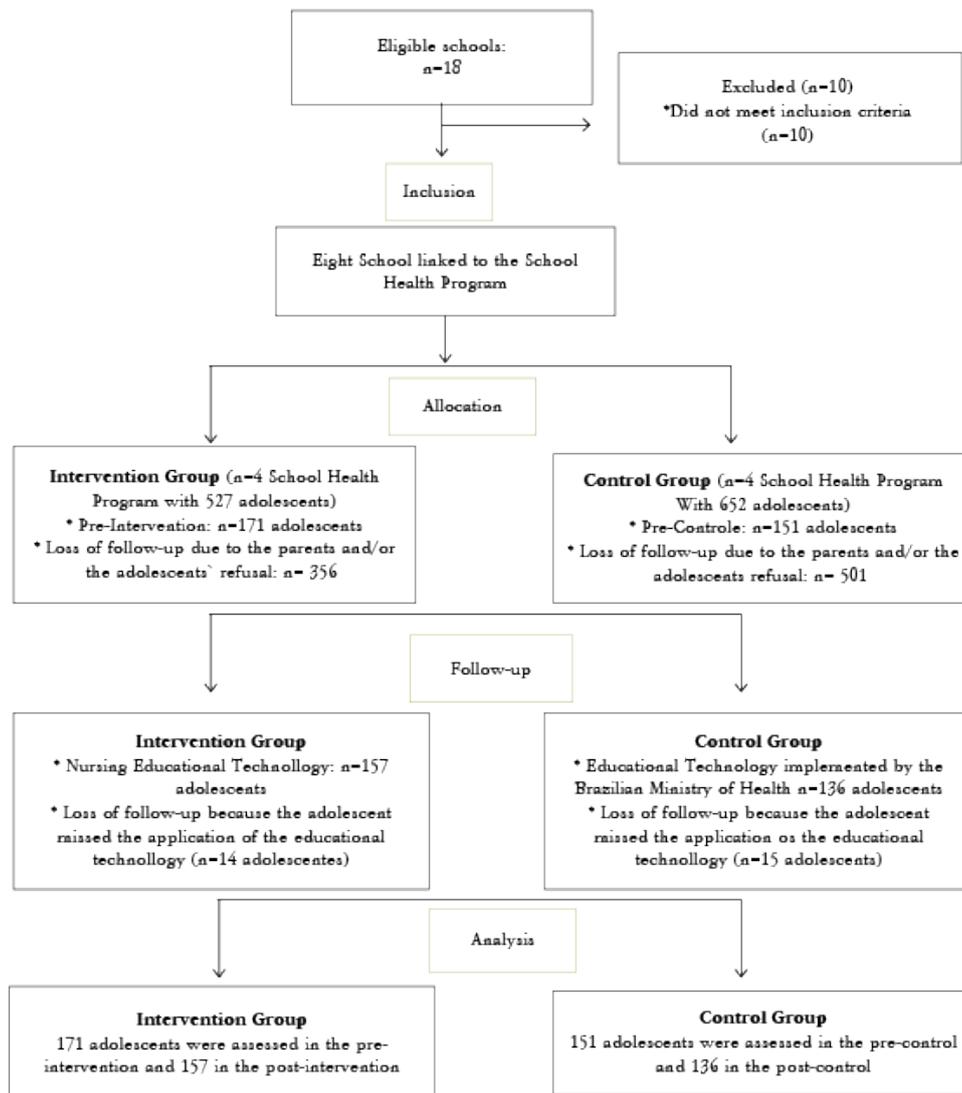
Adolescents aged from 9 to 13 years old were invited in their respective classrooms and meetings

were scheduled with their legal guardians. (At least five meetings were scheduled in an attempt to reach a number of informed consent agreements close to the sample calculated.) After consent was obtained, a questionnaire was applied to assess the participants' previous knowledge. The Educational Technology was applied at different points in time, according to

the assigned group, and the questionnaire was then reapplied.

The adolescents whose legal guardians did not attend the meetings or refused to participate, were excluded. Figure 1 presents in detail the process of inclusion, allocation of schools, and follow-up of the Intervention and Control groups.

**Figure 1** – Follow-up flowchart of the Intervention and Control Groups. Juazeiro do Norte, Ceará, Brazil – 2015



Source: Created by the authors.

After the participants' legal guardians consented to the study, the interventions to implement the educational technologies were scheduled with the schools' academic coordinators. Three meetings were held in each

school in a private room that was arranged by the schools' principals or coordinators. There was a 7-day interval between meetings. A questionnaire addressing previous knowledge was applied in the first meeting; the educational

technology was implemented according to each group (Intervention or Control) in the second meeting; and knowledge was reassessed in the third meeting after the educational technology was implemented.

The new Nursing Educational Technology based on Nola Pender's<sup>(15)</sup> theory was applied in four schools within the Intervention Group. There were two stages: the first was based on a theater play, in which the benefits and adverse effects of the HPV vaccine and the link between HPV and cervical cancer were explained<sup>(16)</sup> while the dynamics "Unraveling mysteries and clarifying doubts" was applied in the second stage. Groups with from five to six adolescents were composed and cards containing statements were handed to each group to be discussed. The adolescents were supposed to provide their points of view regarding the vaccine using the cards they had received. The groups were expected to rely on their knowledge of the adolescence developmental process concerning bodily changes, on information regarding the vaccine and its side effects, and comments found

on social networks in order to assess whether the statements were true or not<sup>(16)</sup>.

The Educational Technology proposed by the Brazilian Ministry of Health was applied to the Control Groups (CG) in four schools. It was composed of an institutional campaign broadcasted by the media, on the web (online leaflets and blog), and also printed posters that were available online during the data collection period. This material addressed the relationship between HPV and cervical cancer and the benefits of the vaccine. The intervention ended with a lecture given by a health worker from a primary healthcare unit using multimedia projection as a teaching resource.

The questionnaire (applied before and after the implementation of the Educational Technologies) addressed sociodemographic and cultural information (age, school grade, religious beliefs, head of the family, educational level of the head of the family, family income, and ethnicity), adolescence-related factors (physical changes perceived by the adolescents) and 15 questions concerning five key-items related to the subject (Chart 1).

**Chart 1** – Questions concerning five key-items related to the subject

<b>Key-items</b>	<b>Questions</b>
A. Cancer	A1 What is cancer? A2 What is cervical cancer? A3 How is cervical cancer prevented and treated?
B. HPV	B1 What does HPV stands for? B2 What are the symptoms of HPV? B3 How do you prevent HPV?
C. Vaccine	C1 What are the benefits of the HPV vaccine? C2 What are the main side effects of the HPV vaccine? C3 In which body part is the vaccine given?
D. Vaccination	D1 Who should provide information regarding the vaccine? D2 Has anyone influenced you to get the vaccine? D3 What information do you believe you should receive about the vaccine?
E. Autonomy	E1 What is autonomy? E2 Why should information on the vaccine/vaccination be given? E3 Who should decide whether to get vaccinated?

Source: Created by the authors.

The questionnaire and the Educational Technology were based on the health promotion model proposed by Nola Pender and on the

inter-relationship of the following elements: individual characteristics and experiences; feelings and knowledge regarding the behavior

one wishes to achieve; and desirable health promotion behavior<sup>(15)</sup>.

To identify the adolescents' perceptions of the vaccine-related benefits and barriers, as well as the interpersonal influences perceived in the groups, knowledge the adolescents had prior to the application of the Educational Technology, and knowledge acquired after the intervention, was compared. Each question contained four alternatives for answers, but only one was correct. The total score ranged from 0 to 15 points for each questionnaire.

Data were processed in the Statistical Package for the Social Sciences (SPSS), version 20.0, license No.10101131007. The z-test was used to compare proportions. The effect of the nursing educational technology was compared to the educational technology employed by the Ministry of Health measured by Student's *t* test: the means concerning the total number of corrected answers provided by the adolescents in the IG and CG were compared before and after the educational technologies were implemented.

The Chi-square test was used to compare knowledge between groups for each of the

questions. This test was performed only using the distribution of the number of correct answers in each question. The total number of correct questions should be equivalent to the number of participants, according to the group to which participants were assigned, and time of assessment (before and after exposure to the educational technology). Level of significance was established at equal to or less than 5% (0.05) to assess the effect of the nursing educational technology.

All ethical aspects concerning research involving human subjects were complied with and the study project was approved under CAAE No. 40830615.2.0000.5055.

## Results

A total of 171 adolescents were initially assigned to the Intervention Group (GI) and 151 to the Control Group (CG). The groups were homogeneous in terms of sociodemographic and cultural data, except for characteristics concerning school grade and ethnicity; significant differences ( $p=0.0001$ ) were found, as shown in Table 1.

**Table 1** – Distribution of the number of adolescents according to characteristics and assigned group. Juazeiro do Norte, Ceará, Brazil – 2015 (continued)

Characteristics	Intervention Group (n=171) f (%)	Control Group (n=151) f (%)	P*
<b>Age (years)</b>			0.49
9-11	50(33.1)	57(37.8)	
12	63(41.7)	64(42.4)	
13	58(33.9)	30(19.9)	
<b>Education</b>			0.0001
3 <sup>rd</sup> -5 <sup>th</sup> grades	-	40(26.5)	
6 <sup>th</sup> grade	83(48.5)	60(39.7)	
7 <sup>th</sup> grade	59(34.5)	48(31.8)	
8 <sup>th</sup> grade	22(12.8)	3(2.0)	
<b>Religious beliefs</b>			0.6788
Catholic	138(80.7)	130(86.1)	
Evangelical	22(12.9)	18(11.9)	
Others	11(6.4)	3(2.0)	
<b>Ethnicity</b>			0.0001
Indigenous	82(48.0)	53(30.1)	
Caucasian	55(32.2)	37(24.5)	
Afro-descendant	34(19.9)	61(40.4)	

**Table 1** – Distribution of the number of adolescents according to characteristics and assigned group. Juazeiro do Norte, Ceará, Brazil – 2015 (conclusion)

Characteristics	Intervention Group (n=171) f (%)	Control Group (n=151) f (%)	P*
<b>Head of the family</b>			0.29
Mother	89(52.1)	77(51.0)	
Mother and father	60(35.1)	55(36.4)	
Father	11(6.4)	4(2.6)	
Grandparents/uncles or aunts	11(6.4)	15(9.9)	
<b>Family income</b>			0.80
Up to 1 time the MW	146(85.4)	130(62.2)	
1 to 2 times the MW	17(10.1)	16(7.7)	
2 or more times the MW	8 (4.7)	5(3.3)	

Source: Created by the authors.

Note: Conventional signal used:

- Numerical data equal to zero not resulting from rounding.

\* Chi-square test

Table 2 presents the characteristics of the groups in regard to personal factors, based on developmental milestone indicators for

adolescents. Most of the adolescents had undergone most of the physical changes and presented more than one of these indicators.

**Table 2** – Distribution of the number of adolescents according to milestones achieved and assigned group. Juazeiro do Norte, Ceará, Brazil – 2015

Characteristics	Intervention Group n=171 n(%)	Control Group n=151 n(%)	Z-test for proportions (p)=
Menarche	97(56.7)	60(39.7)	<b>0.001</b>
Breast development	134(78.4)	113(74.8)	0.432
Pubic hair	103(60.2)	77(50.9)	0.494
Weight gain	95(55.6)	88(58.2)	0.576

Source: Created by the authors.

The Educational Technologies were presented to 151 adolescents in the Intervention Group and 136 in the Control Group. Even though differences were found between groups in regard

to school grade, as shown in Table 1, Table 3 shows there were no differences in the means of correct answers provided by either group when previous knowledge was assessed (p=0.388).

**Table 3** – Comparison between the means of correct answers provided to the questionnaire applied before and after the educational intervention. Juazeiro do Norte, Ceará, Brazil – 2015

Variables	n	Mean	Standard deviation	Mean Standard Error	P*
<b>Before</b>					0.388
Intervention Group	171	7.76	2.2	0.175	
Control Group	151	7.52	2.6	0.215	
<b>After</b>					<b>0.001</b>
Intervention Group	157	10.32	2.9	0.232	
Control Group	136	9.17	3.0	0.263	

Source: Created by the authors.

\* Student's t test.

Statistically significant differences were found in the IG after the Nursing Educational Technology, based on Nola Pender<sup>(15)</sup>, was applied and compared to the Educational Technology proposed by the Brazilian Ministry of Health ( $p=0.001$ ). This finding shows that the Nursing Educational Technology had a greater impact on the adolescents' level of knowledge

concerning the entire set of questions addressing the topic.

Table 4 presents a comparison between the adolescents' knowledge assessed in each question before and after the implementation of the Educational Technologies, according to assignment to the Intervention or Control group.

**Table 4** – Distribution of the number of adolescents according to the number of correct answers provided to questions grouped per key-items. Juazeiro do Norte, Ceará, Brazil – 2015

Key-items	Before (n=322)			After (n=293)		p*
	Intervention Group n= 171 (%)	Control Group n=151 (%)	p*	Intervention Group n=157 (%)	Control Group n=136 (%)	
A1	52(30)	50(33)	0.603	103(66)	58(43)	<b>&lt;0.001</b>
A2	65(38)	56(37)	0.864	74(47)	73(54)	0.264
A3	123(72)	97(64)	0.139	123(78)	111(82)	0.486
B1	74(43)	56(37)	0.259	123(78)	86(63)	<b>0.004</b>
B2	69(40)	58(38)	0.722	105(67)	74(54)	<b>0.024</b>
B3	85(50)	55(36)	<b>0.016</b>	83(53)	58(43)	0.081
C1	66(39)	67(44)	0.294	109(69)	76(56)	<b>0.017</b>
C2	116(68)	80(53)	<b>0.006</b>	123(78)	92(68)	<b>0.039</b>
C3	155(91)	141(93)	0.369	155(99)	129(95)	<b>0.055</b>
D1	153(89)	134(89)	0.833	142(90)	117(86)	0.239
D2	71(42)	70(46)	0.383	55(35)	56(41)	0.280
D3	81(47)	81(54)	0.261	113(72)	87(64)	0.142
E1	82(48)	61(40)	0.173	131(83)	86(63)	<b>&lt;0.001</b>
E2	70(41)	73(48)	0.182	92(59)	73(54)	0.397
E3	65(38)	57(38)	0.961	90(57)	71(52)	0.380

Source: Created by the authors.

\* Chi-square test.

Comparison between the groups revealed that both presented a low level of knowledge prior to the implementation of the Educational Technologies for virtually all items of the questionnaire, except for items B3 (how to prevent cervical cancer) and C2 (vaccine side effects), in which the Intervention Group presented knowledge greater than that presented by the Control Group.

Analysis of the effect of the Nursing Educational Technology, compared to the Educational Technology proposed by the Brazilian Ministry of Health showed, for most items, that the Intervention Group presented significantly greater knowledge than the Control Group in regard to cancer (A1), HPV symptoms (B1, B2), all items concerning the vaccine (benefits, side effects, and site of application),

and to the concept of autonomy (E1). That is, the Nursing Educational Technology based on Nola Pender's<sup>(15)</sup> theory produced a greater effect on the adolescents' level of knowledge.

No differences in the knowledge of the groups were found in regard to the other items. An analysis of the percentages of correct answers provided by each group before and after the intervention shows an improvement for virtually all the items of the questionnaire. Thus, the Educational Technology proposed by the Ministry of Health can also be used by health workers to improve level of knowledge on the subject.

One of the points relevant for decision-making in regard to vaccination is the development of autonomy, considered part of adolescents' developmental process. After the educational technologies were applied, more than 40% of the female adolescents from the IG and CG considered the decision, as to whether they should be vaccinated, not to be theirs but their parents'.

## Discussion

Analysis of the sociodemographic and cultural data of both groups showed they differed in terms of school grade, a difference that is explained by the large interval in the age group of the population targeted by the vaccination schedule (9 to 13 years old). In regard to ethnicity, one should consider the vast cultural diversity of Brazil, in which different ethnicities are present. Physical changes experienced by the adolescents aged between 9 and 13 years old is explained by the fact that bodily changes begin before 10 years of age and may manifest from 8 to 14 years old, according to each individual's physiological puberty<sup>(17)</sup>.

The adolescents presented a low level of previous knowledge in regard to aspects related to HPV, cervical cancer, and vaccination and were influenced by their parents to whether to be vaccinated or not. This study's results are in agreement with the international literature, which emphasizes that adolescents

do not have sufficient understanding regarding human papillomavirus and the vaccine<sup>(17-18)</sup>. Brazilian studies also indicate there is a lack of knowledge among adolescents in regard to the link between HPV and cervical cancer<sup>(19-20)</sup>. One study conducted in Mozambique reports that adolescents were aware of cervical cancer but that their knowledge regarding the etiology of cervical cancer needed to improve<sup>(21)</sup>.

This study's results show that the level of the adolescents' knowledge on most of the items related to the topic improved after the implementation of the educational technologies. The number of correct answers provided by the groups (Intervention and Control) before and after the educational technologies shows a need to implement educational interventions to improve knowledge.

Another important piece of information collected in this study is that adolescents assigned to their parents the power to decide whether they should receive the HPV vaccine or not. This finding corroborates what the literature has already stated, the fact that parents often do not understand or acknowledge the autonomy of their daughters, which in turn prevents them from having freedom of choice. It is, therefore, essential that parents promote a sense of responsibility in their children, enabling them to make their own decisions<sup>(22)</sup>.

Lack of autonomy to decide whether to receive the HPV vaccine or not may be associated with the fact that understanding in regard to the vaccine is permeated with taboos. Most adolescents and their parents are unaware of the vaccine's side effects and experience unfounded fear. For this reason, the target population and their legal guardians need to have access to information regarding the vaccine's benefits and side effects to support decision-making<sup>(23)</sup>.

Given a lack of knowledge on the topic among the population, the literature highlights the importance of implementing health education actions as part of the HPV vaccination schedule<sup>(21)</sup>. Educational campaigns should sensitize the population about HPV, reinforcing its connection with cervical cancer<sup>(24)</sup>. Health

workers should provide appropriate information regarding the HPV vaccine, suggest health education actions directed to HPV infection, relating it to cervical cancer and clarifying the role of vaccinations in order to increase knowledge among adolescents<sup>(17)</sup>. The educational technologies implemented and compared in this study are in agreement with guidelines found in the literature, as both addressed subjects related to cervical cancer and the benefits of the vaccine.

The educational technologies implemented among adolescents can be used in several activities, such as workshops, theater plays, group dynamics, conversation rounds, and interactive games, among others, focused on learning and based on clarifying certain health-related subjects<sup>(25)</sup>.

The nursing educational technology based on Nola Pender, which was implemented in the Intervention Group, employed dramatization and group dynamics, unraveling and clarifying doubts regarding the HPV vaccine so that adolescents would improve their knowledge of the theme. Another study conducted in Ceará, Brazil also employed educational technologies using interactive games and promoted significant changes in the knowledge and understanding of adolescents, enabling them to clarify doubts<sup>(25)</sup>.

Despite the information on vaccination that is broadcast on television, the informative posters of the Brazilian Ministry of Health, and information provided on the Internet, this study showed that many of the adolescents recruited presented a low level of prior knowledge on the HPV vaccine. Such findings highlight the importance of health workers providing information related to this topic, using already existing educational technologies directed to the target population, such as the one provided by the Ministry of Health, which was implemented with the Control Group, or even developing new technologies such, as the one implemented to the Intervention Group.

This study's limitations include a difficulty accessing the adolescents' legal guardians, considering that many did not attend the meetings and some did not allow the participation of

their daughters because they considered the HPV vaccine to be harmful, which resulted in a sample that was smaller than expected. Another limitation is the physical structure of most public schools. The adolescents' attention was impaired due to a lack of proper ventilation, lack of a door on the classroom, and the use of child-sized furniture instead of furniture appropriate to the adolescents' ages. Such discomfort affected learning and revealed the obstacles to be faced by health workers who intend to implement health education actions in schools.

## Conclusion

This study shows the positive influence of the nursing educational technology based on Nola Pender's theory, revealing that adolescents respond better to dynamic technologies.

Compared to the educational technology developed by the Brazilian Ministry of Health, the nursing educational technology promoted greater improvement in the knowledge of adolescents, both in regard to the mean of total correct answers in the set of questions related to the theme and in regard to the index of correct answers for most of the questionnaire's items.

Even though the Educational Technology developed by the Ministry of Health presented a result below what was expected, workers can employ it to promote knowledge of the theme. The implementation of the Educational Technologies were important to clarifying the benefits of vaccination, as well as related myths, considering the HPV vaccine was only recently incorporated into the Unified Health System.

There are doubts regarding the subject that need to be clarified in order to improve the knowledge of a large number of adolescents and their legal guardians, considering that parents influence adolescents' decision-making. We suggest that educational technologies addressing this subject be implemented for the target population and their legal guardians.

New studies, using educational technologies that also include parents in addition to the vaccine's target population, are recommended in

order to improve sensitization in other Brazilian states. Planned health education actions promoted together with the school health program will enable health workers to increase the knowledge of adolescents and also that of their legal guardians, considering that parents strongly influence the adolescents' decision-making regarding whether to take the vaccine or not.

### Collaboration:

1. conception, design, analysis and interpretation of data: Aliniana da Silva Santos, Paulo César de Almeida and Maria Corina Amaral Viana;

2. writing of the article and relevant critical review of the intellectual content: Aliniana da Silva Santos, George Jó Bezerra Sousa, Raquel Lucena Nicodemos, Paulo César de Almeida, Edna Maria Camelo Chaves and Maria Corina Amaral Viana;

3. final approval of the version to be published: Aliniana da Silva Santos, George Jó Bezerra Sousa, Raquel Lucena Nicodemos, Paulo César de Almeida, Edna Maria Camelo Chaves and Maria Corina Amaral Viana.

### References

- Barbosa IR, Souza DLB, Bernal MM, Costa ICC. Regional inequalities in cervical cancer mortality in Brazil: trends and projections through to 2030. *Ciênc Saúde Coletiva* [Internet]. 2016 [cited 2018 Aug 22];21(1):253-62. Available from: DOI: 10.1590/1413-81232015211.03662015 [Portuguese]
- D'Souza G, Cullen K, Bowie J, Thorpe R, Fakhry C. Differences in Oral Sexual Behaviors by Gender, Age, and Race Explain Observed Differences in Prevalence of Oral Human Papillomavirus Infection. *PLoS ONE* [Internet]. 2014 [cited 2018 Aug 22];9(1):e86023. Available from: DOI: 10.1371/journal.pone.0086023
- Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças Transmissíveis. Coordenação-Geral do Programa Nacional de Imunizações. Informe técnico sobre a vacina papilomavírus humano (HPV) na atenção básica. Brasília; 2013 [cited 2018 Aug 22]. Available from: <http://www.riocomsaude.rj.gov.br/Publico/MostrarArquivo.aspx?C=2m3JlW6qoI%3D>
- Quevedo JP, Inácio M, Wieczorkiewicz AM, Invernizzi N. A política de vacinação contra o HPV no Brasil: a comunicação pública oficial e midiática face à emergência de controvérsias. *R Tecnol Soc* [Internet]. 2016 [cited 2018 Aug 3];12:1-26. Available from: DOI: 10.3895/rts.v12n24.3206
- Silva PMC, Silva IMB, Interaminense INCS, Linhares FMP, Serrano SQ, Pontes CM. Knowledge and attitudes about human papillomavirus and vaccination. *Esc Anna Nery* [Internet]. 2018 [cited 2018 Aug 22];22(2):e20170390. Available from: DOI: 10.1590/2177-9465-EAN-2017-0390 [Portuguese]
- Souza AF, Costa LHR. Cervical Cancer and HPV: Women's Knowledge after Nursing Consultation. *Rev Bras Cancerol* [Internet]. 2015 [cited 2018 Aug 22];61(4):343-50. Available from: [http://www.inca.gov.br/rbc/n\\_61/v04/pdf/05-artigo-conhecimento-de-mulheres-sobre-hpv-e-cancer-do-colo-do-utero-apos-consulta-de-enfermagem.pdf](http://www.inca.gov.br/rbc/n_61/v04/pdf/05-artigo-conhecimento-de-mulheres-sobre-hpv-e-cancer-do-colo-do-utero-apos-consulta-de-enfermagem.pdf)
- Santos AD, Santos PMA, Santos MB, Santos AMD. Conhecimento de mulheres sobre o câncer de colo uterino em um município do Nordeste do Brasil. *Rev Iberoam educ invest enferm* [Internet]. 2015 [cited 2018 Aug 22];5(3):64-76. Available from: <http://www.enfermeria21.com/revistas/aladefe/articulo/174/conhecimento-de-mulheres-sobre-o-cancer-de-colo-uterino-em-um-municipio-do-nordeste-do-brasil/>
- Ogilvie G, Anderson M, Marra F, McNeil S, Pielak K, Dawar M, et al. A population-based evaluation of a publicly funded, school-based HPV vaccine program in British Columbia, Canada: parental factors associated with Papilomavírus Humano vaccine receipt. *Plos Med* [Internet]. 2010 [cited 2018 Aug 22];7(5):e1000270. Available from: DOI: 10.1371/journal.pmed.1000270
- Mwaka AD, Wabinga HR, Mayanja-Kizza H. Mind the gaps: a qualitative study of perceptions of healthcare professionals on challenges and proposed remedies for cervical cancer help-seeking in post conflict northern Uganda. *BMC Fam Pract* [Internet]. 2013 [cited 2018 Sep 4];14:1-14. Available from: DOI: 10.1186/1471-2296-14-193
- Lacerda ABM, Soares VMN, Goncalves CGO, Lopes FC, Testoni R. Oficinas educativas como estratégia de promoção da saúde auditiva do adolescente: estudo exploratório. *Audiol Commun Res* [Internet].

- 2013 [cited 2018 Sep 1];18(2):85-92. Available from: DOI: 10.1590/S2317-64312013000200006
11. Nietzsche EA, Backes VMS, Colomé CLM, Ceratti RN, Ferraz F. Tecnologias educacionais, assistenciais e gerenciais: uma reflexão a partir da concepção dos docentes de enfermagem. *Rev Latino-am Enfermagem* [Internet]. 2005 [cited 2019 Jan 15];13(3):344-53. Available from: DOI: 10.1590/S0104-11692005000300009
  12. Áfio ACE, Balbino AC, Alves MDS, Carvalho LV, Santos MCL, Oliveira NR. Análise do conceito de tecnologia educacional em enfermagem aplicada ao paciente. *Rev Rene* [Internet]. 2014 [cited 2019 Jan 15];15(1):158-65. Available from: DOI: 10.15253/2175-6783.2014000100020
  13. Silva DML, Carreiro FA, Mello R. Tecnologias educacionais na assistência de enfermagem em educação em saúde: revisão integrativa. *Rev enferm UFPE on line* [internet]. 2017 [cited 2019 Jan 15];11(Supl.2):1044-51. Available from: <http://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/13475/16181>
  14. Osis MJD, Duarte GA, Sousa MH. Conhecimento e atitude sobre HPV e vacinas. *Rev Saúde Pública* [Internet] 2014 [cited 2019 Jan 15];48(1):123-33. Available from: DOI: 10.1590/S0034-8910.2014048005026
  15. Santos AS, Viana MCA, Chaves EMC, Bezerra AM, Goncalves Junior J, Tamboril ACR. Educational technology based on Nola Pender: promoting adolescent health. *Rev enferm UFPE on line* [Internet]. 2018 [cited 2018 Sep 1];12(2):582-8. Available from: <https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/22609> [Portuguese]
  16. Pender NJ, Murdaugh CL. *Health. Promotion in nursing practice*. 5th ed. New York: Pearson; 2015.
  17. Fisher H, Trotter CL, Audrey S, MacDonald-Wallis K, Hickman M. Inequalities in the uptake of Human Papillomavirus Vaccination: a systematic review and meta-analysis. *Int J Epidemiol* [Internet]. 2013 [cited 2018 Sep 1];42(3):896-908. Available from: DOI: 10.1093/ije/dyt049
  18. Donken R, Tami A, Knol MJ, Lubbers K, Van der Sande MAB, Nijman HW, et al. Changes in (risk) behavior and HPV knowledge among Dutch girls eligible for HPV vaccination: an observational cohort study. *BMC Public Health* [Internet]. 2018 [cited 2018 Sep 1];18(1):837. Available from: DOI: 10.1186/s12889-018-5745-6
  19. Blackman E, Thurman N, Halliday D, Butler R, Francis D, Joseph M, et al. Multicenter study of human papillomavirus and the human papillomavirus vaccine: knowledge and attitudes among people of African descent. *Infect Dis Obstet Gynecol* [Internet]. 2013 [cited 2018 Sep 2];2013:428582. Available from: DOI: 10.1155/2013/428582
  20. Andrade VRM, Ribeiro JC, Vargas FA. Conhecimento e atitude das adolescentes sobre o exame de Papanicolau e papiloma vírus humano. *Adolesc Saúde* [Internet]. 2015 [cited 2018 Sep 5];12(2):69-75. Available from: [http://www.adolescenciaesaude.com/detalhe\\_artigo.asp?id=503#](http://www.adolescenciaesaude.com/detalhe_artigo.asp?id=503#)
  21. Bardají A, Mindu C, Augusto OJ, Casellas A, Cambaco O, Simbine E. Awareness of cervical cancer and willingness to be vaccinated against human papillomavirus in Mozambican adolescent girls. *Papillomavirus Res* [Internet]. 2018 [cited 2018 Sep 5];5:156-62. Available from: DOI: 10.1016/j.pvr.2018.04.004
  22. Barbosa PV, Neumann AP, Alves CF, Teixeira MAP, Wagner A. Autonomia, Responsividade/ Exigência e Legitimidade da Autoridade Parental: Perspectiva de Pais e Adolescentes. *Psico-USF* [internet]. 2017 [cited 2018 Sep. 5];22(1):23-34. Available from: DOI: 10.1590/1413-82712017220103
  23. Guedes MCR, São Bento PAS, Telles AC, Queiroz ABA, Xavier RB. Vaccine of the human papillomavirus and cervical cancer: a reflection. *Rev enferm UFPE* [internet]. 2017 [cited 2018 Sep 5];11(1):224-31. Available from: <https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/11897>
  24. He J, He L. Knowledge of HPV and acceptability of HPV vaccine among women in western China: a cross-sectional survey. *BMC Womens Health* [Internet]. 2018 [cited 2018 Sep 6];18(1):1-8. Available from: DOI: 10.1186/s12905-018-0619-8
  25. Lemos IZS, Miranda MLF, Matias LVR, Lédio MF, Alves ACP, Marques, SF. Tecnologia educativa para trabalhar a sexualidade de adolescentes no contexto escolar. *R Interd* [Internet]. 2015 [cited 2019 Jan 16];8(3):110-8. Available from: [https://revistainterdisciplinar.uninovafapi.edu.br/index.php/revinter/article/view/738/pdf\\_242](https://revistainterdisciplinar.uninovafapi.edu.br/index.php/revinter/article/view/738/pdf_242)

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