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Do Head and Neck Cancer Survivors Attend a High Street Dentist on a Regular Basis?

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Abstract - *Head and neck cancer (HNC) patients face complex oral health issues following treatment. The aims of this study were to determine the proportion of HNC patients attending their dentist regularly and investigate clinico-demographic characteristics associated with attendance. Two surveys asked about patient attendance patterns and dentition. Pre-treatment orthopantomographs were evaluated for those treated between 2007-2009. The response rate was 66% (444/672). 69% (305/444) saw a high street dentist regularly. 28% of edentulous patients attended regularly compared with 84% with natural teeth, p<0.001. Associations at p<0.001 with regular attendance were the leaving of formal education (>16 years) and earlier clinical staging. HNC patients should be encouraged to see a dentist regularly for routine dental care and cancer surveillance in partnership with the cancer service.*

KEYWORDS: Dental care; Head and neck Cancer; Oral cancer; Dental assessment

INTRODUCTION

In 2008 oral and oropharyngeal cancer (ICD-10 C-00 - 14) was estimated to be the 7th most common cancer worldwide, with an estimated 482,000 new cases and 273,000 deaths[1]. Following diagnosis of oral and oropharyngeal cancer a multidisciplinary approach to patient care is critical for best treatment outcomes [2, 3] and may significantly improve patient survival[4].

Oral cancer is more prevalent in people living in areas of deprivation who are also less likely to avail themselves of health services except in an emergency [5]. Patients diagnosed with oral cancer, frequently, have poor oral hygiene and dental care and comply poorly with treatment. At diagnosis, approximately 58 to 97% of patients require some form of dental care [6, 7]. There is also a tendency for poor overall compliance with dental care irrespective of the socioeconomic background [8]. Up to 50% of irradiated HNC patients could be lost to follow-up [9].

Dental care, hence, plays a crucial role in the multidisciplinary approach to overall patient care since dental health is a significant contributor to patient well being. Rosales and co-workers[10] reported that, with the exception of the provision of complete dentures, pre-therapy dental screening and treatment for patients undergoing radiation therapy prevented or minimized complications in the post-radiation period, reduced dental treatment needs and provided better overall oral health conditions for patients. Current UK national guidelines recommend that patients should have access to a Consultant in Restorative Dentistry/Oral Rehabilitation within the Head & Neck Cancer Multidisciplinary Team (HNC MDT) as many patients face complex oral rehabilitation and dental health issues during and after their oncology treatment [11-13]. In addition current guidelines recommend that patients receiving oral surgery or radiotherapy to the mouth with or without adjuvant chemotherapy should have access to lifelong dental follow up and dental rehabilitation.

There is paucity in studies assessing dental attendance and compliance with dental treatment in this patient group. Lawrence et al., [14] investigated patient-reported access to general dental services of patients with HNC who were to receive radiotherapy. Although 69% reported being registered with a general dental practitioner 52% had not been reviewed by a dentist within the previous 12 months. A recent study also noted that whilst 94% of the patients consulted a dentist before radiotherapy only 53% of the patients received dental care following radiotherapy [15]. In addition there are also potential barriers to dental care of this patient group within the primary care setting including complexity of care and financial remuneration [16].

The aims of this cross sectional survey of head and neck cancer survivors were to (i) determine the proportion of patients reporting attending a high street dentist on a regular basis (ii) investigate whether clinical characteristics such as age, gender, dental status, stage, site of tumour, radiotherapy and time since treatment were associated with regular dental attendance. (iii) compare dental findings from the OPTs with normative data available in the literature.

Patients & Methods

Patients with primary squamous cell carcinoma of oral and oropharyngeal tumour sites from January 1998 to December 2009 were identified from the University Hospital Aintree HNC Database. Clinical characteristics were obtained from the HNC Database, and mortality status was tracked via the Office of National Statistics (ONS). Patients

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known to be alive, under 85 years of age and disease free have been surveyed annually since 2000 with a different mix of questions each time. The surveys conducted in March 2009 and March 2010 both asked patients if they had a regular high street dentist that they saw regularly (e.g. 6 monthly or yearly), if they had any of their natural teeth, if they had ever had radiotherapy as part of their treatment for H&N cancer, if their cancer had ever come back and the age at which they had left formal education (school, college or university). For patients responding to both 2009 and 2010 surveys their most recent response (2010) was taken for analysis; otherwise their 2009 or 2010 response was used.

For the January 2007 to December 2009 patient subset, pre-treatment OPT data at first presentation at Aintree were obtained from the hospital Picture Archiving and Communicating System (PACS). OPT data comprised the number of maxillary and mandibular teeth present and a Kennedy classification [17] for each arch. Depending on where in the mouth teeth are missing, edentulous situations can be broadly grouped under four different categories: Class I (bilateral posterior edentulous areas), Class II (unilateral posterior edentulous area), Class III (unilateral tooth bounded edentulous area) and Class IV (anterior tooth bounded edentulous area which crosses the midline).

Association of clinical and demographic factors with whether patients saw a high street dentist regularly, and with OPT data availability, was tested using Fishers Exact test (2 comparison groups) and the Chi-squared test (3 or more groups). Binary logistic regression was used to further explore the association of factors with seeing a high street dentist regularly. Due to the large number of tests performed statistical significance was taken to be $p<0.01$.

RESULTS

The question about having a regular dentist was answered by 66% (444/672) of eligible patients surveyed in 2009/2010. The only notable variation in answering the question was a lower (56%) response from patients aged 75-84 years; otherwise variation by specialty, gender, site, TN stage, primary treatment and year diagnosed ranged from 62-70%. Two-thirds of responders, 69% (305/444) saw a high street dentist regularly. Only 28% with no natural teeth saw their dentist regularly compared with 84% with natural teeth, $p<0.001$ (Table 1). Other associations at $p<0.001$ for patients more likely to see a dentist regularly were the leaving of formal education after the age of 16 and earlier clinical staging; at $p<0.01$ patients with pharyngeal tumours and patients without free-flap surgery. There were no notable differences in seeing a dentist regularly in respect of whether patients had received radiotherapy to the head or neck, nor by whether their cancer had come back (Table 1). Logistic regression with $p=0.01$ for entry and exit to the model gave a final independent predictive model comprising age at leaving education (<16, 16+), primary tumour site (oral, pharyngeal), clinical T stage (Tis/T1/T2, T3/T4) and any natural teeth (Yes, No) at survey (Table 2).

The 2007-2009 cohort of patients presenting with primary oral & oropharyngeal tumours comprised 511 patients, 442 patients for curative treatment and 69 for palliative care. OPT results were available before surgery or within 28 days of diagnosis (if no surgery was planned) for 64% (282/442) and 45% (31/69) respectively. Factors associated with OPT data availability for patients having curative treatment were speciality, age at diagnosis, tumour site and treatment (Table 3). Of the 442 patients receiving curative treatment, 282 had OPG data. The number and distribution of teeth for the 282 patients with OPT data are summarised in Table 4. Overall, 44% (124/282) had 21 or more teeth, 40% (77/194) oral sites and 53% (47/88) oropharyngeal sites. Of the 69 patients receiving palliative care, 31 had OPT data - of these only 1 had 2009/20 survey data, as the vast majority had died within a few months of diagnosis (42% within 3 months, 68% within 6 months and 94% within 12 months). Also of the 31 palliative patients with OPT data, 23% (7/31) had 21 or more teeth, 14% (3/21) oral sites and 40% (4/10) oropharyngeal sites.

Of those 282 with OPT data, 230 were surveyed in 2009/2010 with 60% (139) responding to the question about having a regular dentist. A high street dentist was seen regularly by 64% (89/139). Those with no teeth at presentation were less likely to have a regular dentist, 35% (8/23) as compared to 70% (81/116) of those with teeth, $p=0.001$ Fisher's Exact test. Of those with teeth at presentation but with no teeth at follow-up only 29% (7/24) had a regular dentist. Those with natural teeth at follow-up were the group most likely to have a regular dentist (80%, 74/92). Figure 1 indicates that either having no teeth at presentation or the loss of all natural teeth between presentation and follow-up was a strong indicator of the patient not having a regular dentist at the time of survey. The strongest predictor ($p<0.001$, chi-squared test) of having no natural teeth at presentation was patient age, with 1% (1/70) for those under 55 years, 14% (16/118) aged 55-64, 36% (20/55) aged 65-74 and 41% (16/39) aged 75 years or older. None of the other baseline patient characteristics (as per Table 3) were associated at $p<0.01$.

DISCUSSION

The aims of this study were to assess dental attendance of this patient group and attempt to identify associated clinical characteristics. Routine dental attendance has been associated with better oral health [18] and various studies have demonstrated that oral health-related quality of life (OHRQOL) improves with routine dental attendance although these have focused mainly on the elderly population [19-21]. A more recent study suggests that improvement of OHRQOL due to regular dental attendance is mainly influenced by residential location rather than patient factors possibly reflecting the local dental services as well as local patient concepts of dental care [22]. It is however not clear whether the oral health benefits are due to regular attendance or because of a healthy user effect [18].

A strength of these surveys is that they provide some insight into patient reported dental attendance following treatment for HNC in the Merseyside region. The sample also represents the totality of HNC survivors hence somewhat reducing selection bias. The main limitation of this study was that no attempt was made to investigate the reasons for and potential barriers to regular dental attendance. In addition, this survey was carried out in the North West region and patients, treated for HNC in this unit, were not asked whether the practices they attended were NHS, private or mixed. The findings of this survey may therefore not be

Table 1. *Does patient have a high street dentist that they see regularly?*

		Follow-up survey: Do you have a high street dentist that you see regularly? (6monthly, each yearly)		*P value**
		%	N	
ALL patients		69	305/444	
Factors pertaining at follow-up survey				
Have any natural teeth	Yes	84	267/316	<0.001
	No	28	35/125	
Ever had RT as part of treatment of H&N cancer	Yes	68	172/254	0.46
	No	71	131/184	
Has H&N cancer ever come back	Yes	64	38/59	0.36
	No	71	252/356	
Age at survey	<55	80	70/88	0.06
	55-64	69	114/165	
	65-74	64	87/137	
	75-84	63	34/54	
Factors pertaining at presentation				
Specialty	MFU	66	224/339	0.04
	ENT	77	81/105	
Age when left school or college or university	Less than 16	58	136/235	<0.001
	16-17	80	109/136	
	18+	84	52/62	
Year of diagnosis	1998-2003	68	69/102	0.96
	2004-2006	70	73/105	
	2007-2009	69	163/237	
Age at diagnosis	<55	78	104/134	0.04
	55-64	66	123/186	
	65-74	61	61/100	
	75+	71	17/24	
Gender	Male	67	197/295	0.24
	Female	72	108/149	
Site	Oral	64	179/280	0.006
	Pharyngeal	77	126/164	
T stage	Tis/T1/T2	75	232/309	<0.001
	T3/T4	55	71/129	
N stage	0	70	200/287	0.04
	1	56	33/59	
	2-3	75	71/95	
Primary Treatment	Surgery only	69	161/234	0.74
	Surgery with RT, chemo or chemo/RT	67	97/145	
	RT or chemo or Chemo/RT without surgery	72	47/65	
Type of flap (if surgery)	No Free-flap	75	147/196	0.001
	Soft	65	88/135	
	Composite	48	23/48	

**Fishers Exact test (2 comparison groups) and the Chi-squared test (3 or more groups).*

representative of the national situation and similar studies would be required to compare these findings.

The overall response rate was 66% which is reasonably good for this patient cohort with usual response rates of between 40-60% (23).This has also been the experience in other surveys in Merseyside [24, 25].

In this survey, 20% were edentate whereas 80% had varying levels of partial edentulism. It is not clear how the factors associated with OPT data availability for patients having curative treatment (speciality, age at diagnosis, tumour site and treatment) might have affected this estimate of edentulousness. The rate of edentulousness, however, is high compared to the normal population (6%) as reported in the most recent Adult dental Health Survey (ADHS) (2009) [26]. Similarly the overall mean number of teeth among adults in this cohort was 16.1 with 40% and 53% of patients with HNC limited to oral and oropharyngeal sites respectively having 21 or more teeth. When compared with the normative population these figures are significantly worse

Table 2. *Factors independently associated with patients having a high street dentist that they see regularly.*

Age leaving formal education	*Tumour site*	*Clinical T Stage*	*Do you have any of your natural teeth remaining?*	*Survey: Do you have a high street dentist that you see regularly?*	
				%	N
<16	Oral	Tis t1 T2	YES	86	56/65
			No	27	10/37
		T3 T4	YES	57	17/30
			No	20	4/20
	Pharyngeal	Tis T1 T2	YES	81	26/32
			No	23	3/13
		T3 T4	YES	84	16/19
			No	15	2/13
16+	Oral	Tis T1 T2	YES	88	72/82
			No	33	5/15
		T3 T4	YES	69	9/13
			No	0	0/8
	Pharyngeal	Tis T1 T2	YES	100	48/48
			No	63	5/8
		T3 T4	YES	94	17/18
			No	75	3/4

Logistic regression with p=0.01 for entry and exit to the model gave a final independent predictive model of the factors displayed above.

Table 3. *2007- 2009 cohort receiving primary curative treatment - Patient characteristics and OPT data availability*

		OPT data available		P value*
		%	N	
ALL patients		64	282/442	
Year of diagnosis	2007	64	78/122	
	2008	67	106/159	0.56
	2009	61	98/161	
Specialty	MFU	72	237/330	
	ENT	40	45/112	<0.001
Age at diagnosis	<55	60	70/117	
	55-64	74	118/159	
	65-74	50	55/109	0.001
	75+	68	39/57	
Gender	Male	65	182/281	
	Female	62	100/161	0.61
Site	Oral	69	194/281	
	Pharyngeal	55	88/161	0.003
T stage	Tis/T1/T2	62	178/289	
	T3/T4	68	102/149	0.17 excl NK/Tx
	Not known/Tx	50	2/4	
N stage	0	65	184/281	
	1	65	34/52	
	2-3	60	64/107	0.57 excl NK
	Not known	0	0/2	
Primary	Surgery only	61	120/196	
Treatment	Surgery with RT, chemo or chemo/RT	75	113/150	<0.001
	RT or chemo or Chemo/RT without surgery	51	49/96	
Type of flap	No Free-flap	50	142/285	
	Soft	90	101/112	<0.001
	Composite	87	39/45	

**Fishers Exact test (2 comparison groups) and the Chi-squared test (3 or more groups).*

Table 4. *2007- 2009 cohort receiving primary curative treatment - Number and distribution of teeth*

	Median no. teeth	*Mean no. teeth*	*Edentulous N/(%)*	*Fully Dentate N/(%)*
Maxilla	9 (0-12)	7.4	87 (31%)	88 (31%)
Mandible	10 (5-13)	8.6	59 (21%)	70 (25%)
Both	19 (6-25)	16.1	20% (57)	17% (48)
Kennedy Classification of partial dentition	*I*	*II*	*III*	*IV*
Maxilla	24 (9%)	45 (16%)	29 (10%)	9 (3%)
Mandible	44 (16%)	52 (18%)	54 (19%)	3 (1%)

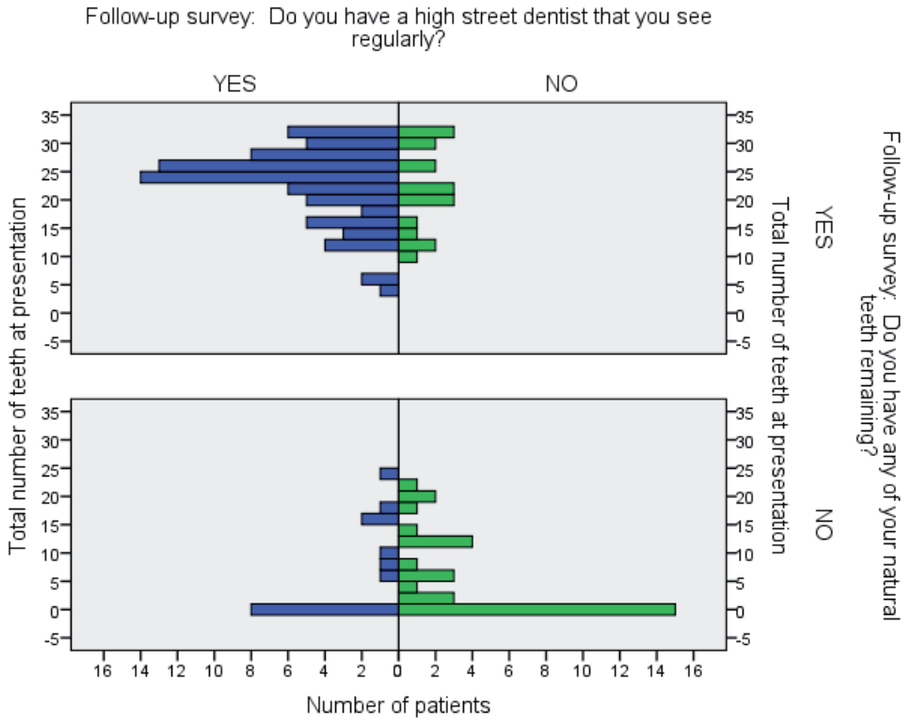

Figure 1. *Natural teeth at presentation and at follow-up survey in respect of patients having a high street dentist they see regularly*

(25.7 mean teeth with 80-86% of adults having 21 teeth or more). Having 21 or more natural teeth is considered to be consistent with a functional dentition [27].

In this survey, 69% of patients reported attending a high street dentist regularly (in the previous 6 – 12 months). Recent figures from the ADHS (2009) (26) suggest that 61% attend for regular checkups, 10% attend for occasional checkups and 29 either attend when having trouble or never attend (2%). In addition 50% of all dentate adults reported attending the dentist at least once every six months; 21% at least once a year; and 6% per cent once every two years. A difficulty here is defining what constitutes regular dental attendance and whether regular dental attendance constitutes a dental check up or dental treatment. One may speculate that patients from this patient cohort attend more regularly possibly due to the higher level of dental disease. It is also possible that non-response bias may be overestimating the number of regular attenders in this cohort as one could speculate that non-responders are more likely to have poorer health and less likely to attend a dentist regularly. In addition despite regular dental attendance there is a difference between patient perceived oral health and OHRQoL and their actual oral health status.

Associations at $p<0.001$ for reduced dental attendance included patients who were edentate, (only 28% of patients with no natural teeth attending a dentist routinely compared with 84% with natural teeth), patients leaving formal education before the age of 16 and patients with late clinical staging (T3/T4). It is not clear whether edentate patients wore dentures or not as this was not assessed in the survey. All these associations may reflect socio-economic disparities in regular dental attendance which are usually established in early life and persist throughout life [28, 29]. Deprivation may also be associated with more rapidly growing tumours[30].

Associations at p<0.01 for increased dental attendance included patients with pharyngeal tumours and patients without free-flap surgery. From the data it appears that patients with pharyngeal tumours were more likely to have teeth following treatment (53% vs 40%) which would likely increase patient need for regular dental attendance. This may reflect the nature of the tumour and oncological treatment received of these patients with less teeth in the field of radiation requiring extraction. If OPT availability is considered a surrogate marker for dental assessment prior to HNC treatment then patients not requiring surgery, not requiring flap reconstruction, diagnosed with pharyngeal tumours and seen by ENT would appear be less likely to assessed dentally (Table 3). It is the authors' view that it is essential that all patients should have an OPT as part of their dental assessment at diagnosis of HNC. More recently groups have been established at national and local level to develop Head and Neck Cancer Quality Performance Indicators (QPI) of which a dental assessment before and after treatment for HNC is as a key contributor to quality the HNC service.

In conclusion, within the limitations of this study we conclude that despite a majority of patients reporting regular dental attendance there is still a large number of patients who fail to attend for routine dental follow up and treatment following treatment for HNC. The reasons for this need to be elucidated prior to identifying strategies to address this issue. Collaborative research within the primary dental care setting at both local and national level will contribute to addressing the gaps in knowledge understanding which will inform more robust patient care pathways for this patient group.

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REFERENCES

1. Ferlay J, Parkin DM, Steliarova-Foucher E. Estimates of cancer incidence and mortality in Europe in 2008. Eur J Cancer. 2010;46:765-81.
2. Cawood JI, Stoelinga PJ. International Academy for Oral and Facial Rehabilitation: consensus report. Int J Oral Maxillofac Surg 2006; 35:195–198.
3. Beumer J, Curtis TA, Marunick MT. Maxillofacial rehabilitation: Prosthodontic and Surgical Considerations. 2nd ed. Michigan: Ishiyaku EuroAmerica; 1996
4. Friedland PL, Bozic B, Dewar J, et al. Impact of multidisciplinary team management in head and neck cancer patients. Br J Cancer 2011;104:1246–1248.
5. Multi-disciplinary guidelines for the oral management of patients following oncology treatment (National Library of Guidelines (UK), 2000) Townsend, P. Poverty in the United Kingdom. London: Penguin.)
6. Lizi EC. A case for a dental surgeon at regional radiotherapy centres. Br Dent J 1992: 173: 24–26.
7. Jham BC, Reis PM, Miranda EL, Lopes RC, Carvalho AL, Scheper MA, Freire AR. Oral health status of 207 head and neck cancer patients before, during and after radiotherapy. Clin Oral Investig 2008: 12: 19–24.
8. Lockhart PB, Clark J. Pretherapy dental status of patients with malignant conditions of the head and neck. Oral Surg Oral Med Oral Pathol 1994: 77: 236–241.
9. Rogers SN, Brown JS, Woolgar JA, Lowe D, Magennis P, Shaw RJ, Sutton D, Errington D, Vaughan D. Survival following primary surgery for oral cancer.Oral Oncol. 2009; 45:201-211.
10. Rosales AC, Esteves SC, Jorge J, Almeida OP, Lopes MA. Dental needs in Brazilian patients subjected to head and neck radiotherapy. Braz Dent J. 2009; 20: 74-7.
11. National Institute for Health and Care Excellence (2004) [Improving outcomes in head and neck cancer - The Manual]. [CSGHN]. London: National Institute for Health and Care Excellence.
12. Scottish Intercollegiate Guidelines Network (2006) [Diagnosis and management of head and neck cancer] [SIGN 90]. Edinburgh. ISBN 9781905813001.
13. Roland NJ, Paleri V (eds). Head and Neck Cancer: Multidisciplinary Management Guidelines. 4th Edition. London: ENT UK; 2011 Chapter 9 Restorative Dentistry/Oral Rehabilitation.
14. Lawrence M, Aleid W, McKechnie A. Access to dental services for head and neck cancer patients. Br J Oral Maxillofac Surg. 2013; 51:404-7.
15. Sennhenn-Kirchner S, Freund F, Grundmann S, Martin A, Borg-von Zepelin M, Christiansen H, Wolff HA, Jacobs HG. Dental therapy before and after radiotherapy--an evaluation on patients with head and neck malignancies. Clin Oral Investig. 2009; 13:157-64.
16. Husein AB, Butterworth CJ, Ranka MS, Kwasnicki A, Rogers SN. A survey of general dental practitioners in the North West of England concerning the dental care of patients following head and neck radiotherapy. Prim Dent Care. 2011; 18:59-65.
17. Cummer WE: Possible combinations of teeth present and missing in partial restorations, Oral Health, 10:421-430, 1920.
18. Thomson WM, Williams SM, Broadbent JM, Poulton R, Locker D. Long-term dental visiting patterns and adult oral health. J Dent Res. 2010; 89: 307-11.
19. Fiske J, Gelbier S, Watson RM. The benefit of dental care to an elderly population assessed using a sociodental measure or oral handicap. Br Dent J 1990; 168:153–6.
20. Petersen PE, Nortov B. The effect of a three-year trial of a community dental care program for aged pensioners in Denmark [in Danish]. Ugeskr Laeger 1995; 157: 2712–6.
21. Locker D. Does dental care improve the oral health of older adults? Community Dent Health 2001; 18:7–15.
22. Crocombe LA, Brennan DS, Slade GD. The influence of dental attendance on change in oral health–related quality of life. Community Dent Oral Epidemiol 2012; 40: 53–61
23. Bjordal, K., Ahlner-Elmqvist, M., Hammerlid, E., Boysen, M., Evensen, J. F., Biörklund et al. A Prospective Study of Quality of Life in Head and Neck Cancer Patients. Part II: Longitudinal Data. The Laryngoscope 2001; 111: 1440–1452.
24. Pace-Balzan A, Cawood JI, Howell R, Butterworth CJ, Lowe D, Rogers SN. The further development and validation of the Liverpool Oral Rehabilitation Questionnaire: a cross-sectional survey of patients attending for oral rehabilitation and general dental practice. Int J Oral Maxillofac Surg. 2006; 35 :72-8.
25. Precious E, Haran S, Lowe D, Rogers SN. Head and neck cancer patients' perspective of carer burden. Br J Oral Maxillofac Surg. 2012; 50: 202-7.
26. O'Sullivan I, Lader D, Beavan,Seymour C, Chenery V, Fuller E, Sadler K. Foundation report: adult dental health survey. London: The Health and Social Care Information Centre, 2011. Online report available at http://www.hscic.gov.uk/pubs/dentalsurveyfullreport09. (accessed July 2013)
27. Kayser AF. Shortened dental arches and oral function. Journal of Oral Rehabilitation, 1981; 8: 457–462.
28. Listl S. Inequalities in dental attendance throughout the lifecourse. J Dent Res. 2012; 91: 91S-97S.
29. Listl S. Income-related inequalities in denture-wearing by Europeans aged 50 and above. Gerodontology. 2012; 29: e948-55.
30. Rogers SN, Pabla R, McSorley A, Lowe D, Brown JS,Vaughan ED An assessment of deprivation as a factor in the delay in presentation, diagnosis and treatment in patients with oral and oropharyngeal squamous cell carcinoma'. Oral Oncology 2007; 43: 648-655.