



# mHealth interventions to improve public knowledge of HPV-associated oropharyngeal cancer in the UK

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## Abstract

In the United Kingdom (UK), the current prevalence rates of oropharyngeal cancer linked to human papillomavirus (HPV) are 6.29% and 2.04% in men and women, respectively. Over the years, the burden of this disease has increased in the UK, and this is mainly due to the rising prevalence of HPV infection in the UK. Research evidence has shown that over 70% of oropharyngeal cancers in the UK are linked to HPV. Oral sex is the major route of transmission of HPV, and over 63% of UK young adults are found to have a positive history of oral sex practice. However, only a minority of the UK population are aware of HPV-associated oropharyngeal cancer; this therefore calls for more public health efforts to increase awareness and knowledge on HPV-associated oropharyngeal cancer in the UK. While the use of technology-based, clinic-based, and community-based interventions have been employed to improve public awareness and knowledge on the role of HPV-associated oropharyngeal cancer, mobile health (mhealth) interventions have not been seriously explored despite existing robust evidence on the effective roles of mhealth in improving awareness and knowledge in diverse diseases. This article therefore calls for the adoption and use of mhealth interventions in educating the UK's population on HPV-associated oropharyngeal cancer. The use of mhealth interventions in this regard is highly viable as its implementation closely aligns with the country's National Health Service (NHS) commitment towards the digital transformation of the UK's healthcare system.

## Keywords

Human papillomavirus, HPV, oropharyngeal cancer, mhealth, education, UK

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## Introduction

Oropharyngeal cancers are groups of head and neck malignancies which affect the base of the tongue and the oropharynx [1]. Oropharyngeal cancer ranks as the 24th commonest malignancy and the 23rd commonest cause of cancer-related deaths globally [2], and this burden has continued to rise at an alarming rate over the past three decades due to increased rate of exposure to human papillomavirus (HPV) especially from unprotected oral sexual practices [3]. Globally, HPV infection has been linked with more cases of oropharyngeal cancers [4], with several developed countries of the world, including several European countries [including the United Kingdom (UK)], and the United States, reporting more than 70% of their oropharyngeal cancers to be linked to HPV [4].

Aside from exposure to HPV infection, several other risk/aetiological factors have been associated with the development of oropharyngeal cancer [5–7]. These factors include human immunodeficiency virus (HIV), tobacco use, alcohol consumption, betel quid and areca nut chewing, genetic factors (heredity, mutation), sedentary lifestyle, and poor intake of fruits and vegetables in diets [5, 6].

In the UK, oropharyngeal cancer is grouped as a subtype of oral cancer [6]. Over the years, there has been a rising incidence of oral cancers in the UK, and this rise is being driven by the rising rates of oropharyngeal cancers [8]. To curb the rising incidence of oropharyngeal cancer in the UK, many public health interventions have been implemented to curb the disease burden. These interventions include oral screening programmes, public education to improve oral cancer awareness and knowledge, tobacco and alcohol cessation programmes, and sex education programmes [5, 6, 9–12]. While these interventions have reduced the prevalence of some major oral cancer risk factors (especially tobacco and alcohol use) in the UK, HPV infection remains high [6, 10, 13–17]. This explains why there is a persistent increase in the incidence rate of HPV-associated oropharyngeal cancer in the UK [6, 13].

Mobile health (mHealth) interventions have been documented to effectively improve awareness, knowledge, attitudes, and behaviors towards diverse killer diseases. However, this intervention strategy has been highly underutilized for HPV-associated oropharyngeal cancer prevention, and control in the UK and even worldwide [18–21].

This article aims to examine the scope of the burden of HPV-associated oropharyngeal cancers in the UK and provide evidence-based recommendations on the potential use of mhealth-based education intervention in curbing the current burden of HPV-associated oropharyngeal cancer in the country.

## The burden of HPV-associated oropharyngeal cancer in the UK

In the latest scientific report (published in the year 2024) on the global burden of cancer, which was based on the Global Cancer Observatory (GLOBOCAN) 2022 data, it was documented that oropharyngeal cancer has an age-standardised incidence rate of 1.9% [22]. However, in the latest country-level GLOBOCAN cancer fact sheet (published in the year 2024), the age-standardised incidence rate of oropharyngeal cancer in the UK was 2.6% [23]. A comparison of the UK incidence rate of oropharyngeal cancer with that of the global rate indicates that the incidence rate of oropharyngeal cancer in the UK is above the global average; this is a worrisome situation of serious public health importance [6, 22].

According to the 2023 report on the UK's epidemiology of HPV-associated cancers, by the ICO/IARC (Catalan Institute of Oncology and the International Agency for Research on Cancer) Information Centre on HPV and Cervical Cancer [24], HPV-associated oropharyngeal cancer prevalences in men and women were 6.29% and 2.04%, respectively. Notably, these prevalence rates are getting close to that of cervical cancer (also caused by HPV) in women (11.0%), and it can be estimated that the overall prevalence rate of HPV-associated oropharyngeal cancers in the UK may overtake that of cervical cancer within the next decade [24, 25]. Pertinently, this assertion was made based on the rising rates of oral sex—a major risk factor for oral HPV infection—practice in the UK [12]. In a recent nationwide survey in the UK, over 63% of UK young adults were found to have a positive history of oral sex [12]. Furthermore, research has shown that over 50% of people, both men and women, will contract HPV infection at least once in their lifetime [26, 27].

Overall, this suggests that many of the UK adult population is at risk of developing HPV-associated oropharyngeal cancer in later life. This therefore indicates that HPV-associated oropharyngeal cancer is a serious threat to the UK public health system.

## **mHealth interventions for HPV-associated oral cancer in the UK**

Public health education interventions have been proven to play a very significant role in the prevention of diseases [28]. Through education, a lot of people can be made aware and knowledgeable of the risk factors, signs and symptoms, and preventive and curative measures against oropharyngeal cancers [29, 30]. In a very recent study conducted among the UK's general population, it was found that only a minority (25%) of this population were aware of HPV-associated oropharyngeal cancers [31]. This indicates that more public health efforts are needed in the UK to increase public awareness and knowledge on the role of HPV in oropharyngeal cancer development.

There are diverse public health education strategies that can be adopted to improve awareness and knowledge on HPV-associated oropharyngeal cancer. These strategies include the use of technology-based, clinic-based, and community-based interventions [21, 29, 30, 32–34]. However, of all these intervention strategies, technology-based (especially mhealth) interventions have not been adequately explored in the UK, and in fact, there is currently no known empirical evidence of its use in educating the UK public about HPV-associated oropharyngeal cancer [21].

There are three broad types of mhealth intervention strategies which include the use of mobile phone short messaging service (SMS), the use of wearable or portable monitoring devices, and the use of mobile phone-based applications [35]. Notably, different studies, of different research designs, in the UK have reported that mhealth interventions are oftentimes more effective than other intervention strategies in improving awareness and knowledge on health matters, especially among the lay populations [18–20]. For example, a recent intervention study conducted in the UK, by Stallard et al. [36], on the use of mobile phone-based application (app) intervention to promote psychological wellbeing and reduce self-harm practices among young people. Furthermore, the app was found to have high acceptability among its users [36]. Also, in another UK-based intervention study, by Innes et al. [37], which adopted the use of SMS to educate secondary school students about toothbrushing, it was reported that SMS-based intervention significantly improved secondary school students' toothbrushing practices, six months after the intervention.

Overall, the use of mhealth interventions has not only been successful in the UK alone. Significant successes have also been recorded in other high-income countries, as well as in low- and middle-income countries [19, 38, 39]. For example, a meta-analysis on the effectiveness of mhealth interventions reported a significant improvement in self-management and the achievement of glycemic control among patients with diabetes mellitus in the USA, Korea, and multiple European countries [40]. Another recent systematic review and meta-analysis reported that mhealth interventions improved the timeliness, rate of uptake, and dropout rate of childhood vaccination in multiple African countries [41].

Pertinently, the effectiveness of mhealth interventions has not only been found to surpass non-digital interventions alone, but also other forms of digital interventions. For example, in a randomized control trial by Carter et al. [42], the use of mhealth was found to be significantly more effective, compared to web-based and paper-based diaries, in ensuring effective weight management among overweight persons in New Zealand. In another randomized control trial by Zhang et al. [43], it was reported that mhealth intervention, compared to web-based intervention, significantly improved knowledge on coronary heart disease in Singapore.

Based on the above reports on the effectiveness of mhealth interventions in disease prevention and control, it will be worthwhile if mhealth interventions can be adopted for HPV-associated oropharyngeal cancer education in the UK. This intervention can play a huge role in improving HPV-related knowledge, thus enhancing HPV vaccination intent and uptake, and promoting other practices that protect against the disease among the general population [44–46].

Interestingly, the adoption of mhealth interventions closely aligns with the UK's National Health Service (NHS) commitment towards the digital transformation of the UK's healthcare system by March 2025 [47]. Therefore, such intervention seems very promising and timely in the UK public health setting. Furthermore, the limited size of the dental and medical specialist workforce in the UK and the lack of a national oropharyngeal cancer screening program in the country further underscore the need for adopting mhealth-based strategies to promote HPV-associated oropharyngeal cancer knowledge among the people in the UK [48, 49]. This strategy will further reduce the over-reliance of the UK populace on the country's specialist workforce for clinical advice/interventions on oropharyngeal health-related issues (especially on HPV-associated oropharyngeal cancer), because mhealth interventions can effectively provide such services, thus reducing too much public dependence on the already strained public healthcare system in the country [50].

The uptake, utilization, and feasibility of mhealth intervention delivery are also very important issues to consider prior to the massive roll-out of an mhealth intervention [51]. Several factors have been found to influence uptake and utilization of mhealth interventions which include characteristics of the mhealth intervention, access to internet and smart phones, social and health needs of the potential end-users, public health policies of the society implementing such intervention, and the implementation climate [52, 53]. If all these factors are properly harnessed, it will boost the uptake and utilization of mhealth-based educational interventions on HPV-associated oropharyngeal cancer in the UK, which will ultimately facilitate the roll-out success rates of such interventions. Fortunately, the UK's population has an exceptionally high access rate to internet and smartphones, coupled with the UK's public health system which is now prioritizing on the digitalization of healthcare [47, 53]. Based on these factors, it seems the feasibility of a successful and massive roll-out of educative mhealth interventions on HPV-associated oropharyngeal cancer in the UK is very promising if more efforts are put in place to harness all other influential factors.

## Conclusions

The majority of the UK population remains ignorant of HPV-associated oropharyngeal cancer, which is a cause for great concern. Therefore, the need for a strategic public health intervention in the UK to increase awareness and knowledge of HPV-associated oropharyngeal cancer using mhealth interventions, just as it has been employed in the UK and globally in improving awareness and knowledge of other diseases, is highly desirable.

## Abbreviations

GLOBOCAN: Global Cancer Observatory

HIV: human immunodeficiency virus

HPV: human papillomavirus

mHealth: mobile health

NHS: National Health Service

SMS: short messaging service

UK: United Kingdom

## Declarations

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## Author contributions

KKK: Conceptualization, Investigation, Validation, Writing—original draft, Writing—review & editing, Project Management, Supervision. AAS: Investigation, Validation, Writing—original draft, Writing—review & editing. JNN: Writing—review & editing. All authors read and approved the submitted version.

## Conflicts of interest

The authors declare that they have no conflicts of interest.

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Not applicable.

## Consent to participate

Not applicable.

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Not applicable.

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