

## Frequency of Head and Neck Cancers in Children and Adolescents in an Iranian Population From 1989 to 2009

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### Abstract

**Background:** A small number of malignant tumors occur during childhood and adolescence. The frequency of such tumors in these age groups is evaluated in only a few studies.

**Objectives:** We aimed to determine the frequency of head and neck cancers in a population of Iranian children and adolescents.

**Patients and Methods:** The records of patients  $\leq 19$  years old, suffering from head and neck cancers, were reviewed in the pathology centers of Hamadan province from 1989 to 2009. Patients with central nervous system tumors, thyroid and melanoma were excluded. Data were collected based on age, sex and lesion location and statistical analysis was performed.

**Results:** Among the study population (3368 cases of head and neck cancer), 75 cases (2.22%) belonged to children and adolescents aged between 0 - 19. The Mean  $\pm$  SD age of the patients was  $13 \pm 5.6$  (range: 2 months, 19 years). The most common cancers were non-Hodgkin's lymphoma (23%), squamous cell carcinoma (SCC) (20%), and Hodgkin's lymphoma (14.7%). Malignant oral and maxillofacial tumors account for only 18.7% of all head and neck tumors.

**Conclusions:** Carcinomas were the most common malignant tumors of head and neck observed in this age group. Also, oral cancers in children and adolescents constitute a small percentage of the lesions that were studied

**Keywords:** Head and Neck, Cancer, Adolescents, Children

## 1. Background

Only 2% of all malignant tumors occur in infancy and childhood; nonetheless, neoplastic diseases accounts for 9% of all deaths in children of 4 to 14 years old. Cancers of infancy and childhood differ biologically and histologically from their counterparts occurring later in life (1); also, several tumors are even more common in childhood (1).

Head and neck cancer refers to any malignant tumor of skin, lips, salivary glands, sinuses, oral cavity, pharynx, and larynx (2). Head and neck tumors in children represent 2% - 3% of all head and neck tumors and 7.8% of pediatric tumors (3).

A small number of researches have studied the frequency of malignant tumors in children and adolescents of different countries.

## 2. Objectives

Since several factors (infectious agents, trauma, nutritional deficiencies, genetic factors and sunlight) contribute to the pathogenesis of cancers(4), considering the limited information on this topic in Iran, as well as the importance of the issue, we aimed to study the frequency of head and neck cancers during a period of 20 years in Hamadan, West Iran.

## 3. Patients and Methods

This retrospective study was done on the pathological records of patients referred to public and private pathology centers in the province of Hamedan, from 1989 to 2009. All records of patients with head and neck cancers in that period were extracted and analyzed.

Records of patients with cancers of thyroid, central ner-

vous system (brain and spinal cord) and melanoma were excluded (2, 4). Data related to individuals of  $\leq 19$  years old (regarding age, sex, lesion location, histopathologic diagnosis and treatment centers) were gathered and recorded in the data collection sheet. Afterwards, the cancers of head and neck were evaluated regarding frequency, age, sex, and anatomical distribution. Data were statistically analyzed using SPSS software, version 16 (SPSS Inc., Chicago, IL, USA).

#### 4. Results

Having checked the records of patients during 20 years, 3368 cases of head and neck cancer were found, 2.22% of which (75 cases) belonged to children and adolescents aged between 0 - 19. Out of these patients, 23.7% (17 cases) were female and 77.3% (58 cases) were male (male to female ration: 3.41:1). The Mean  $\pm$  SD age of the patients was  $13 \pm 5.6$  (minimum 2 months, maximum 19 years old).

Regarding lesion type, the most common cancers were 18 cases of non-Hodgkin's lymphoma (23%), 15 cases of squamous cell carcinoma (SCC) (20%) and 16 cases of Hodgkin's lymphoma (14.7%), respectively. Table 1 pres-

ents the frequency of head and neck tumors with regard to the lesion type. Totally, 24% of patients had ages  $< 10$  and 76% were older than 10 years old. In patients aged less than 10 years, the most common lesion was SCC and the most involved area was the skin, while in patients with age  $\geq 10$  years old, the neck was the most involved area and lymphoma was the most common lesion (Table 2).

Table 3 shows the frequency of head and neck cancers based on lesion location. In female patients, the cervical lymph nodes were mostly involved, while in males, the skin was more commonly involved. Also, the most frequent lesions in male and female patients were SCC and lymphoma, respectively. Table 4 depicts the gender distribution of patients, based on lesion type.

Of all head and neck tumors, only 18.7% were malignant oral and maxillofacial tumors. These lesions were as following: SCC (one case of lips and one case of tongue), mucoepidermoid carcinoma (one case in palate and three cases in parotid gland), lymphoma (one case in oral cavity), also in mandible (two cases of osteosarcoma, one case of chondrosarcoma and one case of mucoepidermoid carcinoma).

**Table 1.** Frequency of Malignant Head and Neck Tumors Based on Lesion Type

Lesion Type	Values <sup>a</sup>
Carcinoma	34 (45.3)
Lymphoma	29 (38.7)
Sarcoma	4 (5.3)
Metastasis	4 (5.3)
Undiagnosed	4 (5.3)
Total	75 (100)

<sup>a</sup>Data are presented as No. (%).

**Table 2.** Age Distribution of Patients Based on Lesion Type<sup>a</sup>

Lesion Type	Age	
	$< 10$	$\geq 10$
Carcinoma	9 (26.5)	25 (73.5)
Lymphoma	8 (27.6)	21 (72.4)
Sarcoma	0 (0)	4 (100)
Metastasis	0 (0)	4 (100)
Undiagnosed	1 (0)	3 (100)
Total	18 (24)	57 (76)
P Value	0.146	0.146

<sup>a</sup>Data are presented as No. (%).

**Table 3.** Frequency of Malignant Head and Neck Tumors Based on Location

Lesion Location	Values <sup>a</sup>
Larynx	2 (2.7)
Ears	5 (6.7)
Eyes	1 (1.3)
Pharynx	9 (12)
Neck	27 (36)
Salivary glands	3 (4)
Lips	1 (1.3)
Oral mucosa	5 (6.7)
Skin	17 (22.7)
Jaw	5 (6.7)
Total	75 (100)

<sup>a</sup>Data are presented as No. (%).

**Table 4.** Gender Distribution of Patients Based on Lesion Type<sup>a</sup>

Lesion Type	Gender	
	Male	Female
Carcinoma	30 (88.2)	4 (11.7)
Lymphoma	21 (72.4)	8 (27.5)
Sarcoma	0 (0)	4 (100)
Metastasis	3 (75)	1 (25)
Undiagnosed	4 (100)	0 (0)
Total	58 (77.3)	17 (23.7)
P Value	0.048	0.048

<sup>a</sup>Data are presented as No. (%).

## 5. Discussion

Cancers represent a large group of diseases with high mortality rates (5). Cancers of head and neck constitute 5% - 50% of all cancers throughout the world (6). However, there are not enough studies investigating these cancers in children and adolescents. Therefore, no exact information is in hand. This might be due to different geographic zones, different anatomical areas that are being studied, as in the case of head and neck cancers, and racial and cultural factors. In the current study, out of 3368 cases that were histopathologically diagnosed as head and

neck cancers, 75 cases (2.22% of all) had occurred in patients with age  $\leq 19$  years old. The youngest case was a 2-month-old boy, with SCC on the facial skin.

The male-to-female ratio was 3.4:1 for patients with head and neck cancers, which reveal the higher male-to-female ratio, in congruence with several other studies (7-16). Nevertheless, other studies have discussed head and neck cancers in different age groups (such as  $\geq 15$  years old) or other anatomic areas (3, 8-14). Table 5 presents the results of the current study, compared with other similar studies.

Table 5. Patient and Histologic Characteristics of Head and Neck Tumors in Children and Adolescents in Similar Surveys<sup>a</sup>

	Current Study	Khademi et al. (7)	Rapidis et al. (8)	Jafari-Ashkavandi et al. (9)	Elarbi et al. (10)	Ategbesola et al. (11)	Ajayi et al. (12)	Alkhatieb et al. (13)	Arotiba (14)
Number of cases	75	136 (M)	308 (M)	35 (M)	8 (M)	74 (M)	47 (M)	26 (M)	70 (M)
Time interval	1898 - 2009	2007 - 2000	1983 - 1964	2009 - 2005	1991 - 2007	2001 - 1991	1992 - 2003	1991 - 2000	1992 - 1980
Age range	0 - 19	1 - 19	16 - 0	0 - 18	18 ≤	19 ≤	19 ≤	< 19	15 ≥
Lesion spectrum	Head and Neck	Head and Neck	Head and Neck	Oral-Facial	Oral-Facial	Oral-Facial	Oral-Facial	Oral-Maxillofacial	Oral-Facial
Male-to-female ratio	3:40	1:87	1:59:1 (1:49:1 Malignant)	≥ 12 (1:2:1), 13:18 (2:4:1)	1:66:1	1:4:1	2:9:1	1:2:1	1:4:1 (2:1:1 Malignant)
Population nationality	Iran	Iran	Greece	Iran	Libya	Nigeria	Nigeria	Jordan	Nigeria
Type of the studied lesions	M	M and B	M and B	M and B	M and B	M and B	M	M and B	M and B
Most common area involved in malignant lesions	36% Neck	Cervical lymph node	(58 Neck/5%)	Mandible	Mandible (50%)	Maxilla (43%)	Maxilla and Maxillary, antrum 3/38	Face 1, 2-post nasal space	
Carcinomas <sup>b</sup>	45:3	~22		Most Common Malignant Carcinomas (SCC, MEC, and ACC each with 4 cases)		~2	10:6	4:2	11:8
Sarcomas <sup>b</sup>	3/5	11				~6	36:2	26	22:1
Most common histologic subtypes	Osteosarcoma	Rhabdomyosarcoma	Rhabdomyosarcoma	Rhabdomyosarcoma (14%)	Rhabdomyosarcoma	Rhabdomyosarcoma (60%)	Osteosarcoma (23), Rhabdomyosarcoma (23%)	Rhabdomyosarcoma	Embryonal/Rhabdomyosarcoma (3.5%)
Lymphomas <sup>b</sup>	38:7	~61	3/52	20		~89	2/53		
Most common histologic subtypes	Non-Hodgkin's lymphoma	Non-Hodgkin's lymphoma	Hodgkin's lymphoma	Burkitt's lymphoma (50%)	Burkitt's lymphoma (98%)	Burkitt's lymphoma (38.3%)	Extranodal Non-Hodgkin's lymphoma	Burkitt's lymphoma (22.4%)	

<sup>a</sup>Abbreviations: ACC, Adenoid cystic carcinoma; B, Benign; BCC, Basal cell carcinoma; M, Malignant; MEC, Mucoepidermoid carcinoma; SCC, Squamous cell carcinoma.  
<sup>b</sup>Data are presented as %.

In both age groups (<10 and ≥10 years old) examined in this study, cancer was encountered more often in males. The most common cancer in males was SCC. The reason why skin cancers are so prevalent in head and neck may be the increased exposure to sunlight (17). However, the most common head and neck cancer in females was lymphoma.

In this study, the most involved area was cervical lymph node network, which is similar to the results of other researches that studied head and neck cancers (7, 8). Nevertheless, in several other studies, different areas, like the maxillae and maxillary sinuses and mandible, were the most commonly involved areas, which can be a result of the fact that oral and maxillofacial areas were the only parts inspected. Also in several studies, lymph nodes in the neck were excluded totally (3, 9-12).

In this study, in a general classification, the most common cancers were carcinomas (45.3%), lymphomas (38.7%) and sarcomas (5.3%). Based on lesion type, the most common malignant tumors of head and neck were non-Hodgkin's lymphoma, SCC and Hodgkin's lymphoma, respectively.

Lymphomas comprise a wide range of cell types and histopathologic patterns. They can simply be divided into two groups of Hodgkin and non-Hodgkin (7). In this study, 23% of cases were patients with non-Hodgkin's lymphoma, 66% were seen in individuals aged 10 to 19 years old, and the remaining, in patients <10 years old, 77% were in male patients and 66% were in neck.

In other studies, lymphoma was the most common malignancy in children and adolescents. In the report of Ajayi et al. 53.2% of malignant oral-facial tumors were found to be lymphomas, out of which 96% were non-Hodgkin, which is higher than what we found. Also, contrary to the current study, most patients were aged ≤9 years old (12). Khademi et al. reported that 30% of the lesions they studied were non-Hodgkin's lymphoma, which is similar to the result of our study (7). However, since their study was also performed in Iran, the importance of early diagnosis and treatment of these lesions needs to be studied more precisely in this geographical zone. Several investigators reported that Burkitt lymphoma and Hodgkin lymphoma are the most common lymphomas of the head and neck (8, 10-14).

According to Biswas et al. rhabdomyosarcoma was the most common malignant tumor in children. It needs to be mentioned that, in their study, cervical lymph nodes were excluded (3).

In the current study, malignant oral and maxillofacial tumors constitute 0.4% of all cancers in head and neck, out of which nine cases (18.7%) were seen in this the age range ≤19 years old.

In this group, mucoepidermoid carcinoma was the most common cancer and was mostly detected in parotid gland. This is different from the result of most other studies, in which lymphomas, particularly Burkitt lymphoma, were the most common cancers in these areas (9, 11, 14, 18). Moreover, they were different in relation to the most commonly involved area. Since a number of these studies were per-

formed on facial areas, and several others studied the oral cavity and the surrounding area, this difference can be due to the different anatomic areas studied. Furthermore, different geographic regions also contribute to this difference, because, for example, Burkitt lymphoma is one of the most common childhood oral cancers in regions such as Africa (14, 19, 20). However, most of these studies and the results of the current study indicate that oral cancers are not common in this age group.

The results of this study show that carcinomas are the most common malignant tumors of head and neck observed in this age group (≤19 years old). Also, oral cancers in children and adolescents constitute a small percentage of the lesions that were studied. However, the fact that the occurrence of such cancers in this study differs from other studies, can probably be due to geographical, cultural and racial factors, and also the anatomical areas that were studied.

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## Footnote

**Authors' Contribution:** Study concept and design: Setareh Shojaei, Massoumeh Zargaran and Fahimeh Baghaei; acquisition of data: Homa Farhadifar, Zahra Dehbani, Abdolazim Sedighi, Arash Dehghan, Alireza Monsef Esfahani and Mohammad Jafari; analysis and interpretation of data: Homa Farhadifar, and Zahra Dehbani; drafting of the manuscript: Setareh Shojaei, Massoumeh Zargaran and Fahimeh Baghaei; critical revision of the manuscript for important intellectual content: Setareh Shojaei and Fahimeh Baghaei; statistical analysis: Javad Faradmal. Administrative, technical, and material support: Setareh Shojaei, Fahimeh Baghaei, Abdolazim Sedighi, Arash Dehghan, Alireza Monsef Esfahani, and Mohammad Jafari; study supervision: Setareh Shojaei, Massoumeh Zargaran, and Fahimeh Baghaei.

## References

1. Kumar V, Abbas AK, Fausto N, Aster JC. *Robbins and Cotran: Pathologic Basis of Disease*. 8th ed. Philadelphia: Saunders Elsevier; 2010. pp. 373-5.
2. Chin D, Boyle GM, Porceddu S, Theile DR, Parsons PG, Coman WB. Head and neck cancer: past, present and future. *Expert Rev Anticancer Ther*. 2006;6(7):1111-8. doi: 10.1586/14737140.6.7.1111. [PubMed:16831082]
3. Biswas D, Saha S, Bera SP. Relative distribution of the tumours of ear, nose and throat in the paediatric patients. *Int J Pediatr Otorhinolaryngol*. 2007;71(5):801-5. doi: 10.1016/j.ijporl.2007.01.021. [PubMed:17368816]
4. Dobrossy L. Epidemiology of head and neck cancer: magnitude of the problem. *Cancer Metastasis Rev*. 2005;24(1):9-17. doi: 10.1007/s10555-005-5044-4. [PubMed:15785869]
5. Chen MH, Colan SD, Diller L. Cardiovascular disease: cause of morbidity and mortality in adult survivors of childhood cancers.

- Circ Res.* 2011;**108**(5):619–28. doi: 10.1161/CIRCRESAHA.110.224519. [PubMed: 21372293]
6. Otoh EC, Johnson NW, Ajike SO, Mohammed A, Danfillo IS, Jallo PH. Primary head and neck cancers in North-Western Nigeria. *West Afr J Med.* 2009;**28**(4):227–33. [PubMed: 20425737]
  7. Khademi B, Taraghi A, Mohammadianpanah M. Anatomical and histopathological profile of head and neck neoplasms in Persian pediatric and adolescent population. *Int J Pediatr Otorhinolaryngol.* 2009;**73**(9):1249–53. doi: 10.1016/j.ijporl.2009.05.017. [PubMed: 19525017]
  8. Ravidis AD, Economidis J, Goumas PD, Langdon JD, Skordalakis A, Tzortzatou F, et al. Tumours of the head and neck in children. A clinico-pathological analysis of 1,007 cases. *J Craniomaxillofac Surg.* 1988;**16**(6):279–86. [PubMed: 3049677]
  9. Jaafari-Ashkavandi Z, Ashraf MJ. A clinico-pathologic study of 142 orofacial tumors in children and adolescents in southern Iran. *Iran J Pediatr.* 2011;**21**(3):367–72. [PubMed: 23056815]
  10. Elarbi M, El-Gehani R, Subhashraj K, Orafi M. Orofacial tumors in Libyan children and adolescents. A descriptive study of 213 cases. *Int J Pediatr Otorhinolaryngol.* 2009;**73**(2):237–42. doi: 10.1016/j.ijporl.2008.10.013. [PubMed: 19070371]
  11. Aregbesola SB, Ugboko VI, Akinwande JA, Arole GF, Fagade OO. Orofacial tumours in suburban Nigerian children and adolescents. *Br J Oral Maxillofac Surg.* 2005;**43**(3):226–31. doi: 10.1016/j.bjoms.2004.11.006. [PubMed: 15888358]
  12. Ajayi OF, Adeyemo WL, Ladeinde AL, Ogunlewe MO, Omitola OG, Effiom OA, et al. Malignant orofacial neoplasms in children and adolescents: a clinicopathologic review of cases in a Nigerian tertiary hospital. *Int J Pediatr Otorhinolaryngol.* 2007;**71**(6):959–63. doi: 10.1016/j.ijporl.2007.03.008. [PubMed: 17418424]
  13. Al-Khateeb T, Al-Hadi Hamasha A, Almasri NM. Oral and maxillofacial tumours in north Jordanian children and adolescents: a retrospective analysis over 10 years. *Int J Oral Maxillofac Surg.* 2003;**32**(1):78–83. [PubMed: 12653238]
  14. Arotiba GT. A study of orofacial tumors in Nigerian children. *J Oral Maxillofac Surg.* 1996;**54**(1):34–8. [PubMed: 8530997]
  15. Jaffe BF. Pediatric head and neck tumors: a study of 178 cases. *Laryngoscope.* 1973;**83**(10):1644–51. doi: 10.1288/00005537-197310000-00006. [PubMed: 4800746]
  16. Sengupta S, Pal R, Saha S, Bera SP, Pal I, Tuli IP. Spectrum of head and neck cancer in children. *J Indian Assoc Pediatr Surg.* 2009;**14**(4):200–3. doi: 10.4103/0971-9261.59601. [PubMed: 20419020]
  17. Wu S, Han J, Laden F, Qureshi AA. Long-term ultraviolet flux, other potential risk factors, and skin cancer risk: a cohort study. *Cancer Epidemiol Biomarkers Prev.* 2014;**23**(6):1080–9. doi: 10.1158/1055-9965.EPI-13-0821. [PubMed: 24876226]
  18. Chidzonga MM. Oral malignant neoplasia: a survey of 428 cases in two Zimbabwean hospitals. *Oral Oncol.* 2006;**42**(2):177–83. doi: 10.1016/j.oraloncology.2005.07.003. [PubMed: 16256412]
  19. Adebayo ET, Ajike SO, Adekeye EO. Tumours and tumour-like lesions of the oral and perioral structures of Nigerian children. *Int J Oral Maxillofac Surg.* 2001;**30**(3):205–8. doi: 10.1054/ijom.2001.0052. [PubMed: 11420902]
  20. Asamo EA, Ayanlere AO, Olaitan AA, Adekeye EO. Paediatric tumours of the jaws in northern Nigeria. Clinical presentation and treatment. *J Craniomaxillofac Surg.* 1990;**18**(3):130–5. [PubMed: 2345186]