

## Evaluation of Delayed Diagnosis of Neck Masses and Related Factors

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### Abstract

**Background:** Due to the importance of time in diagnosis and treatment and, as a result, the prognosis of patients with neck malignancies, we decided to evaluate the causes of delay in diagnosis of neck masses and their associated factors.

**Aim:** In this study, we have evaluated the delay in diagnosing neck masses and the related factors.

**Methods:** This descriptive-analytical study was performed on 500 patients with a neck mass who were referred to Loghman Hakim Hospital in 2019. Demographic data were recorded. The time of the delay to visit a doctor and the time of the delay to diagnosis were recorded. Factors related to the delay in the patient and physician's diagnosis, including the patient's socioeconomic status, literacy and income level, associated symptoms, history of smoking, infections and underlying diseases, were evaluated.

**Results:** the mean age of patients was 46.04 years. 50.4% were female. The mean time interval between feeling neck mass and visiting a doctor was 34.72 days. This time interval between feeling neck mass and visiting a doctor in patients with higher education levels was less than in illiterate patients with low education levels ( $p = 0.046$ ). This interval time in patients with higher income levels was less than in patients with lower income levels ( $p = 0.009$ ). This interval was significantly increased with increasing age ( $p < 0.001$ ).

**Conclusion:** Based on our findings, some factors such as age, income and education level significantly influence the process of diagnosis and treatment. On the other side, the presence of some signs and symptoms like dysphagia, sore throat, weight loss, etc., can remarkably reduce delay in that process. Ultimately it seems helpful to make an application which provides essential training for elderly, low-income or unlearned patients and facilitates consulting and referring to doctors for them.

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### Introduction

Neck masses are any swelling or enlargement of the structures between the mandible and the clavicle. They may be due to subcutaneous fat, vascular structures, nerves, or saliva (1). Neck masses can be caused by infectious,

inflammatory, congenital, traumatic, benign or malignant neoplasms (2). Neck masses are one of the relatively common complaints of patients referred to the Ear Nose Throat clinic. Usually, they include 10-15% of complaints,

which in addition to making the patient anxious, is sometimes a diagnostic problem for the physicians. Cervical masses are common in adults, but the underlying causes of most of them are not easily discernible. Although most neck masses in children are due to infection, the reasons for most stable neck masses in adults are neoplasms (3,4).

On the other hand, an asymptomatic cervical mass may indicate the onset or only clinical manifestation of head and neck cancers such as squamous cell carcinoma of the head and neck (HNSCC), lymphoma, thyroid, or salivary gland cancers (5). SCC of the head and neck is a major global problem for human health and accounts for 6% of all cancers (6). Its prevalence has also increased worldwide, especially in the SCC of the tongue. Time is essential in diagnosing cervical masses because delays in diagnosing metastatic HNSCCs are associated with higher tumour stage and poor prognosis (7–9). Unfortunately, despite advances in diagnostic modalities in recent decades, delays in diagnosis are common in these patients. About 40 years ago, patients with cervical masses had an average delay of 5 to 6 months from onset to the time of diagnosis of malignancy (10).

Today, studies have reported that this delay in diagnosis is about 3 and 6 months (11,12). Symptoms that increase clinical suspicion of malignancy are included hoarseness, earache, hearing loss, sores or swelling of the mucous membranes, new numbness in the cheeks or mouth, dyspnea, painful swallowing, dysphagia, weight loss, hemoptysis, confusion, nasal congestion, and unilateral epistaxis (7,13,14).

Despite advances in treating these cancers, the prognosis is still poor, and there has been a slight improvement in 5-year survival over the past four decades. In most countries, its incidence and mortality have been constant or increased in the last four decades (15). Considering the importance of time in diagnosis, treatment, and prognosis of patients

with neck masses and the lack of a similar study in our country, we evaluated the time of patient and physician delay in diagnosis and treatment of cervical masses.

## Methods

### Subjects

In this prospective cross-sectional study, during 2019, for one year, all patients referred to Loghman Hospital otorhinolaryngology clinic with a complaint of neck mass were non-randomly sampled. The only inclusion criterion was age more than 18 years old. Exclusion criteria comprise the patient's death before completing the examination and dissatisfaction with the continuation of the study at any stage.

The ethical committee of Shahid Beheshti University of Medical Sciences approved this investigation (IR.SBMU.MSP.REC.1398.487). All included individuals cooperated during the whole process of examinations and other evaluations.

Written consent was obtained from each included case. In this study, the time of feeling neck mass in patients, time to see a physician, time to refer to an otorhinolaryngology specialist, time of diagnosis and time of starting treatment were evaluated according to the number of days based on medical documents. Also, demographic information including age, sex, education, occupation, marital status, history of smoking and alcohol consumption, symptoms at the initial visit, type of pathology and location of the mass, clinical grades of the tumour, previous history of the disease were recorded in a form prepared to collect information.

Factors related to the delay in the diagnosis of the patient and the physician were as follows: the patient's socioeconomic status, education, history of smoking, infections and underlying diseases of the patient, other family members with a neck mass, physician speciality, type of neck mass from completed by observation and interview with the patient by the researcher.

### Statistical analysis

The results of this study were analyzed by SPSS software (version 19). Quantitative data were analyzed using a descriptive program and displayed as Mean  $\pm$  standard deviation. Chi-Square tests were used to compare percentages or frequencies between groups. An independent sample t-test compared the mean parametric data between the two groups. Pearson correlation test was used to examine the relationship between quantitative variables, and the Spearman correlation test was conducted to examine the ranking variables. The effect of an independent variable on the level of dependent variables was also investigated using multiple linear regression. In this study, a p-value less than 05.0 was considered statistically significant.

### Results

Five hundred consecutive patients were included in this study. The mean age of included cases was 46.04 years. Two hundred-fifty-two patients (50.4%) were female, and 248 (49.6%) were male. The mean interval between feeling neck mass and visiting a physician in all patients was 34.72 days (minimum zero days and maximum 120 days).

#### **The mean time interval between feeling neck mass and visiting a doctor based on history**

There was no significant difference in the mean interval time between feeling neck mass and visiting a doctor between women (28.19 days) and men (23.85 days) (P-value=0.33). There was also no association between the mean time interval between feeling a neck mass and visiting a doctor based on gender, marital status, smoking and alcohol consumption. There was a significant relationship between the mean interval time between feeling neck mass and visiting a doctor based on education ( $p = 0.046$ ).

The mean interval time in literate patients was less than in illiterate patients or low education levels [L1].

There was also a relationship between the mean time interval with income level ( $p = 0.009$ ). There was also a significant relationship between age and patient delay to the physician ( $p < 0.001$ ).

With increasing age, the time interval between feeling the neck mass and visiting a doctor increased significantly.

The relationship between the time interval between feeling a neck mass and visiting a doctor according to the causes and the accompanying symptoms can be seen in Table 1 and Table 2.

As it was shown in table 2 epistaxis and dysphagia had the shortest and longest time interval between a neck mass and visiting a physician (two and 20.74 days respectively).

#### **Mean time interval between visiting a doctor and referring to a specialist**

The mean time interval between visiting a doctor and referring to a specialist in all patients was 175.28 days (minimum zero days and full 380 days).

The relationship between this time interval and the patient's history was evaluated. There was no significant difference in the mean interval time between visiting a doctor and referring to a specialist between women (164.60 days) and men (143.49 days) (P-value= 0.5). Also, no association was found in the meantime interval between visiting a doctor and referring to a specialist based on age, marital status, smoking and alcohol consumption (all P-values > 0.05). There was an association between the mean time interval between referring to a doctor and referring to a specialist with education ( $p=0.013$ ).

Also, an association was observed between the mean time interval between referring to a doctor and referring to a specialist with the level of income ( $p = 0.008$ ).

The relationship between time to see a doctor and referral to a specialist based on causes accompanying symptoms are seen in Tables 3 and 4.

**Table 1.** The interval time between feeling a neck mass and visiting a doctor according to causes

Cause of neck mass	Mean	Standard deviation	p-value
<b>Infectious</b>	14.33	5.24	0.45
<b>Non-infectious</b>	19.33	9.42	
<b>Rheumatological</b>	33.33	15.77	0.57
<b>Non-rheumatological</b>	47.76	17.59	

**Table 2.** The time interval between feeling a neck mass and visiting a doctor according to the presence of symptoms

Symptoms	Mean	Standard deviation	p-value
<b>Hearing loss</b>			
Yes	3.36	2.40	0.044*
No	19.19	8.62	
<b>Lesion pain</b>			
Yes	3.67	2.65	0.02*
No	23.59	12.41	
<b>Hemoptysis</b>			
Yes	2.1	1.37	0.016*
No	18.93	8.18	
<b>Nasal congestion</b>			
Yes	6.40	5.17	0.03*
No	19.00	8.67	
<b>Epistaxis</b>			
Yes	2.00	1.14	0.043*
No	18.56	7.800	
<b>Hoarseness</b>			
Yes	8.04	5.72	0.03*
No	20.39	5.45	
<b>Dyspnea</b>			
Yes	18.75	8.51	0.5
No	19.40	7.58	
<b>Dysphagia</b>			
No	20.74	5.66	0.019*
Yes	3.89	2.70	
<b>Sore throat</b>			
Yes	4.67	2.61	0.005*
No	18.86	4.20	
<b>Weight lose</b>			
Yes	3.44	2.23	0.023*
No	20.26	9.93	
<b>Night sweats</b>			
Yes	4.64	3.0	0.004*
No	19.32	8.84	
<b>Ear pain</b>			
Yes	4.99	3.83	0.04*
No	19.27	8.85	

\*Symptoms with a significant difference in the time interval

**Table 3.** The interval time between feeling a neck mass and visiting an otorhinolaryngologist according to the causes

Cause of neck mass	Mean	Standard deviation	p-value
<b>Infectious</b>	78.01	49.29	0.62
<b>Non-infectious</b>	54.57	34.99	
<b>Rheumatological</b>	8.33	4.57	0.016*
<b>Non-rheumatological</b>	71.90	28.39	

**Table 4.** The relationship between referral time to specialist by doctor based on presence of symptoms of neck masses

Symptoms	Mean	Standard deviation	p-value
<b>Hearing loss</b>			0.044*
Yes	3.36	2.40	
No	19.19	8.62	
<b>Lesion pain</b>			0.57
Yes	46.40	11.46	
No	39.20	14.02	
<b>Hemoptysis</b>			0.27
Yes	36.5	11.37	
No	39.51	13.27	
<b>Nasal congestion</b>			0.32
Yes	22.40	10.44	
No	39.51	13.27	
<b>Epistaxis</b>			0.63
Yes	36.52	12.14	
No	42.65	14.55	
<b>Hoarseness</b>			0.78
Yes	31.64	8.43	
No	44.43	14.69	
<b>Dyspnea</b>			0.98
Yes	42.63	10.49	
No	42.65	14.72	
<b>Dysphagia</b>			0.93
No	46.10	9.67	
Yes	42.14	14.46	
<b>Sore throat</b>			0.012*
Yes	13.50	2.12	
No	73.71	14.24	
<b>Weight lose</b>			0.88
Yes	49.38	12.7	
No	41.89	14.84	
<b>Night sweats</b>			0.45
Yes	54.75	18.17	
No	49.87	14.17	
<b>Ear pain</b>			0.019*
Yes	12.60	5.35	
No	57.31	14.17	

\*Symptoms with a significant difference in the time interval

### The time interval between referring the patient to a specialist and diagnosis or treatment

The mean time interval between referral and diagnosis in all patients was 51.02 days (minimum zero days and maximum 300 days).

The mean time interval between diagnosis and treatment in all patients was 86.55 days (minimum zero days and maximum 365 days).

There was no significant difference in the mean interval time between diagnosis and treatment between women (57.61 days) and

men (65.19 days). Also, no association was found between the mean time interval between diagnosis and treatment based on age, marital status, smoking and alcohol consumption. There was an association between the mean time interval between diagnosis and treatment based on education ( $p = 0.005$ ). The mean time interval between diagnosis and treatment in patients with higher education was less than in illiterate patients or lower education levels.

There was also a relationship between the mean time interval between diagnosis and treatment based on income level ( $p = 0.018$ ). The mean time interval between diagnosis and treatment was lower in patients with higher income levels than in patients with lower income levels. The relationship between diagnosis and treatment after referring patients to a specialist based on causes and symptoms of neck masses are seen in Tables 5 and 6.

**Table 5.** The relationship between diagnosis and treatment after referring patients to specialists based on causes of masses

Cause of neck mass	Mean	Standard deviation	p-value
<b>Infectious</b>	54.0	26.53	0.51
<b>Non-infectious</b>	63.85	21.82	
<b>Rheumatological</b>	2.5	0.7	0.002*
<b>Non-rheumatological</b>	31.58	12.7	

**Table 6.** The relationship between diagnosis and treatment time interval based on symptoms on neck masses

Symptoms	Mean	Standard deviation	p-value
<b>Hearing loss</b>			
Yes	4.04	2.92	0.04*
No	57.30	21.28	
<b>Lesion pain</b>			
Yes	18.67	11.36	0.012*
No	80.86	25.46	
<b>Hemoptysis</b>			
Yes	49.8	17.37	0.77
No	75.71	41.78	
<b>Nasal congestion</b>			
Yes	4.33	1.65	0.041*
No	77.28	21.28	
<b>Epistaxis</b>			
Yes	49.0	15.42	0.87
No	72.95	42.72	
<b>Hoarseness</b>			
Yes	11.67	8.04	0.028*
No	82.0	25.33	
<b>Dyspnea</b>			
Yes	4.0	1.47	0.34
No	51.42	22.29	
<b>Dysphagia</b>			
No	21.25	17.48	0.012*
Yes	83.69	31.71	
<b>Sore throat</b>			
Yes	6.0	3.48	0.038*
No	75.41	21.88	
<b>Weight lose</b>			
Yes	2.01	1.03	0.001*
No	77.6	21.17	
<b>Night sweats</b>			
Yes	54.80	27.38	0.73



No	73.9	31.24	
<b>Ear pain</b>			
Yes	45.0	43.64	
No	73.51	55.09	0.85

\*Symptoms with a significant difference in the time interval

**Table 7.** The correlation between stages of masses with all situations

<b>Time interval between feeling a mass and visiting a doctor</b>			
<b>Clinical grade</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>p-value</b>
II	36.14	11.29	
III	29.14	9.73	0.028*
IV	8.7	6.54	
<b>Time interval between visiting a doctor and referring to a specialist</b>			
<b>Clinical grade</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>p-value</b>
II	84.22	29.41	
III	36.13	19.55	0.014*
IV	6.72	3.95	
<b>Time interval between visiting a doctor and referring to a specialist</b>			
<b>Clinical grade</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>p-value</b>
II	64.19	17.63	
III	28.14	14.77	0.025*
IV	14.27	5.37	

**Table 8.** The final diagnosis of the masses

<b>Type of pathology</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Parathyroid disorders</b>	100	20
<b>SCC laryngeal</b>	60	12
<b>Thyroid cancer</b>	15	3
<b>Unspecific</b>	10	2
<b>Carotid body tumor</b>	3	1
<b>metastatic</b>	30	6
<b>Melanoma</b>	4	1
<b>lymphoma</b>	13	3
<b>No data</b>	265	52

#### **Mean time interval in all situations and their relationship with stages of neck masses**

The relationship between stages of neck masses based on pathology with the time interval between visiting a doctor, referring to a specialist, diagnosis, and treatment are seen in Table 7.

As was demonstrated in table 7, the higher clinical grades of masses are associated with a shorter delay in visiting a physician, referring to specialists, and visiting specialists.

#### **Final Diagnosis**

The frequency of pathology types of patients is summarized in Table 8. Overall, the pathology of 235 patients was available, and the most common cause of neck mass was related to parotid gland disorders (n = 100). The most frequent cause of neck masses among masses with pathological data was parathyroid disorders. Melanoma and carotid body tumors each accounted for about one per cent. Thirty cases (about six per cent) had metastasis.

#### **Discussion**

In this study, we evaluated the causes of delay between sensing a neck mass by a patient and visiting a doctor and referring to a specialist, diagnosis, and treatment. Five hundred patients were entered into the study. The mean age of patients was 46.04 years, and 50.4% of patients were female. There was a significant association between education levels and economic status with the time interval between feeling a mass by the patient and visiting a doctor, referring to a specialist, and diagnosis

and treatment. Sex, marriage status, smoking, and alcohol consumption were not related to the prolonged time interval from feeling a mass to treatment. There was a statistically significant relationship between the pathological grades of the masses based on pathology reports and lowered time to visit physicians for diagnosis and treatment.

In the current study, we observed that the mean time delay between feeling a mass in a patient and visiting a doctor was 34.72 days. In a study by Kassirian et al. (16), they reported that this delay was 120 days in Canada. Lee et al. (17) reported that this interval was about one month, and in another study by Nieminen et al. (18), this delay was about 1.5 months. Nieminen et al. study and Lee et al. study had similar findings to our finding of delayed time to visit a doctor. However, Kassirian et al. found it very different from our study's findings. Of the differences between Kassirian et al., the study from our study was a statistical population. In the current study, we evaluated 500 patients, but the understudied population of Kassirian et al. was less than half of our study population. One of the advantages of our study was that it was performed on a large population.

Some research found that some factors were associated with the time interval of the first presentation by a patient and visiting a doctor, such as fear, smoking history, and socioeconomic factors (16,18–20). Our findings showed that smoking history was not associated with patient delay, but socioeconomic factors such as education and income had a significant relationship with patient delay. Our findings differed from other studies about the association of socioeconomic factors with patient delay. It seems that patients with a high level of income or education are careful about their health because they are less concerned about their primary needs in life. Also, they are educated

about their health. The relationship of socioeconomic factors with patient delay should be evaluated in further studies. Some other studies demonstrated that poor socioeconomic status is related to patient delay in visiting a doctor (21,22).

In the current study, we observed that manifestations associated with the patient's delay included hoarseness, dysphagia, sore throat, weight loss, night sweats, ear pain, hearing loss, lesion pain, hemoptysis, and nasal congestion, and epistaxis. In the Kassirian et al. (16) study, these manifestations included pain and mouth soreness. Another study reported that pain was related to shorter time intervals to visit a doctor (23).

In the current study, the mean period for referring patients to a specialist was 175.28 days. The Kassirian et al. study (16) was about 11 months or 330 days. This rate in our country was significantly lower than in Canada. This difference may come from wasting time holding multidisciplinary consulting (24).

In a study in Iran, Amirchaghmaghi et al. evaluated 143 patients with head and neck cancer and concluded that the median delay was 60 days. A physician visited about 30.8% of patients in the first month. Factors such as low level of education, low income, smoking, and living in rural areas have been the most critical factors related to patient delay, which is mainly in line with our research findings (not about smoking). However, the average delay in visiting a doctor in our study was less than in the Amirchaghmaghi et al. study, probably due to the number of samples and the geographical area. Amirchaghmaghi et al. also reported that age is a factor associated with patient delay, which is similar to our findings. However, as in our study, there was no association between gender and marital status with patient delay (25).



In the study by Carvalho et al., the relationship between disease stage and patient delay was investigated in 679 head and neck cancer patients. The results of this research showed that there is a significant and inverse relationship between disease stage and patient delay. In other words, increasing the stage of the disease was associated with a shorter duration of patient delay. These results are similar to the findings of our study. Our study observed a significant inverse relationship between the disease stage and patient delay (26). Kassian et al. mentioned that the disease stage had no relationship with the patient delay, which was in contrast with the present study (16).

Nieminen et al. reported a mean delay of 35 days for the patient delay, of which 73% of patients sought medical care for three months (18). The delay in primary health care was 20 days to diagnose and treat. The main symptoms affecting patient delay were hoarseness and respiratory problems, while patients with a palpable mass on the neck had a shorter delay. Also, factors such as tumor size and regional metastases have been associated with shorter patient delays. This time delay of patients is mainly comparable to the results of our study, which was 34.72 days. However, in contrast to this study, in our study, patients with symptoms associated with hoarseness had a shorter mean delay.

### Conclusion

The results of this study showed that factors such as increasing age, decreasing income level, and education level significantly affect the delay in referring patients to a doctor. Thus the process of diagnosis and treatment of the disease is delayed. On the other hand, the presence of symptoms such as hoarseness, dysphagia, sore throat, weight loss, night sweats, earache, lesion pain, hemoptysis, nasal congestion, and epistaxis, as well as significantly increasing the stage of the

disease, significantly reduce the delay of patients to visit a doctor. In other words, the presence of these symptoms in patients reduced the time interval between feeling the neck mass and visiting a doctor. Therefore, the study of these factors in predicting or preventing patients from delaying the treatment process and preventing disease progression is significant. An application should also be made to provide the necessary training for patients with lower levels of education or older patients, if possible, to create an easier way to consult with a doctor and lower the time to refer to a doctor.

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### Conflicts of Interest

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