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Evaluating Cervical Cancer Screening relevance in a Northern Ireland population

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Introduction

What is Cervical Cancer?	Cervical cancer arises from HPV infection, which induces premalignant cervical intraepithelial neoplasia (CIN) that can progress to malignancy.
How prevalent is Cervical cancer?	Cervical Cancer is the fourth most common cause of cancer in women in the UK, affecting an average of 3,300 women annually.
What preventative measures are in place?	Implementation of preventative schemes: Cervical Cancer Screening Programme (CCSP) includes the use of HPV vaccines and cervical screening analysis.

Key words: *Cervical, cancer, HPV, CCSP, other, vaccine, genotypes*

Hypothesis

Increasing prevalence of "*other*" non-vaccine HR-HPV genotypes contributing to new surges of pre-malignant cervical abnormalities, requiring the adjustment of the current NI Vaccination/Screening programme.

Objective

Review the increased HPV L1 antibodies in currently implemented vaccines and their relationship to the decreasing presence of HR-HPV compared to previous vaccine types and the unvaccinated population.

Method:

Part 1:

Systemic Search: Searches for relevant scientific literature were performed using USearch, PubMed and other relevant databases. Studies regarding Cervical cancer and HPV genotypes (HPV 16 &18) were included by refining searches. Additionally finding dysregulated genes (E6, E7, TP53, and Pi63) was also sourced.

Data extraction & SSPS: Figures and genomic data for HR–HPV were sourced from a personally conducted investigation within Antrim Area Hospital (AAH), investigating HPV genotype prevalence in 320 cervical samples.

Ethical approval was not required for this project as it was conducted on previously reported samples.

Results were analysed by one–sample T-test to calculate statistical significance (P Value = <0.05)

Results:

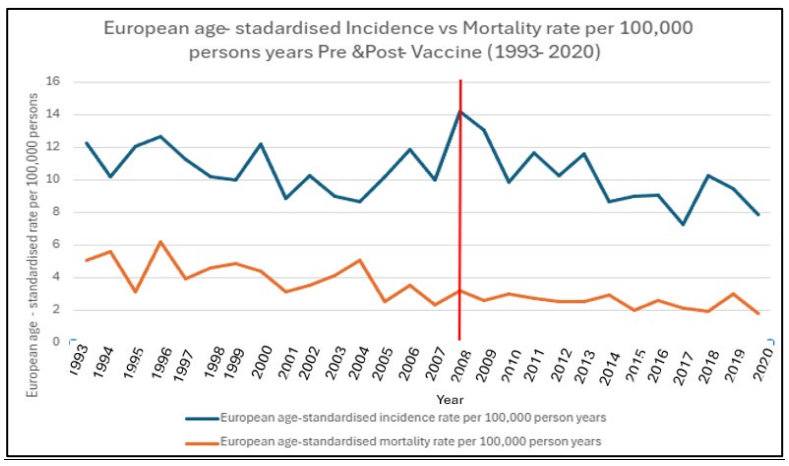


***Figure 1*: Comparison of Cervical cancer incidence and mortality rates in Northern Ireland Pre and Post introduction of HPV vaccine programme (1993-2020)** *(Red line indicates introduction of HPV*

Part 2: Manual investigation /examination of Northen Ireland Health and Social Care Trust (AAH) Cervical samples:

Step 1: Sample preparation

- *Cervical samples previously collected were vortexed & centrifuged to form a cellular pellet*
- *Supernatant was discarded and the pellet re-suspended with Phosphate Buffered Saline to optimise isolated cellular material.*

Step 2: Allplex HPV28 Detection Assay

- *Reagents were loaded: HPV extraction kit, PCR plate (Roche Diagnostics Ltd)*
- *Samples were loaded (Each run contained 40 samples)*
- *Nimbus Allplex programme was run to detect 28 HR HPV genotypes.*

Step 3: CFX96 Thermocycler

- *The 96-well plate from Allplex was covered with plastic film and placed in a CFX96 thermocycler, where PCR extraction was ran.*
- *Results were collected in table format and analysed for quantifiable graphical representation.*

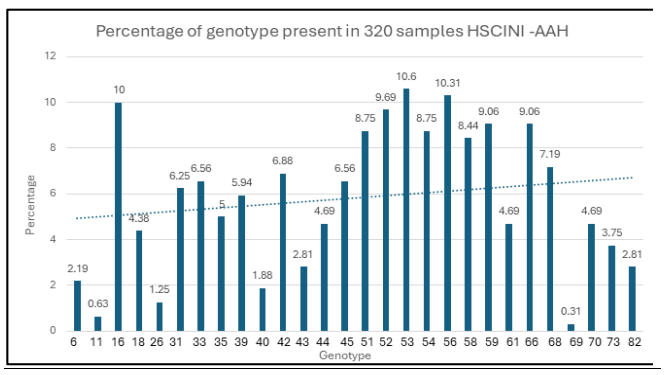


***Figure 2*: Shows the Percentage of distribution of the total HPV (HR &LR) identified in the 320 samples collected within AAH, against the average percentage** (*identified by the dotted line*).

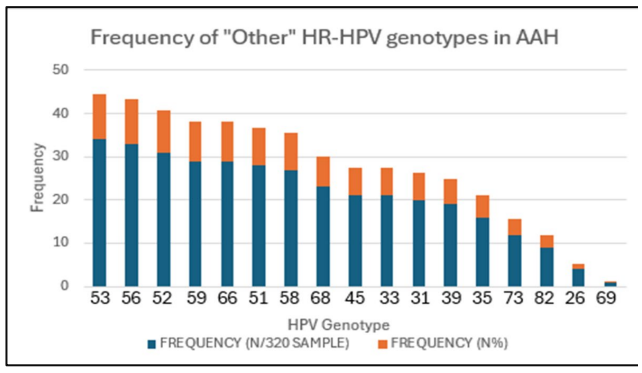
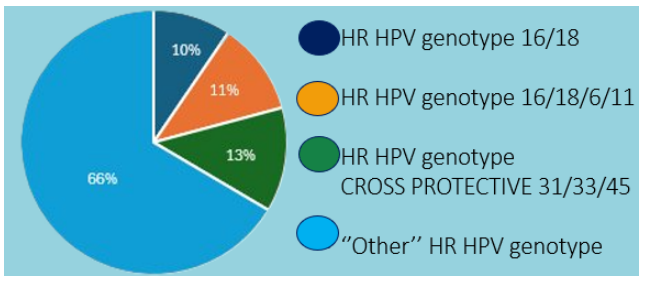


Figure 3: The most frequent "Other" HR-HPV genotypes found in n=320 samples of the HSCT North–AAH *(sourced from the total HR-HPV genotypes excluding HPV 16 &18)*.



Vaccination	Provides Protection against:	Cross – protection:
Bivalent (Cervarix)	16 & 18	31,33,45
Quadrivalent (Gardasil)	6,11,16,18	31,45

***Figure 4*: HR-HPV Genotypes: Bivalent, Quadrivalent, Cross-protected, "Other" genotypes; Current HPV vaccines and their protection limits**

Summary:

- Most frequently detected "Other" HPV genotypes were **HPV 53, 56, 52.**
- **HPV 52** is of particular concern due to its close association with HR HPV 16, and its rapid progression rate from infection to CIN3, and Cervical Cancer.

Conclusion:

Low screening uptake due to socioeconomic deprivation, education, healthcare, and attitudes drives 'Other' HR-HPV rise. Solutions: self-sampling, catch-up vaccination, expanded testing. Goals: reduce NHS workload, shorten turnaround times, improve cervical cancer care

Limitations:

- Some "Other" genotypes not detected by Allplex HPV 28 Assay Kit
- Sample variability (cT values, clotted, haemorrhagic samples)
- Sample degradation due to storage (degradation >6 months)
- Limitation to NHSCT and follow-up due to anonymised samples

References:

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2. Northern Ireland Cancer Registry. (2022) https://www.qub.ac.uk/research-centres/nicr/CancerInformation/official-stat
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