The knowledge of high school students from Budapest about cervical cancer, HPV infection and its prevention

PhD thesis

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Introduction

Cervical cancer was the 4th most frequent malignant disease among women worldwide and the 10th of all malignant tumors in 2015. In the same year, nearly 526 000 new cases were registered (ASIR=14,3/100 000) and the mortality was estimated to be 239 000 (ASDR=6,6/100 000), covering about 7.5% of female deaths from cancer.

Almost 85% of cervical cancer cases are registered in the developing countries, where the disease is responsible for 12% of cancer-related deaths among females. Furthermore, nine out of ten lethal cases are registered in these countries. In Hungary, cervical cancer incidence is higher than the EU-average: incidence was two-fold in 2012 with 1178 new cases. In the same year, 461 women deceased from the disease.

In Hungary, cervical cancer screening has been operating opportunistically since the 1950s. In 2003, however, a population-based screening program was established as part of the National Public Health Program. According to the provided schedule, organized cervical cancer screening is recommended by cytology to women aged 25-65 every 3 years after an initial negative test. Since 2008, following international practices, nurses of the Maternity and Child Health Service (MCHS) joined the MCHS Cervical Cancer Screening pilot program, and afterwards the general program.

Since September 2014, two doses of the bivalent HPV vaccine are offered nationwide free of charge to 7th grade school girls. As HPV infection is responsible for 99% of cervical cancers, the prevention of this STI is primordial, for screening and immunization my significantly reduce the incidence and mortality of this condition.

The success of a population-based screening program (secondary prevention) depends essentially on the demand i.e.: motivation of the target population, thus in order to increase attendance, one of the main pre-requisites are raising the awareness of the disease to an optimal level (primary prevention). Furthermore, the acceptance and uptake of the HPV vaccine, also part of primary prevention, relies fundamentally on the awareness of the disease and the vaccine, which helps eliminate fears and misbeliefs (deterrent factors) considering vaccination.

Aims

Our study aimed to explore the knowledge about HPV infection, cervical cancer and the attitude towards HPV vaccination of high school graduates in Budapest, as sexual behavior and vaccine uptake are equally influenced by the awareness of the disease itself, its risk factors and vaccine-related attitudes. One of the main arguments for choosing this population was the high HPV-prevalence of this age-group. These students could not benefit from the current vaccination program, though had access to the vaccine under different circumstances, nevertheless,

vaccination is still recommended for them. Even though cervical cancer only affects women, we decided to include males in our study as vaccination is available for both sexes. Furthermore, we also aimed to explore the knowledge of males regarding the conditions caused by the virus in men (e.g.: genital warts, anal cancer etc.).

Methods

In our cross-sectional study, we determined the target population as grammar and vocational high school graduates 18 years of age. Data collecting took place between March 2013 and May 2014. The participating institutions (N=40) were randomly selected through the online database of the National Educational Agency. We contacted the principal of each school in e-mail to ask their permission to conduct our research in their establishment. In the end, we were invited by 19 high schools with 73 classes. The contents of the questionnaire and the method of our study was accepted by the Semmelweis University's Board of Ethics (reference number: 23/2013).

Questionnaires were typically filled out by students during headmaster or biology classes. Students were orally informed by the conducting teachers that participation was voluntarily, and data processing was anonymous.

We distributed 2180 questionnaires and received 1636 (response rate: 75%). Data were first registered by Microsoft Office Excel and transferred later to IBM SPSS v.23. 56 questionnaires were excluded from further analysis (e.g.: questionnaires where items concerning the knowledge of the disease were left unanswered or responses were inadequate). In the end, we started analysis with 1580 questionnaires.

The questionnaire contained 54 items with single or multiple-choice questions on the following five topics: socio-demographic background (9 items), lifestyle factors (17 items), knowledge about cervical cancer/HPV infection (12 items), attitude towards the HPV vaccine (11 items), cervical cancer screening related knowledge and attitudes (4 items).

We first performed frequency analysis, then Pearson Chi-square tests based on sex and school-type for associations. Results were accepted at $p<0.05$ with 95% confidence interval (95%CI). For variables with non-normal distribution, we used nonparametric tests as Mann-Whitney U and Kruskal-Wallis H test.

To describe the attitude towards vaccination, we determined a new variable. While creating it, we used the following variables: the self-perceived risk of HPV infection, the will to vaccinate the future child, the will to make the vaccine mandatory, the efficacy of vaccination after the initiation of sexual life, the will to vaccinate boys, and the items discussing the general efficacy of the vaccine. We tested the internal consistency of the questions indicated above, and the Cronbach's alpha value was 0.774, thus we judged the answers suitable to analyze the

attitude towards vaccination. Next, answers were recoded with attributing code 1 to "no" and code 2 to "yes" answers. Missing items were coded as 0. After adding the code numbers, we created a new variable - "attitude score" - with values ranging from 1 to 12. The average score was 7.08 (SD=2.89), the median: 7.00. Our goal was to construct a multi-variable model to define the predictors of the attitudes towards vaccination. We therefore conducted binary logistic regression with a new variable that we created by applying a median split on our "attitude score" (1-6 and 7-12 respectively).

Results

Socio-demographic characteristics

Socio-demographic factors are presented by contingency tables based on sex and school-type (*Table 1)*.

Table 1. Characteristics of the high-school sample based on sex and school-type (N=1580).

Variables	Sex, N (%)		χ^2-test, p-value	School-type, N (%)		χ^2-test, p-value
	Male	Female		Vocational	Grammar	
Male Female	---	---	---	490 (77.2) 601 (57.2)	121 (22.8) 449 (42.8)	<0.001
Budapest Outside Budapest	351 (6.2) 179 (33.8)	743 (71.6) 294 (28.4)	0.027	651 (65.2) 347 (34.8)	443 (77.9) 126 (22.1)	<0.001
Pursue education Yes No	 251 (67.5) 121 (32.5)	 463 (75.8) 148 (24.2)	0.005	 472 (67.3) 230 (32.8)	 463 (92.2) 39 (7.8)	<0.001
Pocket-money <5000 Ft >5000 Ft	 279 (74.0) 98 (26.0)	 625 (83.6) 123 (16.4)	<0.001	 572 (79.0) 152 (21.0)	 332 (82.8) 69 (17.2)	0.146
Works Yes No	 302 (60.9) 194 (39.1)	 858 (54.0) 729 (46.0)	0.007	 580 (60.4) 380 (39.6)	 580 (51.6) 543 (48.4)	<0.001
Religious Atheist	132 (50.8) 128 (49.2)	257 (57.2) 192 (42.8)	0.095	243 (56.5) 187 (43.5)	146 (52.3) 133 (47.7)	0.274
Eats Regularly Irregularly	 313 (60.9) 201 (39.1)	 508 (49.5) 519 (50.5)	<0.001	 498 (50.6) 487 (49.4)	 323 (58.1) 233 (41.9)	0.005
No diet Diet	407 (85.1) 71 (14.9)	770 (78.3) 214 (21.7)	0.002	760 (81.3) 174 (18.7)	417 (79.0) 111 (21.0)	0.298
1st child Before 25 After 25	 119 (30.1) 276 (69.9)	 388 (55.4) 312 (44.6)	<0.001	 335 (41.8) 466 (58.2)	 172 (38.2) 286 (61.8)	0.154
Sport Occasionally Regularly	 256 (53.1) 226 (46.9)	 703 (73.6) 252 (26.4)	<0.001	 628 (68.6) 288 (31.4)	 331 (63.5) 190 (36.5)	0.051
TV No TV	419 (79.0) 111 (21.0)	888 (84.6) 162 (15.4)	0.007	837 (82.9) 173 (17.1)	470 (82.5) 100 (17.5)	0.887
Radio No radio	344 (64.9) 186 (35.1)	772 (73.5) 278 (26.5)	<0.001	719 (71.2) 291 (28.8)	397 (69.6) 173 (30.4)	0.554
Smoker Non-smoker	172 (34.9) 321 (65.1)	290 (28.9) 713 (71.1)	0.021	324 (25.2) 960 (74.8)	138 (25.7) 398 (74.3)	0.862
Daily < 10 cigarettes > 10 cigarettes	 93 (53.8) 80 (46.2)	 199 (69.8) 86 (30.2)	<0.001	 199 (61.6) 124 (38.4)	 93 (68.9) 42 (31.1)	0.170

Factors related to knowledge

- Risk factors for cervical cancer (*Table 2.*):

Table 2. Primary cause of cervical cancer based on sex and school-type.

Risk factor	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
early initiation of sex life	64/345 (15.6/84.4)	115/486 (19.1/80.9)	0.154	11/110 (9.1/90.9)	98/351 (21.8/78.2)	0.002
promiscuity	163/246 (39.9/60.1)	353/248 (58.7/41.3)	<0.001	33/88 (27.3/72.7)	256/193 (57.0/43.0)	<0.001
smoking	116/293 (28.4/71.6)	132/469 (22.0/78.0)	0.020	37/84 (30.6/69.4)	116/333 (25.8/74.2)	0.296
unprotected sex	96/313 (23.5/76.5)	312/289 (51.9/48.1)	<0.001	23/98 (19.0/81.0)	247/202 (55.0/45.0)	<0.001
"I don't know"	131/278 (32.0/68.0)	129/472 (21.5/78.5)	<0.001	56/65 (46.3/53.7)	103/346 (22.9/77.1)	<0.001

Note: Grey background indicates significant difference.

- Prevention of cervical cancer (*Table 3.*):

Table 3. Prevention of cervical cancer based on sex and school-type.

Answers	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
screening	247/162 (60.4/39.6)	452/149 (75.2/24.8)	<0.001	66/55 (54.5/45.5)	344/105 (76.6/23.4)	<0.001
HPV vaccine	177/232 (43.3/56.7)	438/163 (72.9/27.1)	<0.001	52/69 (43.0/57.0)	347/102 (77.3/22.7)	<0.001
safe sex	107/302 (26.2/73.8)	242/359 (22.0/78.0)	0.020	21/100 (17.4/82.6)	182/267 (40.5/59.5)	<0.001
"I don't know"	84/325 (20.5/79.5)	34/567 (5.7/94.3)	<0.001	36/85 (29.8/70.2)	21/428 (4.7/95.3)	<0.001

Note: Grey background indicates significant difference.

- Transmission of HPV (*Table 4.*):

Table 4: Transmission of HPV based on sex and school-type.

Transmission of HPV	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
STI	151/258 (36.9/63.1)	398/203 (66.2/33.8)	<0.001	36/85 (29.8/70.2)	279/170 (62.1/37.9)	<0.001
blood and saliva	74/335 (18.1/81.9)	133/468 (22.1/77.9)	0.119	22/99 (18.2/81.8)	110/339 (24.5/75.5)	0.144
vertical	41/368 (10.0/90.0)	62/539 (10.3/89.7)	0.880	7/114 (5.8/94.2)	63/386 (14.0/86.0)	0.014
"I don't know"	197/212 (48.2/51.8)	138/463 (23.0/77.0)	<0.001	70/51 (57.9/42.1)	122/327 (27.2/72.8)	<0.001

Note: Grey background indicates significant difference and yellow incorrect answers.

- Pathologies caused by HPV in women (*Table 5.*):

Table 5. Pathologies caused by HPV in women based on sex and school-type.

Pathologies	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
cervical cancer	216/193 (52.8/47.2)	483/118 (80.4/19.6)	<0.001	52/69 (43.0/57.0)	346/103 (77.1/22.9)	<0.001
vulvar cancer	30/379 (7.3/92.7)	66/535 (11.0/89.0)	0.052	9/112 (7.4/92.6)	30/419 (6.7/93.3)	0.770
anal cancer	16/393 (3.9/96.1)	16/585 (2.7/97.3)	0.266	4/117 (3.3/96.7)	5/444 (1.1/98.9)	0.086
infertility	69/340 (16.9/83.1)	182/419 (30.3/69.7)	<0.001	17/104 (14.0/86.0)	132/317 (29.4/70.6)	<0.001
genital warts	33/376 (8.1/91.9)	79/522 (13.1/86.9)	0.012	7/114 (5.8/94.2)	53/396 (11.8/88.2)	0.056
head-neck cancer	16/393 (3.9/96,1)	8/593 (1.3/98.7)	0.008	4/117 (3.3/96.7)	3/446 (0.7/99.3)	0.019
"I don't know"	159/250 (38.9/61.1)	94/507 (15.6/84.4)	<0.001	58/63 (47.9/52.1)	95/354 (21.2/78.8)	<0.001

Note: Grey background indicates significant difference and yellow incorrect answers with significant difference.

- Pathologies caused by HPV in men (*Table 6.*):

Table 6. Pathologies caused by HPV in men based on sex and school-type.

Pathology	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
no pathology	43/366 (10.5/89.5)	113/488 (18.8/81.2)	<0.001	9/112 (7.4/92.6)	68/381 (15.1/84.9)	0.028
prostate cancer	56/353 (13.7/86.3)	113/488 (18.8/81.2)	0.033	15/106 (12.4/87.6)	63/386 (14.0/86.0)	0.642
head-neck cancer	7/402 (1.7/98.3)	16/585 (2.7/97.3)	0.320	2/119 (1.7/96.7)	0/449 (0.0/100.0)	0.006
"I don't know"	253/156 (61.9/38.1)	296/305 (49.3/50.7)	<0.001	81/40 (66.9/33.1)	267/182 (59.5/40.5)	0.134

Note: Grey background indicates significant difference and yellow incorrect answers with significant difference.

- Risk factors for HPV infection (*Table 7.*):

Table 7. Risk factors for HPV infection based on sex and school-type.

Risk factor	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
early initiation of sexual life	50/359 (12.2/87.8)	128/473 (21.3/78.7)	<0.001	12/109 (9.1/90.9)	75/374 (16.7/83.3)	0.065
promiscuity	152/257 (37.2/62.8)	339/262 (56.4/43.6)	<0.001	30/91 (24.8/75.2)	266/183 (59.2/40.8)	<0.001
promiscuity of partner	97/312 (23.7/76.3)	233/368 (38.8/61.2)	<0.001	22/99 (18.2/81.8)	180/359 (40.1/59.9)	<0.001
unprotected sex	132/277 (32.3/67.7)	319/282 (53.1/46.9)	<0.001	30/91 (24.8/75.2)	229/220 (51.0/49.0)	<0.001
smoking	60/349 (14.7/85.3)	68/533 (11.3/88.7)	0.116	17/104 (14.0/86.0)	48/401 (10.7/89.3)	0.302
"I don't know"	176/233 (43.0/57.0)	154/447 (25.6/74.4)	<0.001	70/51 (57.9/42.1)	124/325 (27.6/72.4)	<0.001

Note: Grey background indicates significant difference and yellow incorrect answers.

- Prevention of HPV infection (*Table 8.*):

Table 8. Prevention of HPV infection based on sex and school-type.

Method	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
HPV vaccine	150/259 (36.7/63.3)	422/179 (70.2/29.8)	<0.001	42/79 (34.7/65.3)	316/133 (70.4/29.6)	<0.001
screening	154/255 (37.7/62.3)	368/233 (61.2/38.8)	<0.001	41/80 (33.9/66.1)	271/178 (60.4/39.6)	<0.001
safe sex	139/270 (34.0/66.0)	312/289 (51.9/48.1)	<0.001	33/88 (27.3/72.7)	241/208 (53.7/46.3)	<0.001
monogamy	25/384 (6.1/93.9)	63/538 (10.5/89.5)	0.016	9/112 (11.6/88.4)	54/395 (12.0/88.0)	0.153
"I don't know"	143/266 (35.0/65.0)	83/518 (13.8/86.2)	<0.001	57/64 (47.1/52.9)	70/379 (15.6/84.4)	<0.001

Note: Grey background indicates significant difference.

- Source of information on cervical cancer/HPV infection (*Table 9.*):

Table 9. Source of information on cervical cancer/HPV infection

Source of information	N (%)
family and friends	438 (27.7%)
internet	404 (25.6%)
TV, radio	344 (21.8%)
gynecologist	273 (17.3%)
other	229 (14.5%)
GP	216 (13.7%)
specialist nurse	203 (12.8%)
print media, book	158 (10.0%)
other health care worker	120 (7.6%)

Attitude towards HPV vaccination

- Awareness of the HPV vaccine (*Table 10.*):

Table 10. Awareness of the HPV vaccine based on sex and school-type.

Heard of the vaccine	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
"I don't know"	1 (0.3)	16 (2.8)	<0.001	0 (0.0)	14 (3.2)	<0.001
yes	187 (57.5)	493 (85.9)		40 (47.6)	379 (87.5)	
no	137 (42.2)	65 (11.3)		44 (52.4)	40 (9.2)	

Note: Grey background indicates significant difference.

- HPV vaccination status (*Table 11.*):

Table 11. HPV vaccination status based on sex and school-type.

Has been vaccinated	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
yes	23 (8.2)	117 (22.1)	<0.001	3 (5.5)	131 (33.1)	<0.001
no	238 (85.0)	339 (64.1)		64 (87.7)	212 (53.5)	
no, but would like to be	19 (6.8)	13,8 (73.0)		5 (6.8)	53 (13.4)	

Note: Grey background indicates significant difference.

- Self-perceived risk of HPV infection (*Table 12.)*:

Table 12. Self-perceived risk of HPV infection based on sex and school-type.

Self-perceived risk of HPV infection	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
yes	29 (8.4)	130 (23.9)	<0.001	11 (10.6)	78 (18.8)	<0.076
no	144 (43.4)	238 (43.8)		43 (41.3)	176 (42.5)	
"I don't know"	160 (48.2)	176 (32.4)		43 (41.3)	176 (42.5)	

Note: Grey background indicates significant difference.

- Attitude towards the HPV vaccine based on sex and school-type (*Table 13.*):

Table 13. Attitude towards the HPV vaccine based on sex and school-type.

Factor	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
Vaccinate future child						
yes	157 (45.5)	324 (58.9)	<0.001	44 (42.3)	253 (61.7)	0.002
no	110 (31.9)	87 (15.8)		28 (26.9)	69 (16.8)	
"I don't know"	78 (22.6)	139 (25.3)		32 (30.8)	88 (21.5)	
Mandatory vaccination						
yes	93 (27.0)	247 (44.0)	<0.001	21 (20.4)	193 (45.8)	<0.001
no	118 (34.3)	186 (33.1)		41 (39.8)	125 (29.7)	
"I don't know"	133 (38.7)	129 (23.0)		41 (39.8)	103 (24.5)	
Vaccination after starting sex life						
yes	187 (54.8)	409 (72.4)	<0.001	50 (46.3)	301 (70.2)	<0.001
no	50 (14.7)	54 (9.6)		8 (7.4)	41 (9.6)	
"I don't know"	104 (30.5)	102 (18.1)		50 (46.3)	87 (20.3)	
Vaccination of males						
yes	84 (25.0)	265 (47.2)	<0.001	23 (20.9)	156 (37.3)	0.005
no	93 (27.7)	99 (17.6)		29 (26.4)	89 (21.3)	
"I don't know"	159 (47.3)	197 (35.1)		58 (52.7)	173 (41.4)	
Efficacy of the vaccine						
trusts it	66 (21.7)	130 (24.9)	<0.001	20 (23.5)	110 (27.6)	0.400
trusts it but with doubts	169 (55.6)	327 (62.5)		52 (61.2)	247 (61.9)	
no trust in it	69 (22.7)	66 (12.3)		13 (15.3)	42 (10.5)	

Note: Grey background indicates significant difference.

- Discouraging factors for vaccination (*Table 14.*):

Table 14. Discouraging factors for vaccination based on sex and school-type.

Discouraging factor	Vocational school		χ^2-test, p-value	Grammar school		χ^2-test, p-value
	Male yes, n (%)	Female yes, n (%)		Male yes, n (%)	Female yes, n (%)	
adverse effects	105/304 (25.7/74.3)	200/401 (33.3/66.7)	0.010	27/94 (22.3/77.7)	156/293 (34.7/65.3)	0.009
fear	27/382 (6.6/93.4)	67/534 (11.1/88.9)	0.015	11/110 (9.1/90.9)	59/390 (13.1/86.9)	0.228
pain	19/390 (4.6/95.4)	46/555 (7.7/92.3)	0.056	5/116 (4.1/95.9)	33/416 (7.3/92.7)	0.208
other	77/332 (18.8/81.2)	239/362 (39.8/60.2)	<0.001	16/105 (13.2/86.8)	126/323 (28.1/71.9)	<0.001

Note: Grey background indicates significant difference.

- Attitude towards the HPV vaccine of vaccinated students (*Table 15.*):

Table 15. Attitude towards the HPV vaccine of vaccinated students.

Variables		HPV vaccinated students, n (%)			p-value
		Yes	No	No, but wants to be vaccinated	
HPV vaccinated family member *(yes)*	male	20 (86.9)	19 (13.1)	4 (50.0)	<0.001
	female	165 (78.9)	36 (8.7)	14 (18.4)	<0.001
heard of the vaccine *(yes)*	male	21 (84.0)	151 (53.7)	14 (63.6)	0.011
	female	242 (98.4)	463 (85.0)	818 (89.2)	<0.001
self-perceived risk of HPV infection *(yes)*	male	8 (42.1)	19 (11.4)	4 (33.3)	<0.001
	female	48 (27.1)	101 (29.8)	41 (55.4)	<0.001
would vaccinate future child *(yes)*	male	21 (84.0)	107 (49.1)	18 (78.3)	<0.001
	female	229 (98.2)	201 (58.8)	108 (96.4)	<0.001
mandatory vaccination *(yes)*	male	17 (68.0)	55 (30.5)	12 (70.6)	<0.001
	female	163 (76.9)	157 (40.3)	94 (86.2)	<0.001
efficacy of vaccine after starting sex life *(yes)*	male	17 (80.9)	149 (77.2)	13 (92.8)	0.371
	female	199 (91.7)	354 (83.7)	102 (99.0)	<0,001
vaccination of males *(yes)*	male	15 (78.9)	54 (36.7)	11 (73.3)	<0.001
	female	110 (74.8)	206 (60.9)	69 (85.2)	<0.001
trusts the efficacy of the vaccine *(yes)*	male	21 (87.5)	190 (76.0)	12 (66.7)	0.271
	female	233 (97.4)	401 (82.2)	117 (97.5)	<0.001

Note: Grey background indicates significant difference.

Factors influencing attitude towards vaccination

- Socio-demographic and lifestyle factors related to the attitude score (*Table 16.*):

Table 16. Socio-demographic and lifestyle factors related to the attitude score.

Factors	N	Rank		Statistical tests		
		"no"	"yes"	Mann-Whitney U	Wilcoxon W	p
wishes to pursue education	1122	504.85	577.00	92 508.5	121 669.5	0.002
work	1413	681.60	727.61	230 790.5	431 451.5	0.034
diet	1465	674.08	737.18	162 453.5	199 038.5	0.018
wishes to have children	1220	539.07	616.05	56 094.0	697 372.0	0.047
reading journals	1465	720.28	739.22	68 266.0	200 144.0	0.011
reading books	1465	713.67	768.55	263 185.5	396 571.5	0.017
TV	1465	652.95	749.63	132 666.5	164 544.5	<0.001
radio	1465	664.72	760.72	191 500.0	281 176.0	<0.001

- Knowledge about the disease related to the attitude score (*Table 17.*):

Table 17. Knowledge about the disease related to the attitude score.

Factors	N	Rank		Statistical tests		
		"no"	"yes"	Mann-Whitney U	Wilcoxon W	p
early sex life as risk factor for cervical cancer	1465	715.04	810.03	185 874.5	224 377.5	<0.001
promiscuity as risk factor for cervical cancer	1487	642.67	811.98	328 817.0	634 970.0	<0.001
unprotected sex as risk factor for cervical cancer	1465	637.77	849.48	342 336.0	559 806.0	<0.001
screening as means of prevention of cervical cancer	1465	643.59	767.16	250 862.5	813 192.5	<0.001
vaccination as means of prevention of cervical cancer	1465	544.37	827.22	330 437.5	808 190.5	<0.001
safe sex as means of prevention of cervical cancer	1465	684.02	819.92	293 263.0	432 919.0	<0.001
HPV identified as an STI	1465	584.41	843.87	355 625.0	709 005.0	<0.001
transmission of HPV via skin contact	1465	725.27	943.00	47 658.0	49 036.0	<0.001
vertical transmission of HPV	1465	719.32	839.33	126 140.5	140 168.5	<0.001
condyloma as a symptom	1465	705.56	899.79	164 728.5	186 265.5	<0.001
irritation as symptom	1465	714.80	866.28	136 890.0	152 466.0	<0.001
vaginal discharge as symptom	1465	696.06	882.03	214 183.5	256 669.5	<0.001
dyspareunia as symptom	1465	689.34	897.00	228 689.5	276 275.5	<0.001
bleeding as symptom	1465	704.93	888.49	173 822.0	199 022.0	<0.001
infertility as symptom	1465	699.19	931.73	175 667.5	198 458.5	<0.001
safe sex as means of prevention of HPV infection	1465	629.70	842.24	345 849.5	599 677.5	<0.001
monogamy as means of prevention of HPV infection	1465	719.36	852.55	116 558.0	127 883.0	<0.001
vaccination as means of prevention of HPV infection	1465	547.62	845.08	354 391.5	771 560.5	<0.001
screening as means of prevention of HPV infection	1465	630.07	814.18	331 027.5	666 817.5	<0.001
quitting smoking as means of prevention of HPV infection	1465	725.85	799.06	103 970.0	114 266.0	0.048

Note: Yellow background indicates incorrect answers.

Predictors of the attitude score

Our multi-variable model contained the socio-demographic and lifestyle factors presented in *Table 16.* As the indicator of knowledge about the disease, we used the items that discussed the STI origins of cervical cancer and the means of its prevention. In our binary logistic regression, only the sex of the responder, the STI origins of the disease and the awareness of the means of prevention were proven to be the predictors of the attitude score, thus vaccine acceptance (*Table 18.*).

Table 18. Predictors of attitude scores > 7 (median).

Predictor		OR	CI 95%	p-value
Sex (ref.: males)		2.02	1.41-2.90	<0.001
Place of residence (ref.: countryside/dormitory/rents flat)		0.90	0.65-1.25	0.556
Pursuit of education (ref.: does not wish to pursue education)		1.18	0.81-1.72	0.372
Work (ref.: does not work)		1.02	0.75-1.39	0.881
Diet (ref.: no diet)		1.21	0.82-1.77	0.332
Reads book (ref.: does not read books regularly)		1.04	1.04-1.44	0.809
Reads newspapers (ref.: does not read newspapers regularly)		1.39	0.91-2.12	0.118
TV (ref.: does not watch TV regularly)		0.83	0.55-1.24	0.374
Radio (ref.: does not listen to radio regularly)		1.16	0.83-1.62	0.384
Wishes to have children (ref.: does not wish to have children)		1.46	0.84-2.51	0.172
Cervical cancer is an STI (ref.: does not know it is an STI)		2.70	1.97-3.70	<0.001
Prevention of cervical cancer (ref.: no correct answer)	1 correct answer	3.03	1.51-6.10	0.002
	2 correct answers	4.44	2.20-8.96	<0.001
	3 correct answers	3.85	1.84-8.04	<0.001

Note: Grey background indicates significant difference. Nagelkerke R^2 =17,7%.

Conclusions

The awareness and knowledge about cervical cancer/HPV infection among adolescents is insufficient worldwide, however, it is difficult to make objective comparisons between distinct populations. In our country, the knowledge of the disease has been studied in various samples already, both among females and males, and similar tendencies were recorded. Our results of the high school graduates from Budapest were mostly in line with these previous findings, which supports the fact that young Hungarians need further education concerning HPV infection and its prevention.

Several studies, including our own, conducted among high school students, have shown that women have a higher knowledge about the disease. While it is not entirely surprising that women possess more information about cervical cancer, as they are the ones affected by it, the lack of knowledge of men regarding pathologies in males is an indisputable indicator of their poor awareness of the virus and the ineffectiveness of health education programs targeting the youth.

Despite their low level of knowledge, our sample was mostly positive towards the HPV vaccine, as the majority of students would vaccinate their future children. Mandatory vaccination and vaccination of males was less popular however. Deterrents of vaccine

acceptance were the fear of adverse effects and the price of the vaccine; the latter being partially solved by offering the vaccine to 7th grade school girls free of charge since the fall of 2014. Extending free vaccination to a wider population could positively influence vaccine coverage, as could fear of adverse effects be reduced by health education programs.

The main sources of information of the high school graduates from our sample were family and friends, the internet and "traditional" media (TV, radio). Several international and domestic studies have pointed out the importance and efficacy of school-based health education programs. This also underlines the role of these programs, specialist nurses and school doctors. Of course, gynecologists, GPs etc. are also supposed to provide the population with regular and up to date information about the viral infection. Furthermore, as mass media was also indicated as a source of information for high school students, its responsibility in health education is to be mentioned. Having uncovered the lack of knowledge among the youth, the synergic collaboration of the previous actors, and the creation of extended and targeted health education programs would be necessary.

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