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## INVITED ARTICLE

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# Oral Health and Quality of Life Following Radiotherapy for Nasopharyngeal Carcinoma

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### ABSTRACT

**Aim:** To describe the oral health condition and its psychosocial and functional impact among disease-free patients following radiotherapy for nasopharyngeal carcinoma.

**Patients and Methods:** In this cross-sectional study, patients with nasopharyngeal carcinoma who remained disease-free more than 1 year post-radiotherapy, newly diagnosed patients with nasopharyngeal carcinoma, and age- and gender-matched controls completed the Oral Health Impact Profile, the 36-Item Short Form Health Survey, and a dry mouth scale comprising 5 questions. The clinical measures made included degree of mouth opening, candidiasis, mucositis, xerostomia, dental caries index and periodontal indices, and saliva collection.

**Results:** Thirty eight survivors of nasopharyngeal carcinoma, 40 newly diagnosed patients, and 31 controls aged from 31 to 77 years (mean age, 49.3 years) took part in the study. Nasopharyngeal carcinoma survivors had significantly higher negative impacts for 11 of 49 Oral Health Impact Profile statements than did the 2 other groups ( $p < 0.05$ ) and lower scores in the physical functioning domain of the 36-Item Short Form Health Survey subscale ( $p = 0.02$ ). Significantly more nasopharyngeal carcinoma survivors had negative impacts associated with subjective symptoms of dry mouth, sticky saliva, and hoarse voice compared with newly diagnosed patients with nasopharyngeal carcinoma and controls ( $p < 0.001$ ).

**Conclusion:** The impact of prevailing oral conditions was significantly greater for survivors of nasopharyngeal carcinoma compared with the other groups. New, intensity-modulated radiotherapy regimens and radio-protectants are being tested to minimise radiotherapy-related harmful effects on oral health and health-related quality of life.

**Key Words:** Nasopharyngeal cancer, Oral health, Quality of life, Radiotherapy

### INTRODUCTION

Nasopharyngeal carcinoma (NPC) is a common tumour among the Southern Chinese population. In Hong Kong, the prevalence is 23 per 100,000 for men and 9 per 100,000 for women. The primary treatment for NPC is radiotherapy because the tumour is highly radio-sensitive. However, the irradiated field involves the complete nasopharynx and all the lymph nodes in the neck. This field inevitably encompasses the sternomasticatory complex and the major salivary glands. As a result of irradiation, complications such as xerostomia,

mucositis, candidiasis, dental caries, and limited jaw opening can occur. Long-term complications among disease-free survivors, notably persistent restricted jaw opening and symptoms related to permanent salivary gland impairment are common.<sup>1</sup> Quality of life assessment is particularly important for patients with head and neck cancer who often have debilitating problems with appearance, swallowing, and speaking.<sup>2</sup>

The aims of this study were to describe the condition of oral health and its psychosocial and functional impact among disease-free patients following radiotherapy for NPC.

### PATIENTS AND METHODS

In this cross-sectional study, there were 3 groups of patients

- survivors of NPC who remained disease-free more

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than 1 year post-radiotherapy

- newly diagnosed patients with NPC
- age and gender matched healthy control subjects.

All NPC survivors had received 2-dimensional conventional radiotherapy in 2 phases at the Department of Clinical Oncology, Queen Mary Hospital, Hong Kong.

All participants completed an Oral Health Impact Profile (OHIP-49), the 36-Item Short Form Health Survey (SF-36) questionnaire, and a dry mouth scale comprising 5 questions.<sup>3,4</sup> In the case of recently diagnosed patients with NPC, questionnaires were completed before the preradiotherapy dental care or radiotherapy. For the OHIP and dry mouth scale, responses were made using a Likert format. The number of negative impacts for individual OHIP statements, OHIP subscales, and summary scores were calculated. SF-36 subscale scores were computed. Negative impacts for individual dry mouth questions were calculated.

The following clinical measures were made:

- degree of mouth opening
- candidiasis
- mucositis<sup>5</sup>
- xerostomia<sup>6</sup>
- dental caries index (DMFT) and periodontal indices<sup>7</sup>
- saliva collection. Prior to saliva collection, patients rinsed their mouths with phosphate-buffered saline for 30 seconds, then chewed on a piece of sterile rubber for 5 minutes. Whole saliva was then expectorated into a sterile vial. Saliva volume, pH, and buffer capacity were assessed immediately after collection.

## RESULTS

Thirty eight survivors of NPC, 40 newly diagnosed patients, and 31 controls aged from 31 to 77 years (mean age, 49.3 years) took part in the study. There were no statistical differences between the groups in age, gender, educational level, or work status. More than 70% of participants were men. The mean time since completion of radiotherapy for NPC survivors was 28.6 months (SD, 9.9 months). The mean radiation dose was

7281 cGy (SD, 704 cGy). The disease stage at treatment for the 38 survivors was stage I (4), stage II (29), stage III (4), and stage IV (1).

NPC survivors had significantly higher negative impacts for 11 of 49 OHIP statements than did the 2 other groups ( $p < 0.05$ ). When the OHIP sub-scale data were compared, NPC survivors had higher mean scores in functional limitation, physical disability, psychological disability, and handicap domains ( $p < 0.05$ ). OHIP summary scores were also higher indicating a greater overall negative impact ( $p < 0.01$ ).

When SF-36 subscale scores were compared between groups, NPC survivors had lower scores in the physical functioning domain ( $p = 0.02$ ). More survivors considered their health to be better than 1 year previously whereas those patients recently diagnosed with NPC considered their health to be worse than 1 year previously ( $p < 0.01$ ).

Significantly more NPC survivors had negative impacts associated with subjective symptoms of dry mouth, sticky saliva, and hoarse voice compared with newly diagnosed patients with NPC and controls ( $p < 0.001$ ). All NPC survivors experienced dry mouth symptoms “quite a bit” or “very much”.

Data for stimulated whole saliva for the 3 groups are shown in Table 1. The mean salivary flow rate was significantly less for NPC survivors ( $p < 0.01$ ). Saliva buffer capacity was also lower for this group of patients ( $p < 0.01$ ).

The mean number of teeth remaining in NPC survivors, and the proportion of caries-free patients were significantly less than in the other groups despite more frequent attendance for dental care ( $p < 0.01$ ). Restricted mouth opening, presence of candidiasis, and mucositis were also more prevalent in NPC survivors compared with the other groups ( $p < 0.01$ ). There were no differences in periodontal condition between groups.

**Table 1.** Stimulated whole saliva profile by group.

Stimulated whole saliva	Survivors (n = 38)	New patients (n = 40)	Controls (n = 31)	p Value
Mean (SD) [ml/min]	0.05 (0.07)	0.85 (0.53)	0.93 (0.53)	<0.01
pH — mean (SD)	6.4 (0.5)	7.2 (0.5)	7.2 (0.4)	<0.01
Buffer capacity (%)				
High	7.9	67.5	74.2	<0.01
Medium	55.3	27.5	19.4	
Low	13.2	5.0	6.5	
Nil	23.7	0	0	

## DISCUSSION

The impact of prevailing oral conditions was significantly greater in NPC survivors compared with the other groups. Functional problems such as unsatisfactory diet and sensitive teeth are symptomatic of xerostomia and altered taste sensation, which are direct complications of radiotherapy to the head and neck region. However, the impact was broader as some survivors were also disabled and handicapped. Financial loss is an important consideration because the group is of working age and may support families. In contrast the newly diagnosed patients did not have greater oral problems than controls because symptoms of NPC rarely affect the mouth. That there were no signs of psychological or social disability in newly diagnosed patients was a little surprising. However, while the patients were aware of the likely diagnosis, they had not yet completed tests and did not know the extent of the disease.

Although the NPC survivors sought dental care more often as part of their post-radiotherapy dental management, their oral health was poorer than that of the other groups. These patients had more missing teeth and more root caries. The susceptibility to root caries was most probably due to xerostomia and the poorer buffering capacity of residual saliva observed in this group. Another characteristic of the NPC survivors was the higher prevalence of *Candida* infection. This is a well-known sequela of persistent xerostomia. Trismus was also a problem for survivors and did not appear to resolve over time. Survivors did not appear to be at greater risk of periodontal disease.

New, intensity-modulated radiotherapy regimens and radio-protectants are currently being tested and preliminary results suggest that they are likely to reduce post-radiotherapy oral complications and thus minimise harmful effects on oral health and health-related quality of life.

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