



# HPV-AHEAD: role of HPV infection and other co-factors in the aetiology of head and neck cancer (partial Belgian results)

Collaborative project Seventh Framework Programme - EU

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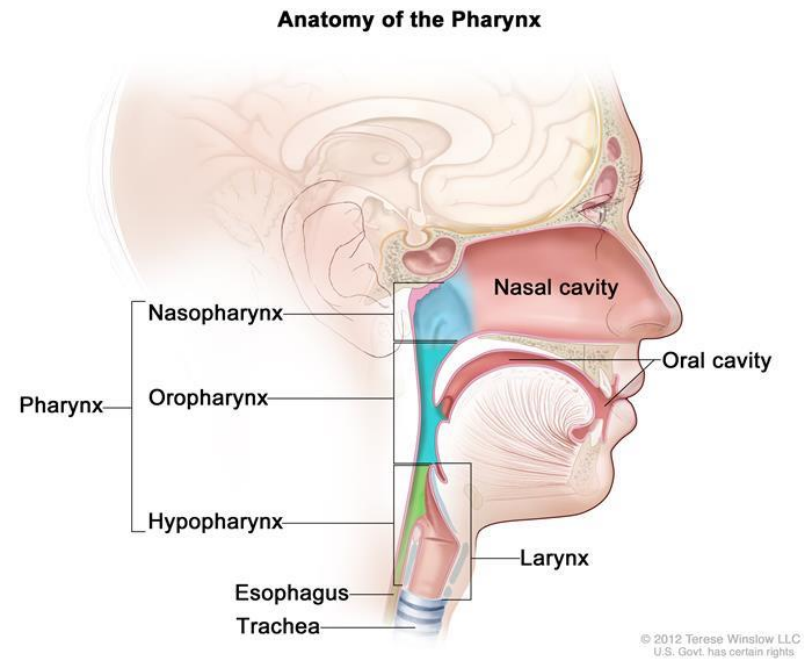
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# HPV-AHEAD

- Coordinator: Dr. Massimo Tommasino (IARC)
- List of participants:
  - International Agency for Research on Cancer (IARC)
  - Deutsches Krebsforschungszentrum (DKFZ)
  - Fundació Privada Institut D'Investigació Biomedica de Bellvitge (IDIBELL)
  - University of Antwerp (UA)
  - Istituto Europeo di Oncologia (IEO)
  - Aristotle University of Thessaloniki (AUTH)
  - German Institute of Human Nutrition (DIfE)
  - Universitätsklinikum Heidelberg (UKH)
  - MTM Laboratories AG (MTM)

# Rationale

## Head & Neck Cancer (HNC):



- \* 6<sup>th</sup> most common malignancy worldwide (550 000 incident cases, 300 000 deaths/Y)
- \* 50% oral cavity, 30% larynx, 10% oropharynx
- \* risk factors: alcohol, smoking, poor oral hygiene, genetic features, HPV
- \* 25% HPV induced; oropharyngeal ca: 10-90% HPV associated
  - > better response to treatment, improved prognosis
  - > steady increase in the last decades (oropharyngeal ca)

# Objectives (for the Belgian contribution)

\* ...

\* To conduct epidemiological studies in European and Indian populations in order to establish the overall proportion and type distribution of HPV-positive HNC at different anatomical sites in different geographical regions as well as the trend of the proportion of HPV-positive HNC in recent decades

\* To determine whether HPV infections interact with additional HNC risk factors in European and Indian populations

\* To perform retrospective studies using the follow-up information on HNC patients (including registry linkages) to establish whether HPV positivity confers a better prognosis and survival.

\* ...

# WP2: Collection of human specimens in European and Indian centres

- EPIC, ARCAGE, IDIBELL, HPV-AHEAD (Belgium & Italy)

→ Belgium: 1300 cases to be retrieved



invasive tumours of oral cavity, oropharynx, hypopharynx and larynx

- archived paraffin embedded tissue blocks, fixed in neutral buffered formalin (no Bouin fixation)
- epidemiological and clinical data (see next slides)

Form and participant identification			
Serial code:	<input type="text"/>		
Hospital number	<input type="text"/>		
Date of interview (dd/mm/yyyy):	<input type="text"/> /20 <input type="text"/>		
Sex: (1: Male; 2: Female; 9: Unknown)	<input type="text"/>		
Marital status: (1: Never married; 2: Married; 3: Widowed; 4: Divorced; 5: Separated; 6: Living as married; 9: Unknown)	<input type="text"/>		
If applicable, age at 1 <sup>st</sup> marriage (in years / 88 = Not applicable; 99 = Unknown):	<input type="text"/>		
For women, age at first pregnancy (in years / 88 = Not applicable; 99 = Unknown):	<input type="text"/>		
For women, history of genital premalignant lesions: (1: Never; 2: Currently; 3: In the past; 9: Unknown)	<input type="text"/>		
For women, history of cervical cancer: (1: Never; 2: Currently; 3: In the past; 9: Unknown)	<input type="text"/>		
Age (in years / 99 = Unknown):	<input type="text"/>		
Weight (in Kg):	<input type="text"/>		
Code of the staff:	<input type="text"/>		

Risk factor – Alcohol drinking			
	If response 2 or 3 age at beginning (in years):	If response 2 or 3 age at stopping (in years):	How many drink do you take per week:
Drinker of alcohol beverages: (1: Never; 2: Current; 3: Past; 9: Unknown)	<input type="text"/>	<input type="text"/>	<input type="text"/>
Type of the beverage (1: wine; 2: liquors, others)	<input type="text"/>	<input type="text"/>	<input type="text"/>

Risk factor – Smoking			
	If response 2 or 3 age at beginning (in years):	If response 2 or 3 age at stopping (in years):	How many times per day:
Smoker: (1: Never; 2: Current; 3: Past; 9: Unknown)	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cigarette:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cigar:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Pipe:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Others: _____	<input type="text"/>	<input type="text"/>	<input type="text"/>

Clinical details	
Date of diagnosis (dd/mm/yyyy):	<input type="text"/> /20 <input type="text"/>
ICD-O code of the primary site: (ICDO-3 <sup>rd</sup> version)	<input type="text"/> - <input type="text"/>
ICD-O histology code of the primary site:	<input type="text"/> - <input type="text"/>
If available, ICD-O code of the 2 <sup>nd</sup> primary site at baseline:	<input type="text"/> - <input type="text"/>

If available, ICD-O histology code of the 2 <sup>nd</sup> primary site at baseline:	<input type="text"/> - <input type="text"/>
Size of the tumor (max diameter-mm)	<input type="text"/>
Ipsilateral neck nodes: (1: No; 2: Present; 9: Unknown)	<input type="text"/>
Contralateral neck nodes: (1: No; 2: Present; 9: Unknown)	<input type="text"/>
Stage: (TNM 2010)	
T-Status: (1: T1; 2: T2; 3: T3; 4: T4a; 5: T4b; 9: Tx)	C <input type="text"/> P <input type="text"/>
N-Status: (0: N0; 1: N1; 2: N2; 3: N3; 9: Nx)	C <input type="text"/> P <input type="text"/>
M-Status: (0: M0; 1: M1; 9: Unknown)	C <input type="text"/> P <input type="text"/>
Composite stage: (1: I; 2: II; 3: III; 4: IVA; 5: IVB; 6: IVC; 9: Unknown)	C <input type="text"/> P <input type="text"/>

Treatment details	
Previous treatment:	<input type="text"/>
Surgery: (1: No; 2: Yes; 9: Unknown)	<input type="text"/>
Radiotherapy (RT): (1: No; 2: Yes; 9: Unknown)	<input type="text"/>
Chemotherapy (C): (1: No; 2: Yes; 9: Unknown)	<input type="text"/>
Intent to treat: (0: No treatment required; 1: Radical; 2: Palliative; 3: Symptomatic; 4: Not taken; 9: Unknown)	<input type="text"/>

Radiotherapy	
Radiotherapy prescribed: (1: No; 2: Yes; 9: Unknown)	<input type="text"/>
Type: (1: No; 2: External beam RT (EBRT); 2: Brachytherapy (BT); 3: EBRT + BT)	<input type="text"/>
Date started (dd/mm/yyyy): <input type="text"/> /20 <input type="text"/>	Date completed: <input type="text"/> /20 <input type="text"/>
Dose prescribed (Gy): EBRT: <input type="text"/> fraction: <input type="text"/>	BT: <input type="text"/> fraction: <input type="text"/>
Dose completed (Gy): EBRT: <input type="text"/> fraction: <input type="text"/>	BT: <input type="text"/> fraction: <input type="text"/>

Surgery	
Date of surgery (dd/mm/yyyy):	<input type="text"/> /20 <input type="text"/>
Primary tumour: (1: No; 2: Wide excision (WE); 3: Partial glossectomy; 4: Total glossectomy; 5: Laryngectomy; 6: WE + Hemimandibulectomy; 7: Other (specify: _____); 9: unknown)	<input type="text"/>
Neck dissection: (1: No; 2: Ipsilateral; 3: Contralateral; 4: Bilateral; 9: Unknown)	<input type="text"/>
Post operative findings	
Positive margin: (1: No; 2: Yes; 3: Not applicable; 9: Unknown)	<input type="text"/>
Other prognostic factors: (1: No; 2: Yes; 3: Not applicable; 9: Unknown)	<input type="text"/>
If yes, metastasis in lymph nodes: (1: No; 2: Yes; 3: Not applicable; 9: Unknown)	<input type="text"/>
If yes, number of nodes with metastasis:	<input type="text"/>
Lowest positive metastatic lymph nodes level: (1: level I; 2: level II; 3: level III; 4: level IV; 5: level V; 9: Unknown)	<input type="text"/>

!4	Perinodal tumour spread: (1: No; 2: Present; 3: Not applicable; 9: Unknown)	<input type="checkbox"/>
!5	Perineural tumour spread: (1: No; 2: Present; 3: Not applicable; 9: Unknown)	<input type="checkbox"/>
!6	Vascular/lymphatic emboli: (1: No; 2: Present; 3: Not applicable; 9: Unknown)	<input type="checkbox"/>
!7	Soft tissue infiltration: (1: No; 2: Present; 3: Not applicable; 9: Unknown)	<input type="checkbox"/>

<b>Chemotherapy</b>		
Chemotherapy prescribed: (1: No; 2: Yes; 9: Unknown)	<input type="checkbox"/>	
Sequencing of chemo: (1: Anterior; 2: Concurrent; 3: Anterior+concurrent; 4: Sandwich; 5: Adjuvant; 6: Palliative)	<input type="checkbox"/>	
Drugs used: (1: Mtx; 2: CDDP; 3: CDDP+ 5FU; 4: Cetuximab + CDDP; 5: Other (specify: _____))	<input type="checkbox"/>	
Number of cycles:	<input type="text"/>	
Date started (dd/mm/yyyy):	<input type="text"/>	
Date completed (dd/mm/yyyy):	<input type="text"/>	

<b>Treatment summary</b>		
Type of treatment: (1: Radical; 2: Palliative)	<input type="checkbox"/>	
Recommended treatment: (1: RT; 2: Surgery; 3: Chemo; 4: S+RT; 5: C+RT; 6: C+S; 7: C+RT+S; 9: Unknown)	<input type="checkbox"/>	
Treatment received: (1: RT; 2: Surgery; 3: Chemo; 4: S+RT; 5: C+RT; 6: C+S; 7: C+RT+S; 9: Unknown)	<input type="checkbox"/>	
Treatment completed: (1: No; 1: Incomplete treatment; 2: Complete treatment)	<input type="checkbox"/>	
Date completion of all (dd/mm/yyyy):	<input type="text"/>	

<b>Response</b>		
Primary site: (1: No response; 2: Partial response; 3: Complete response; 9: Unknown)	<input type="checkbox"/>	
Nodal site: (1: No response; 2: Partial response; 3: Complete response; 9: Unknown)	<input type="checkbox"/>	
Date of evaluation (dd/mm/yyyy):	<input type="text"/>	

	First recurrence	Second recurrence
Local: (1: No; 2: Infield failure; 3: Margin failure; 4: Outside failure; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>
Regional: (1: No; 2: Infield failure; 3: Margin failure; 4: Outside failure; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>
Distant: (1: No; 2: Infield failure; 3: Margin failure; 4: Outside failure; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>
Ipsilateral neck nodes: (1: No; 2: Yes; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>
Contralateral neck nodes: (1: No; 2: Yes; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>
Date of recurrence (dd/mm/yyyy):	<input type="text"/>	<input type="text"/>
Salvage treatment for residual/recurrent disease:		
1. Surgery: (1: No; 2: Yes; 3: Not applicable; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>
2. Radiotherapy: (1: No; 2: Yes; 3: Not applicable; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>

3. Chemotherapy: (1: No; 2: Yes; 3: Not applicable; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>
4. Date of completion of salvage treatment (dd/mm/yyyy):	<input type="text"/>	<input type="text"/>
5. Response to treatment: (1: No response; 2: Complete response; 3: Partial response; 9: Unknown)	<input type="checkbox"/>	<input type="checkbox"/>

<b>Second primary</b>		
Second primary site ICD-O code:	<input type="text"/>	<input type="text"/>
Incidence date(dd/mm/yyyy):	<input type="text"/>	<input type="text"/>

<b>Status at last follow-up</b>		
Follow-up date (dd/mm/yyyy):	<input type="text"/>	
Status: (1: Alive with no evidence of disease; 2: Alive with evidence of disease; 3: Dead due to disease; 4: Dead due to other cause with evidence of disease; 5: Dead due other cause with no evidence of disease; 6: Dead due to other cause and evidence of disease unknown; 7: Dead cause not known; 9: Unknown)	<input type="checkbox"/>	
If dead, indicate the date of death (dd/mm/yyyy):	<input type="text"/>	
If dead, indicate the cause of death (ICD-10):	<input type="text"/>	

<b>Biomarker analysis</b>		
PTEN: (1: cytoplasm; 2: nucleus; 3: cytoplasm/nucleus; 9: Unknown)	<input type="checkbox"/>	
Intensity staining (1: weak; 2: moderate; 3: strong; 9: Unknown)	<input type="checkbox"/>	
AKT: (1: cytoplasm; 2: nucleus; 3: cytoplasm/nucleus; 9: Unknown)	<input type="checkbox"/>	
Intensity staining (1: weak; 2: moderate; 3: strong; 9: Unknown)	<input type="checkbox"/>	
AKT: (1: cytoplasm; 9: Unknown)	<input type="checkbox"/>	
Intensity staining (1: weak; 2: moderate; 3: strong; 9: Unknown)	<input type="checkbox"/>	
Other 1: (1: cytoplasm; 2: nucleus; 3: cytoplasm/nucleus; 9: Unknown)	<input type="checkbox"/>	
Intensity staining (1: weak; 2: moderate; 3: strong; 9: Unknown)	<input type="checkbox"/>	
Other 2: (1: cytoplasm; 2: nucleus; 3: cytoplasm/nucleus; 9: Unknown)	<input type="checkbox"/>	
Intensity staining (1: weak; 2: moderate; 3: strong; 9: Unknown)	<input type="checkbox"/>	

<b>Remarks</b>

# WP3(+6): Laboratory analysis to determine the HPV-positivity

HNC tissue blocks → 10-31 different sections

Thickness	5μ	5μ	3x10μ	3x10μ	5μ	5μ	5μ	5μ	5μ
Sections	S1	S2	T1	T2	S9	S10*	S11-30	S31	

S1/10/31: coated slide for histology HE (3 pathologists independently)

S2/9: coated slide for p16 and Ki67 (surrogate biomarker of viral infection)

S11-30: coated slide for immunohistochemical analyses (cellular protein expression: SUMO, Dok-1, p50-NFκB1, p52-NFκB2, RelA, RelB, IκBα, IκBε, TRAF2, TRAF3, A20, CYLD, PTEN, AKT, mTOR)

T1: tube for RNA extraction – expression of E6\*I-sliced transcripts (RT-PCR, 70bp)

T2: tube for DNA extraction – HPV genotyping (multiplex PCR – Luminex assay: 19 hrHPV + 2 lrHPV)



# WP4: Epidemiology of HPV-positive and -negative HNC

- determination of the distribution of HPV-positive HNC of the various anatomical sites in different geographical regions in Europe and India
- conduction of a comprehensive time trend analysis of HPV-negative and HPV-positive HNC
- assessment of the extent to which HPV infection correlates with occurrence of second primaries and survival

# RESULTS: Test positivity and association RNA/immunocytochemistry

- 1) HPV DNA analysis
- 2) HPV RNA analysis
- 3) p16 + Ki67 dual staining

## HPV DNA analysis (N=525)

HPV type	n	%		remark
HPV 16 single	54	74,0%		
HPV 16 multi	2	2,7%	76,7%	16/18/31 16/35
HPV 18	6	8,2%		
HPV 31	4	5,5%		
HPV 33	1	1,4%		
HPV 35	2	2,7%		
HPV 51	1	1,4%		
HPV 52	1	1,4%		
HPV 6	2	2,7%		
<b>HPV + (13,9%)</b>	<b>73/525</b>	<b>100%</b>		

## HPV16 DNA vs RNA analysis (N=49)

	DNA				
RNA HPV16	HPV16	other hr HPV	lr HPV	negative	
+	14 (60,9%)	0	0	0	14
-	9 (39,1%)	8	1	17 (100%)	35
	23	8	1	17	49

# Immunohistochemistry: p16 and Ki67 dual staining result vs RNA HPV16

Dual stain	RNA HPV16 +	RNA HPV16 -	
+	13	7	20
-	0	27	27
	13	34	47

\* N00066: no tumor, high-grade lesion, DS-positive, p16 diffuse

**RNA HPV16:**            Sensitivity: 13/13 (100%)  
                                 Specificity: 27/34 (79.4%)

All tested samples were Ki67+

# p16 staining pattern vs RNA HPV16 (dual staining)

Staining pattern	RNA HPV16 +	RNA HPV16 -	
diffuse	13	6	19
diffuse/focal	0	1	1
focal	0	2	2
negative	0	25	25
	13	34	47

'diffuse' as cut-off:

sens 13/13 (100%)

spec 28/34 (82.4%)

cut-off restricted to 'diffuse':

increases specificity without reducing sensitivity

# p16 staining intensity vs RNA HPV16 (dual staining)

Staining intensity	RNA HPV16 +	RNA HPV16 -	5
strong	8	4	12
moderate	4	4	8
weak	1	1	2
N/A	0	25	25
	13	34	47

Cut-off must be at '**weak+**' for max sens 13/13 (100%)  
spec 25/34 (73.5%)

*Staining intensity* not useful in finetuning the cut-off for p16,  
*staining pattern* (cut-off at 'diffuse') however is useful.

# CONCLUSION: Test positivity/ immunohistochemistry

- 13,9% of tested BE invasive H&N cancers are HPV DNA+, of which 76,7% **HPV16** DNA+
- 60.9% of HPV16 **DNA+** patients are also HPV16 **RNA+**
- p16 staining **pattern** shows good accuracy:
  - ‘diffuse’ as cut-off: sens 13/13 (100%) to detect HPV16 RNA+ cases  
spec 28/34 (82.4%)
- p16 staining **intensity** is not discriminative
  - ‘weak+’ needed as + criterion to maintain HPV16 RNA sensitivity at 100%
- Ki67 not needed -> **p16 monostaining** sufficient  
definition +cases: **diffuse** staining pattern



# RESULTS: Epidemiology of HPV + and – HNC

## 1) Participant identification:

- sex
- age

## 2) Risk factors:

- alcohol consumption
- cigarette smoking

## 3) Clinical details:

- primary site & histology: ICD-O
- clinical stage: TNM
- date diagnosis

## 4) Treatment details

- radiotherapy
- surgery
- chemotherapy

## 5) Status at last FU

# Participant identification

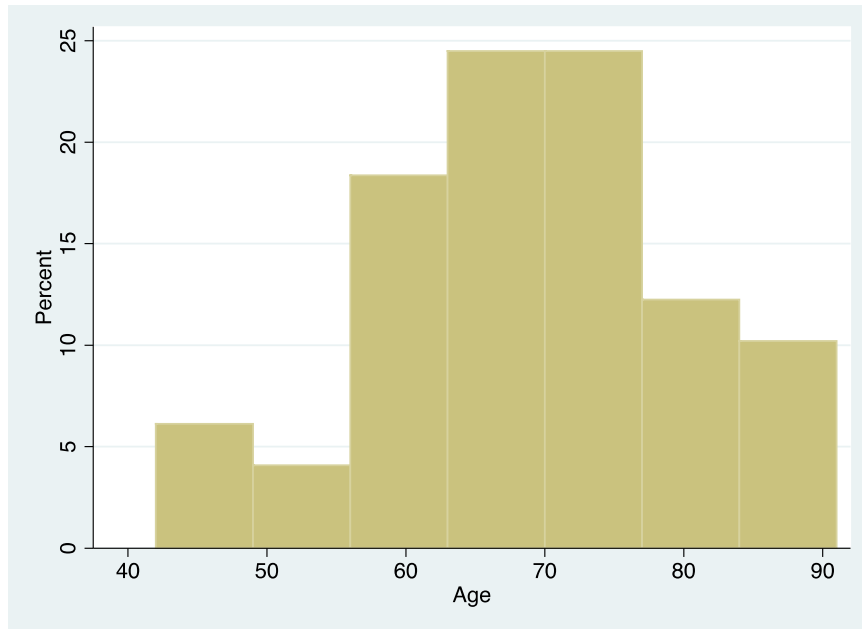
## Sex

sex	RNA HPV16 +	RNA HPV16 -	
male	12 (85.7%)	26 (74.3%)	<b>38 (77.6%)</b>
female	2 (14.3%)	7 (20%)	<b>9 (18.4%)</b>
unknown	0	2 (5.7%)	<b>2 (4.0%)</b>
	<b>14</b>	<b>35</b>	<b>49</b>

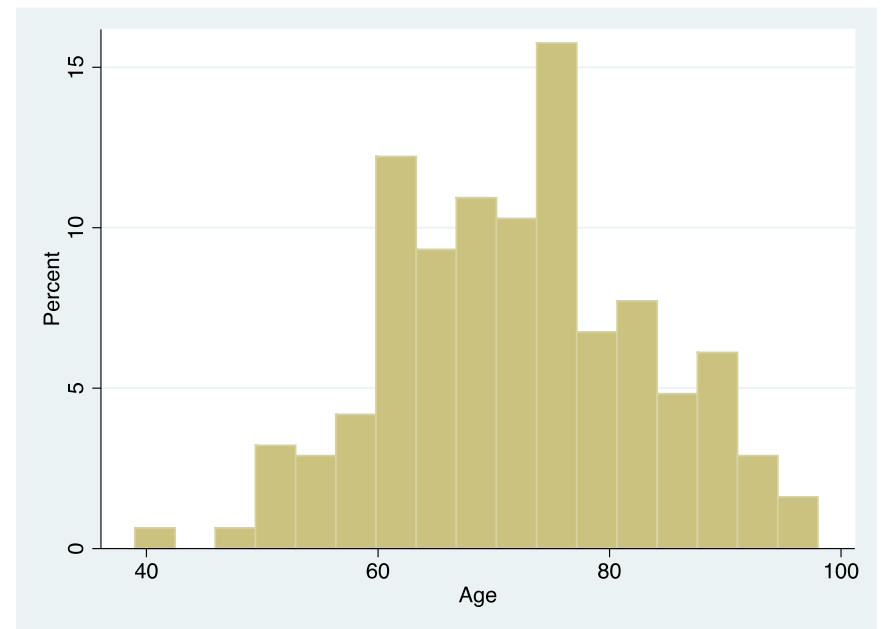
# Participant identification

## Age

HPV16 DNA+



HPV DNA negatives



# Risk factors

## Alcohol consumption

alcohol	RNA HPV16 +	RNA HPV16 -	
never	1 (7.1%)	4 (11.4%)	5
current	6 (42.9%)	12 (34.3%)	18
past	2 (14.3%)	2 (5.7%)	4
unknown	5 (35.6%)	17 (48.6%)	22
	<b>14</b>	<b>35</b>	<b>49</b>

current or past alcohol users:

88.9% of HPV16 RNA+

77.8% of HPV16 RNA-

# Risk factors

## Cigarette smoking

cigarette	RNA HPV16 +	RNA HPV16 -	
never	1 (7.1%)	5 (14.3%)	6
current	7 (50%)	10 (28.6%)	17
past	2 (14.3%)	6 (17.1%)	8
unknown	4 (28.6%)	14 (40%)	18
	14	35	49

current or past smokers of cigarettes:

90.0% of HPV16 RNA+

76.2% of HPV16 RNA-

# Clinical details

## Primary site & histology: ICD-O

grouped primary site	RNA HPV16 +	RNA HPV16 -	
oropharynx*	9 (64.3%)	8 (22.9%)	17
oral cavity	3 (21.4%)	11 (31.4%)	14
nasopharynx	0	1 (2.9%)	1
hypopharynx	1 (7.1%)	1 (2.9%)	2
larynx	0	9 (25.7%)	9
other	1 (7.1%)	5 (14.3%)	6
	14	35	49

\* Described in literature to be HPV-related

Predominant histology (both HPV16 RNA + and -):

Squamous cell carcinoma, NOS (8070/3)

\* Described in literature to be HPV-related

Detailed primary site	ICD-O	RNA HPV16 +	RNA HPV16 -	
lip	C00.1	0	2 (5.7%)	2
tongue, base*	C01	2 (14.3%)	1 (2.9%)	3
tongue, other parts	C02 (.1/.9)	0	5 (14.3%)	5
Floor of mouth	C04 (.9)	2 (14.3%)	3 (8.6%)	5
palate (hard)	C05.0	0	1 (2.9%)	1
mouth, NOS	C06.2	0	2 (5.7%)	2
Tonsil*	C09.9	7 (50%)	4 (11.4%)	11
Oropharynx*	C10 (.0/.9)	0	3 (8.6%)	3
nasopharynx	C11.0	0	1 (2.9%)	1
piriformis sinus	C12	1 (7.1%)	1 (2.9%)	2
overlapping lesion	C14.8	1 (7.1%)	0	1
ethmoidal sinus	C31.1	0	1 (2.9%)	1
larynx	C32.0/.1	0	9 (25.7%)	9
main bronchus	C34.0	0	1 (2.9%)	1
malign neopl, NOS	C80	1 (7.1)	1 (2.9%)	2
		14	35	49

# Clinical details

## Clinical stage: TNM

T-status	RNA HPV16 +	RNA HPV16 -	
T1	1 (7.7%)	7 (23.3%)	8
T2	6 (46.2%)	5 (16.7%)	11
T3	1 (7.7%)	8 (26.7%)	9
T4a	4 (30.8%)	6 (20.0%)	10
T4b	0	1 (3.3%)	1
Tx	1 (7.7%)	3 (10.0%)	4
	13	30	43



# Clinical details

## Clinical stage: TNM

N-status	RNA HPV16 +	RNA HPV16 -	
<b>N0</b>	4 (30.8%)	12 (41.4%)	<b>16</b>
<b>N1</b>	0	6 (20.7%)	<b>6</b>
<b>N2</b>	7 (53.8%)	8 (27.6%)	<b>15</b>
<b>N3</b>	1 (7.7%)	0	<b>1</b>
<b>Nx</b>	1 (7.7%)	3 (10.3%)	<b>4</b>
	<b>13</b>	<b>29</b>	<b>42</b>

### M-status:

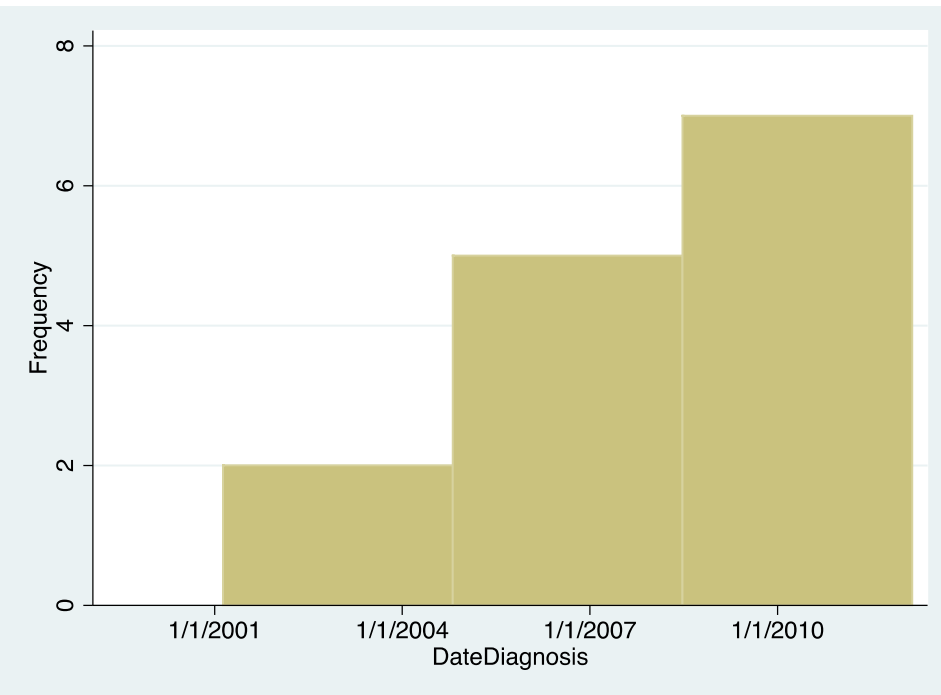
M0: (8/10) 80% versus (13/20) 65%

M1: (1/10) 10% versus (3/20) 15%

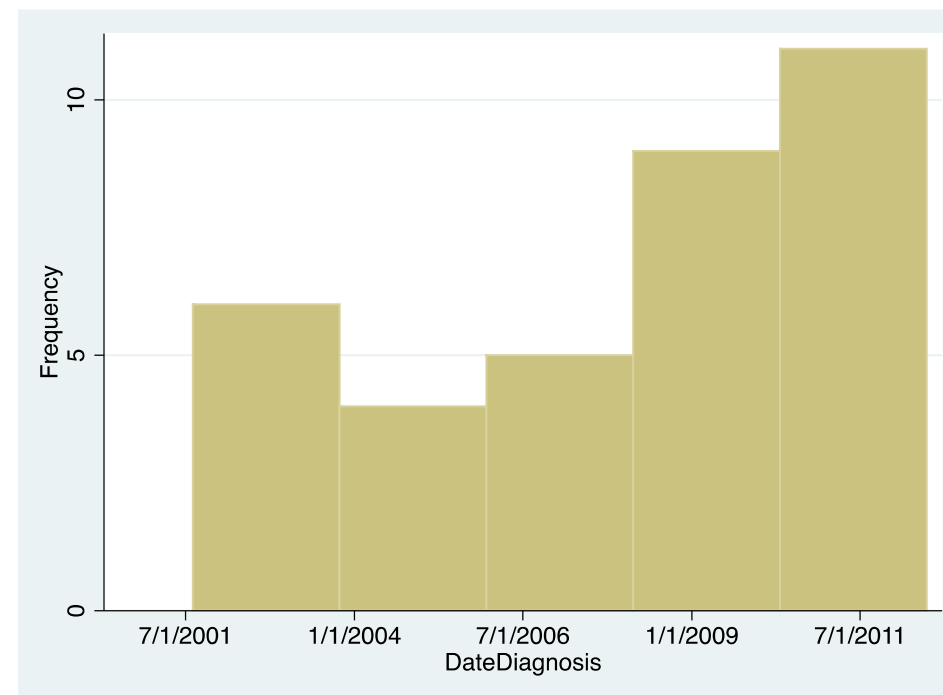
# Clinical details

## Date of diagnosis

HPV16 RNA+



HPV16 RNA -



# Treatment details

	RNA HPV16 +	RNA HPV16 -	
<b>surgery</b>	8 (57.1%)	24 (68.6%)	<b>32/49</b>
<b>radiotherapy</b>	12 (85.7%)	27 (77.1%)	<b>39/49</b>
<b>chemotherapy</b>	9 (64.3%)	13 (37.1%)	<b>22/49</b>
<b>radical</b>	11 (78.6%)	20 (57.1%)	<b>31</b>
<b>palliative</b>	2 (14.3%)	8 (22.9%)	<b>10</b>
	<b>13</b>	<b>28</b>	<b>41</b>

# Status at last FU

	RNA HPV16 +	RNA HPV16 -	
Alive, no evidence of disease	1 (7.1%)	5 (14.3%)	6
Alive, with evidence of disease	12 (85.7%)	21 (60%)	33
Death, due to disease	0	5 (14.3%)	5
Death, due to other reason, with evidence of disease	1 (7.1%)	2 (5.7%)	3
Death cause not known	0	2 (5.7%)	2
	14	35	49

92.8% of the HPV16 RNA+ H&N patients are alive, against 74.3% for the RNA- patients.

# CONCLUSION: Epidemiology of HPV + and – HNC

## HPV16 RNA+ patients (vs HPV16 RNA-):

- male (85.7% vs 74.3%)
- younger (from 40y on)
- current or past alcohol users (88.9% vs 77.8%)
- current or past cigarette smokers (90% vs 76.2%)
- oropharynx (64.3%) vs oral cavity (31.4%) / larynx (25.7%)
- squamous cell carcinoma, NOS (8070/3)

# CONCLUSION: Epidemiology of HPV + and – HNC

HPV16 RNA+ patients (vs HPV16 RNA-):

- RT & CT
- radical treatment
- 92.8% alive



Thanks for your attention!

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