ORIGINAL ARTICLE

A Prevalence Study of Pharyngitis and Its Associated Factors Among Adults With a Sore Throat in Three Primary Clinics in Selangor, Malaysia

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ABSTRACT

Introduction: Since pharyngitis in adults is one of the most common infectious diseases seen in general practitioner consultations in Malaysia, data on pharyngitis among adults concerning to its prevalence, socio-demographic, risk factors and clinical manifestations is very much lacking. This study aims to determine the prevalence of pharyngitis among adults in Sepang, Selangor, Malaysia from 2016 to 2017 and its associated demographic and risk factors. **Methods:** We conducted a cross-sectional study on 215 adult patients with a sore throat as the main symptom and who did not receive any antibiotic treatment within two weeks at three Malaysian primary care clinics. The researchers assessed the participants' clinical manifestations and collected throat swabs for culture to determine the presence of group A streptococcus (GAS). Data on demographic characteristics, clinical manifestation and throat swab culture results were analyzed using chi-square test and multivariate logistic regression. **Results:** Pharyngitis was diagnosed in 130/215 (65%) adults with a sore throat. Only six isolates (2.8%) were identified as GAS. The overall mean age ± S.D was 36.43 ± 15.7. The majority of the participants were in the age group of 18-28 years. There were 42.3% males and 57.7% females; most participants were Malay 62.8%, followed by 30.2% Indian, 5.1% Chinese, and 1.9% other ethnicities. The most common symptom among the participants was cough 196 (91.2%), followed by rhinorrhea 161 (74.8%), tonsillar swelling or exudates 68 (31.6%), inflamed or reddish of pharynx 62 (28.8%), swollen anterior cervical lymph nodes 50 (23.3%), and fever ≥37.5°C 28 (13.0%). **Conclusion:** Besides, there was no significant association between pharyngitis and the demographic variables; the current findings emphasized that inflamed or reddish pharynx, tonsillar swelling or exudates were among the factors associated with pharyngitis.

Keywords: Pharyngitis, Sore throat, Upper Respiratory Tract Infections, Malaysia

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INTRODUCTION

Pharyngitis is one of the commonest upper respiratory tract infections that represent a substantial portion of the cases visited the primary care physicians globally (1). The cause of pharyngitis in adults is mainly viral, and approximately 5-15% is caused by a bacterial infection, mainly caused by group A streptococci (GAS), which is the only indication for antimicrobial therapy (2-4). The commonest typical symptoms of pharyngitis include a sore throat, inflamed pharynx, swollen tonsils, white or yellow patches on the tonsils and fever. Fever ≥ 38oC is usually associated with group A streptococcal (GAS) infection (3). However, cough and nasal discharge are often associated with viral infections than bacterial infections (3,6,7). Other symptoms may include stiff and swollen neck, headache, painful or difficulty swallowing (dysphagia), loss of voice or changes in the voice, vomiting, abdominal pain, and bad breath (2,3).

Evidence suggests that environmental factors, such as cold temperature in winter and spring, air pollution and lack of ventilation in adjacent enclosed spaces can play a significant role in the development of having pharyngitis and increases disease transmission (5,6). Furthermore, other studies reported that patients with any condition that weaker the immune system, such as diabetes, organ

transplant, chemotherapy and AIDS have higher risks of pharyngitis. Also, sinusitis and smoking or exposure to secondary smoke were associated with pharyngitis (7,8). All racial and ethnic groups are affected by pharyngitis globally and the infection can affect both male and female genders (3).

In Malaysia, upper respiratory tract infection (URTI) is the commonest disease to seek treatment in primary care clinics (9). A study reported that the prevalence of upper respiratory tract infection (URTI) was 58.8% in four primary clinics, of which 6.6% were diagnosed with pharyngitis/tonsillitis (10). Another study conducted among children visiting the emergency department in a Tertiary Hospital reported that URTI was the most frequent diagnosis (65%), pharyngitis/tonsillitis was not documented (11). However, data on the epidemiology of pharyngitis with regard to its prevalence, socio-demographic data, and complications is very much lacking in Malaysia. Therefore, this study was to determine and document the prevalence of pharyngitis and GAS among adults with a sore throat and demographic characteristics and clinical features associated with pharyngitis in local primary care clinics. The findings in this study will help in understanding the prevalence of pharyngitis in Malaysia, contribute to the advancement of knowledge on this issue, and also hope to be beneficial for future studies.

MATERIALS AND METHODS

Participants, data collection, isolation and identification
A cross-sectional study was carried out in three public primary care clinics in Selangor, Malaysia during the period from December 2016 to April 2017. Adult patients who attended the clinics and complained of sore throat were included in this study. The diagnosis of sore throat was made by the attending physicians based on the patient's symptoms. Those with conditions that might hinder the completion of the study, including patients treated with antibiotics within two weeks, pregnant women, immunocompromised patients, and very ill patients requiring emergency treatments, were excluded from the study. A cotton throat swab was collected by trained research from the tonsils surface and the wall of the pharynx for 215 patients.

Each throat swab was placed immediately into Amie's transport medium (Oxoid, UK) to suppress the survival of the commensal organism (12). The samples were placed in an icebox and sent to the microbiology laboratory with a complete request form within 6 hours to the Microbiology laboratory at the Faculty of Medicine and health sciences Universiti Putra Malaysia (UPM). At the laboratory, the throat swabs were inoculated onto 5% sheep's blood agar plates, and the plates were incubated in a carbon dioxide enriched atmosphere at 37oC for 24 hours. GAS isolates were identified based on the gold standard of microbiological techniques, which include β haemolytic colonies on blood agar, Gram-positive cocci arranged in chain or pairs, catalase test negative, and susceptibility of 0.05-unit bacitracin disc (12). In addition, for each isolate identified as β haemolytic streptococci; a latex agglutination test (Oxoid, UK) was used to identify group A streptococcus from the culture plates and Pyrrolidonyl arylamidase /PYR-aminopeptidase (Oxoid, UK) was used to confirm the results, which group A streptococcus is positive for PYR test (deep cherry red colour within a minute of addition of the reagent).

The present study was designed to estimate the prevalence of pharyngitis and its associated factors among adults with a sore throat. The sample size was calculated using a single proportion sampling formula based on the previous prevalence of pharyngitis among adults in Thailand (13). The total sample size was 239 subjects after taking into consideration a power of 80%, 95% confidence level and 20% estimate for incomplete data.

The socio-demographic data (age, gender, ethnicity), clinical information, clinical manifestations, comorbidity and chronic diseases were recorded by the researchers. In addition, a complete physical examination including (sore throat, fever, rhinorrhea, redness of pharynx, tonsillar swelling or exudates, swollen anterior cervical lymph nodes, abdominal pain and others) was done by the researchers. Pharyngitis was defined according to the diagnosis and the physical examination of the physicians in the clinics. Patients were diagnosed with pharyngitis if they had redness of pharynx, tonsillar swelling or tonsillar exudates have identified to have pharyngitis (14). Some of the clinical information was obtained from the medical records of the patients. The physical examination by the researchers was compared with the physical examination of the treating physician to verify the accuracy and validity of the clinical presentation.

Statistical analysis

Data was statistically analyzed using Statistical Package for the Social Sciences (SPSS) software version 24.0. Descriptive continuous data was distributed and summarized by descriptive statistics as mean and standard deviation (SD), while categorical data was distributed in percentages and frequencies. A comparison between categorical variables is by the chi-square test with a significance level set at $p < 0.05$. Fisher exact test was used instead of the chi-square test when the expected count in any cell was less than five. The binary logistic regression was applied to identify the predictors of pharyngitis among patients with a sore throat for all study variables. Multivariate logistic regression models were used to determine adjusted odds ratio, P-value and 95% confidence level.

Ethical consideration

This study was approved by the Malaysia Medical

Research and Ethics Committee, Ministry of Health Malaysia [NMRR-15-2387-27757] and the Ethics Committee for Human Study of Universiti Putra Malaysia [UPM/TNCPI/RMC/1.4.18.1(JKEUPM)/F1]. Written informed consent was obtained from all participants and they received written information about the study before collecting the data. All participants in this study were volunteers and they acknowledged that they have the right to withdraw from this research at any time without giving any reason whatsoever. Information from the participants was confidential and was not identified in the writing of the report or publication.

RESULTS

Demographic Characteristics

Of 239 patients who attended the clinics with a sore throat, 24 patients were excluded because five of them had been taking antibiotics in the previous two weeks, two pregnant women, 15 less than 18 years old and two patients were refused to participate in the study. Therefore, the response rate in this study was 89.9%.

The participants have included 91 (42.3%) males and 124 (57.7%) females with a mean age ± S.D (36.43 ± 15.7 years old) and the majority were between 18-28 years old (39.1%). The majority of participants were Malay (62.8%), followed by Indian (30.2%), Chinese (5.1%) and 1.9% from other ethnicities. Forty (18.6%) of the participants were identified as smokers. The prevalence of pharyngitis among the participants with a sore throat was 60.5% (n=130). GAS was positive in 6 (2.8%) of the participants (Table I).

Although pharyngitis cases were more common in males, patients in the age group 18-28 years, Chinese, smoker patients and GAS positive cases, Chi-square test showed that there was no significant association between pharyngitis and the age, gender, ethnicity, smoking status and throat swab results ($p < 0.05$).

Table II summarizes the comorbidity and chronic diseases of the participants. 38 (17.7%) of the participants had hypertension, 36 (16.7%) identified themselves as diabetic, and 25 (11.6%) were reported to have asthma. While 11 (5.1%) had an allergy, 8 (3.7%) had heart diseases, 8 (3.7%) had influenza/flue and 13 (6.1%) had other diseases include two chronic obstructive pulmonary diseases, two sinusitis, two dengue fever, dyslipidemia, pneumonia, conjunctivitis, colitis, rheumatoid arthritis, schizophrenia, anaemia. Based on Chi-square test and Fisher's Exact Test, patients without hypertension and diabetes were significantly associated with pharyngitis ($p < 0.05$), while there was no association with other comorbidity and chronic diseases.

Table III shows the clinical manifestations of the participants with a sore throat. The most common

Table I: Participants' socio-demographic characteristics, smoking status and throat swab results (N = 215)

Characteristic	Pharyngitis (n%)	Not-pharyngitis (n%)	χ^2	*p*
Age group (Years)				
Mean age ± S.D	36.43 ±15.7			
18-28 (n=84)	58 (69.1%)	26 (30.9%)	7.96	0.093
29-39 (n=52)	32 (51.5%)	20 (38.5%)		
40-50 (n=35)	20 (57.1%)	15 (42.9%)		
51-60 (n=25)	13 (52.0%)	12 (48.0%)		
≥ 61 (n=19)	7 (36.8%)	12 (63.2%)		
Gender				
Male (n=91)	56 (61.5%)	35 (38.5%)	0.76	0.783
Female (n=124)	74 (59.7%)	50 (40.3%)		
Ethnicity				
Malay (n=135)	87 (64.4%)	48 (35.6%)		
Indian (n=65)	31 (47.7%)	34 (52.3%)	7.8	0.051
Chinese (n=11)	9 (81.8%)	2 (18.2%)		
Others[a] (n=4)	3 (75.0%)	1 (25.0%)		
Smoking status				
Smoker (n=40)	26 (65.0%)	14 (35.0%)	0.423	0.52
Non- smoker (n=175)	104 (59.4%)	71 (40.6%)		
Throat swab results				
GAS (n=6)	6 (100%)	0 (0%)	4.04	0.08[c]
Non-GAS[b] (n=209)	124 (59.3%)	85 (40.7%)		
Total	130 (60.5%)	85 (39.5%)		

[a] Others refer to one aborigine and 3 ethics from Indonesia; [b] Cases which were negative for GAS test;
[c] refers to Fisher's Exact Test; $p < 0.05$ was not significant: n, number of respondents; N, the sample size of this study;
X^2 refers to a statistic used for testing associations between variables through chi-square test.

Table II: Distribution of comorbidity and chronic diseases of the participants (N = 215)

Comorbidity	Pharyngitis (n%)	Not-pharyngitis (n%)	χ^2	*p*
Hypertension				
Yes (n=38)	14 (36.7%)	24 (63.3%)	10.8	0.001*
No (n=177)	116 (65.5%)	61 (34.5%)		
Diabetes				
Yes (n=36)	15 (41.7%)	21(58.3%)	6.4	0.01*
No (n=179)	115 (64.2%)	64 (35.8%)		
Asthma				
Yes (n=25)	18 (72.0%)	7 (28.0%)	1.58	0.21
No (n=190)	112 (58.9%)	78 (41.1%)		
Allergy				
Yes (n=11)	7 (63.6%)	4 (36.4%)	0.49	1.00[a]
No (n=204)	123 (60.3%)	81 (39.7%)		
Heart diseases				
Yes (n=8)	5 (62.5%)	3 (37.5%)	0.14	1.00[a]
No (n=207)	125 (60.4%)	82 (39.6%)		
Influenza				
Yes (n=8)	4 (50%)	4 (50%)	0.38	0.72[a]
No (n=207)	126 (60.9%)	81 (39.1%)		
Other diseases				
Yes (n=13)	7 (53.8%)	6 (46.2%)	0.254	0.62
No (n=202)	123 (60.9%)	79 (39.1%)		
Total	**130 (60.5%)**	**85 (39.5%)**		

n, number of respondents; N, the sample size of this study; * Statistical significance at $p < 0.05$;
[a] refers to Fisher's Exact Test; X^2 refers to a statistic used for testing associations between variables through chi-square test.

Table III: Distribution of the clinical manifestations of the participants (N = 215)

Clinical manifestations	Pharyngitis (n%)	Not-pharyngitis (n%)	χ^2	*p*
Cough				
Yes (n=196)	115 (58.7%)	81 (41.3%)	2.98	0.09[a]
No (n=19)	15 (78.9%)	4 (21.1%)		
Rhinorrhea				
Yes (n=161)	96 (59.6%)	65 (40.4%)	0.19	0.66
No (n=54)	34 (63%)	20 (37%)		
Inflamed or reddish pharynx				
Yes (n=62)	62 (100%)	0 (0.0%)	54.4	0.001*[a]
No (n=153)	68 (44.4%)	85 (55.6%)		
Fever ≥ 37.5°C				
Yes (n=25)	18 (64.3%)	10 (35.7%)	0.19	0.84
No (n=187)	112 (59.9%)	75 (40.1%)		
Fever ≥ 38°C				
Yes (n=15)	12 (80%)	3 (20%)	2.57	0.17[a]
No (n=200)	118 (59%)	82 (41%)		
Tonsillar swelling or exudates				
Yes (n=68)	68 (100%)	0 (0.0%)	65.0	0.001*[a]
No (n=147)	62 (42.2%)	85 (57.8%)		
Swollen anterior cervical lymph				
Yes (n=50)	34 (68%)	16 (32%)	1.55	0.25
No (n=165)	96 (58.2%)	69 (41.8%)		
Headache				
Yes (n=22)	13 (59.1%)	9 (40.9%)	0.02	1.00
No (n=193)	117 (78.9%)	76 (21.1%)		
Vomiting				
Yes (n=8)	4 (50%)	4 (50%)	0.38	0.72[a]
No (n=207)	126 (60.9%)	81 (39.1%)		
Abdominal pain				
Yes (n=3)	1 (33.3%)	2 (66.7%)	0.94	0.56[a]
No (n=212)	129 (60.8%)	83 (39.2%)		
Diarrhea				
Yes (n=1)	0 (0.0%)	1 (100%)	1.54	0.40[a]
No (n=214)	130 (60.7%)	84 (39.3%)		
Total	130 (60.5%)	85 (39.5%)		

n, number of respondents; N, the sample size of this study; * Statistical significance at $p < 0.05$; [a] refers to Fisher's Exact Test; χ^2 refers to a statistic used for testing associations between variables through chi-square test.

symptom was cough 196 (91.2%), followed by rhinorrhea 161 (74.8%), tonsillar swelling or exudates 68 (31.6%), inflamed or reddish pharynx 62 (28.8%), swollen anterior cervical lymph nodes 50 (23.3%), fever ≥37.5°C 28 (13.0%), headache 22 (10.2%), vomiting 8 (3.7%), abdominal pain 3 (1.4%), and one (0.01%) diarrhea. Chi-square test and Fisher's Exact Test indicated that there was a significant association between pharyngitis and inflamed or reddish pharynx and tonsillar swelling or exudates ($p = 0.001$).

As a preliminary model, all the variables, including socio-demographic factors, throat swab results, comorbidity, chronic diseases and clinical manifestations were identified using univariate logistic regression one by one independently. Six variables (age group, ethnicity, hypertension, diabetes, inflamed or reddish pharynx and tonsillar swelling or exudates) turned out to be significant. Table IV presents the associations between pharyngitis and socio-demographic factors, comorbidity, chronic diseases and clinical manifestations using univariate logistic regression. Age group 18-28 ($p < 0.01$), Indian ethnicity ($p = 0.033$), non-hypertension ($p = 0.001$), non-diabetes (p = 0.013), inflamed or reddish pharynx ($p = 0.001$), tonsillar swelling or exudates ($p = 0.001$) had P-values 0.05 and were included in the multiple logistic regression analysis.

The factors that predicted pharyngitis among adults with sore throat were Malay ethnicity (OR = 9.416, 95% CI = 1.239-71.586, p = 0.03), Indian ethnicity (OR = 38.737, 95% CI = 3.535-424.51, $p = 0.003$), hypertension (OR = 39.270, 95% CI = 1.690-912.56, $p = 0.022$), inflamed or reddish pharynx (OR = 0.004, 95% CI = 0.001-0.021, $p = 0.001$), tonsillar swelling or exudates (OR = 0.003, 95% CI = 0.001-0.015, $p < 0.001$) (Table V).

DISCUSSION

In recent years, the rate of pharyngitis was increased in developing countries and it has been associated with risk factors such as young age, smoking and chronic diseases (15). GAS is the only major pathogen of concern in patients with pharyngitis because of its potential harmful consequences.

In this study, the prevalence of pharyngitis among adults with a sore throat was 60.5%. Close to the prevalence (46.2%) of pharyngitis has been reported among patients with sore throat in another study in Malaysia (16). Another study in Malaysia among patients reported that the prevalence of upper respiratory tract infections (URTIs) was 37%, while 5.7% diagnosed with pharyngitis (17). Differences in findings might be explained by many factors such as the study design, sampling technique, study population, sample size, ecological and difference in clinical diagnosis by physicians.

The prevalence of GAS in adults with a sore throat in the present study was 4.6%. This finding was comparable to results from a study among Taiwanese patients with a sore throat (4.1%) (18), and it was lower compared to a study carried out in Malaysia (14.2%) (19). However, it was much lower than 28%, 25.3% and 26% were reported in Australia, Pakistan and South Africa, respectively (20,21,22). Study design, sampling technique, cultural technique and study population may be a possible explanation of these variations and the low proportion of GAS in the current study (23). Moreover, the sample size of this study was not large and paediatric subjects (under 18 years old) was excluded.

This study found that more females suffered from pharyngitis than males, similar to the results of a

Table IV: The associations between pharyngitis and socio-demographic factors, comorbidity, chronic diseases and clinical manifestations using univariate logistic regression

Variables	OR[a]	95% CI[b]	P-value
Age group (Years)			
18-28	0.261	0.092-0.740	0.01*
29-39	0.365	0.123-1.081	0.069
40-50	0.438	0.139-1.378	0.158
51-60	0.261	0.159-1.821	0.319
≥ 61	Ref		
Gender	Ref		
Male	1.081	0.621-1.882	0.783
Female			
Ethnicity			
Malay	2.207	0.593-8.206	0.237
Indian	4.387	1.131-17.017	0.033*
Chinese and Others	Ref		
Smoking status			
Smoker	1.268	0.619-2.595	0.52
Non- smoker	Ref		
Throat swab results	Ref		
GAS	6.24	0.77-50.25	0.085
Non-GAS			
Hypertension	Ref		
Yes	0.307	0.148-0.636	0.001*
No			
Diabetes	Ref		
Yes	2.52	1.21-5.22	0.013*
No			
Asthma			
Yes	1.79	0.714-4.492	0.214
No	Ref		
Allergy			
Yes	1.152	0.327-4.063	0.825
No	Ref		
Heart diseases			
Yes	1.093	0.254-4.699	0.91
No	Ref		
Influenza	1.556	0.378-6.395	0.540
Yes	Ref		
No			
Other diseases	1.335	0.433-4.117	0.62
Yes	Ref		
No			
Cough	2.641	0.846-8.250	0.095
Yes	Ref		
No			
Rhinorrhea	1.556	0.378-6.395	0.540
Yes	Ref		
No			
Inflamed or reddish pharynx	0.014	0.002-0.103	<0.001*
Yes	Ref		
No			
Fever ≥ 37.5°C	0.830	0.363-1.896	0.658
Yes	Ref		
No			
Fever ≥ 38°C	0.360	0.098-1.315	0.122
Yes	Ref		
No			
Tonsillar swelling or exudates	0.011	0.01-0.08	<0.001*
Yes	Ref		
No			
Swollen anterior cervical lymph	0.655	0.335-1.279	0.215
Yes	Ref		
No			
Headache	1.066	0.434-2.615	0.889
Yes	Ref		
No			
Vomiting	1.556	0.378-6.395	0.540
Yes	Ref		
No			
Abdominal pain	3.108	0.277-34.826	0.358
Yes	Ref		
No			
Diarrhea	1.536	0.095-24.888	0.763
Yes	Ref		
No			

OR[a] -Unadjusted Odds ratio, 95% CI[b] - Confidence interval, *P -value- Significant at $p<0.05$

Table V: Multiple logistic regression analysis on factors associated with pharyngitis among adults with sore throat

Variables	B[a]	SE	Adjusted OR[b]	95% CI[c]	P-value
Age group (Years)					
18-28	0.791	1.239	2.205	0.194-25.020	0.523
29-39	0.242	1.212	1.274	0.118-13.715	0.842
40-50	-0.483	1.195	0.617	0.059-6.411	0.686
51-60	1.467	1.294	4.337	0.343-54.820	0.257
≥ 61			ref		
Ethnicity					
Malay	2.242	1.035	9.416	1.239-71.586	0.03*
Indian	3.657	1.222	38.737	3.535-424.51	0.003*
Chinese and others			ref		
Hypertension					
Yes (n=38)	3.670	1.605	39.270	1.690-912.56	0.022*
No (n=177)			ref		
Diabetes					
Yes (n=36)	2.772	1.505	15.996	0.838-305.48	0.065
No (n=179)			ref		
Inflamed or reddish pharynx					
Yes (n=60)	-5.607	0.884	0.004	0.001-0.021	<0.001*
No (n=155)			ref		
Tonsillar swelling or exudates					
Yes (n=68)	-5.873	0.869	0.003	0.001-0.015	<0.001*
No (n=147)			ref		

B[a] -Coefficient for adjusted OR, Adjusted OR[b] -Adjusted Odds ratio, 95% CI[c] - Confidence interval, *P-value- Significant at $p<0.05$

previous study (24). However, a study among Indian patients found that the highest proportion was among the males (51.2%) (25). Some studies on pharyngitis did not display data on gender, possibly due to the lack of a significant difference in numbers of males and females (16,17).

Pharyngitis was more common in the age group of 18-28 years old in our study. Similarly, a study in Spain found that the highest incidence of pharyngitis among adults was in the age group 18-30 years old (26). Mehta et al. (27) reported that pharyngitis occurs in all age groups, but especially during school age, possibly due to high transmissibility from one child to another (27). However, these variations did not age specific. These results may be explained as the younger age groups (children and teenagers younger than 18 years old) in

this study was excluded due to ethical concerns and the need for parental consent.

Chi-square and univariate logistic findings showed that the age group (18-28 years old) was associated with pharyngitis in adults with a sore throat, which concurred with the findings by previous studies (28,29). We also found that Indian ethnicity was associated with pharyngitis. We have not found any studies reporting similar outcomes.

The current study found no significant statistical association between pharyngitis and smoking status, as reported in other studies (28,29). However, a study was done among patients who complained of pharyngitis found that smoker patients showed a longer history and higher incidence of pharyngitis than non-smokers (30). These findings may be explained by another study where the pharyngeal flora of smokers contains more potential pathogens such as group A streptococcus, group C streptococcus, group G streptococcus and *Candida albicans* compared with those of non-smokers; therefore, smoking might be a risk factor for pharyngitis (31). These variations in the results may be because of the difference is in the study population.

Our study found that non-hypertension and non-diabetes were significantly associated with pharyngitis. In contrast, Lin et al. (32) reported that patients with hypertension or diabetes suffer from pharyngitis more than others. These findings may be explained by the fact that immunocompromised patients might be more susceptible to get infections than others (33). In addition, angiotensin-converting enzyme inhibitors (ACE-I) are widely used in the treatment of hypertension diseases, and ACE-I is associated with a chronic cough that leads to sore throat and pharyngitis (34). The variations between the studies could be attributed to sampling technique and sample size, wherein this present study population was small; hence, the sample size could not adequately detect an association. In addition, other studies reported a significant association between pharyngitis with allergy, ear infections and sinusitis (35,36).

In our study, we evaluated the clinical manifestations of pharyngitis in adults with a sore throat. We found that inflamed or reddish pharynx and tonsillar swelling or exudates were associated with pharyngitis, similar to the results of other studies from different countries (25,26,27). However, it is worth to note that the physical examination of pharyngitis included a tonsillar exudate or inflamed reddish pharynx. These criteria were used as the definition of pharyngitis in this study; therefore, there was no wonderment these criteria were to be the significant predictors of pharyngitis.

The limitations in this study include the definitions of pharyngitis which used which were intentionally broad, because diagnoses were not necessarily accurately recorded in the medical record. In addition, this study was limited to three primary clinics only from one area among adults with sore throat in Malaysia.

CONCLUSION

In conclusion, this study shows a high prevalence of pharyngitis among adults with sore throat in Malaysia. However, the prevalence of GAS infection in adults with a sore throat was low (2.8%). Additionally, Indian ethnicity, non-diabetes and non-hypertension were associated with pharyngitis. This study has confirmed that the presence of tonsillar swelling or exudates and inflamed or reddish pharynx have a significantly higher association with pharyngitis, which may help to diagnose pharyngitis in primary health clinics. Some of the factors that predict pharyngitis such as hypertension, inflamed or reddish pharynx, tonsillar swelling or exudates were among the factors that could be used to diagnose pharyngitis among adults with a sore throat in primary clinics.

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REFERENCES

1. Cots JM, Alos JI, Barcena M, Boleda X, Gymez N, Mendoza A, et al. Recommendations for management of acute pharyngitis in adults. Acta Otorrinolaringologica. 2016;34(9):585-594.
2. Anjos L, Marcondes M, Mariana F, Lima M, Mondelli L, Okoshi MP. Streptococcal acute pharyngitis. Rev Soc Bras Med Trop. 2014;47(4):409-413.
3. Muthanna A, Salim HS, Hamat RA, Shamsuddin NH, Zakariah, SZ. Clinical screening tools to diagnose group A streptococcal pharyngotonsillitis in primary care clinics to improve prescribing Habits.Malays J Med Sci.2018;25(6):6-21.
4. Hersh K, Fleming D, Shapiro DJ, Hyun D Y, Hicks LA. Frequency of first-line antibiotic selection among US ambulatory care visits for otitis media, sinusitis, and pharyngitis. JAMA Intern Med. 2016;176(12):1870-1872.
5. Renner B, Mueller CA, Shephard A. Environmental and non-infectious factors in the aetiology of pharyngitis (sore throat). J Inflamm Res. 2012;61(10):1041-1052.
6. Zhu S, Jenkins S, Addo K, Heidarinejad M, Romo SA, Layne A, et al. Ventilation and laboratory confirmed acute respiratory infection (ARI) rates in

college residence halls in College Park, Maryland. Environ Int. 2020;137(1):105537.
7. Klug TE. Peritonsillar abscess: clinical aspects of microbiology, risk factors, and the association with parapharyngeal abscess. Dan Med J. 2017;64(3):1-39.
8. Kettunen S, Lantto U, Koivunen P, Tapiainen T, Uhari M, Renko M. Risk factors for periodic fever, aphthous stomatitis, pharyngitis, and adenitis (PFAPA) syndrome: a case-control study. Eur J Pediatr. 2018;177(8):1201-1206.
9. Teng CL, Nurjahan MI, Asiah HN, Punithambigai P, Leong KC, Omar M. Upper respiratory tract infections: to what extent is the management evidence-based?. Med J Malaysia. 2003;58(2):159-166.
10. Rezal RS, Hassali MA, Alrasheedy AA, Saleem F, Yusof FAM, Kamal M, et al. Prescribing patterns for upper respiratory tract infections: a prescription-review of primary care practice in Kedah, Malaysia, and the implications. Expert Rev Anti Infect Ther. 2015;13(12):1547-1556.
11. Tham DWJ, Abubakar U, Tangiisuran B. Prevalence and predictors of antibiotic use among children visiting the Emergency Department in a Tertiary Hospital in Malaysia. Eur J Pediatr. 2020;179(5):743-748.
12. Cheesbrough M. District laboratory practice in tropical countries, Part 2. 2nd ed. Cambridge: Cambridge University Press; 2008.
13. Treebupachatsakul P, Tiengrim S, Thamlikitkul V. Upper respiratory tract infection in Thai adults: prevalence and prediction of bacterial causes, and effectiveness of using clinical practice guidelines. J Med Assoc Thai. 2006;89(8):1178-1186.
14. Vincent MT, Celestin N, Hussain AN. Pharyngitis. Am Fam Physician 2004;69(6):1465-1470.
15. Klug TE. Peritonsillar abscess: clinical aspects of microbiology, risk factors, and the association with parapharyngeal abscess. Dan Med J. 2017;64(3):B5333.
16. Ab Rahman N, Teng CL, Sivasampu S. Antibiotic prescribing in public and private practice: a cross-sectional study in primary care clinics in Malaysia. BMC Infect Dis. 2016;16(1):208.
17. Teng CL, Leong KC, Aljunid SM, Cheah M. Antibiotic prescription in upper respiratory tract infections. Asia Pac Fam Med. 2004;3(1):38-45.
18. Shih T, Lin C, Lu C. Evaluation of a streptococcal pharyngitis score in Southern Taiwan. Pediatr Neonatol 2012;53(1):49-54.
19. Foong HBB, Yassim M, Chia YC, Kang BH. Streptococcal pharyngitis in a primary care clinic. Singapore Med J. 1992;33(1):597-597.
20. Bakare O, Schattner P. The usefulness of a clinical "scorecard" in managing patients with sore throat in general practice. Asia Pac Fam Med. 2010;9(1):9.
21. Engel E, Muhamed B, Whitelaw C, Musvosvi M, Mayosi M, Dale B. Group A streptococcal emm type prevalence among symptomatic children in Cape Town and potential vaccine coverage. Pediatr Infect Dis J. 2014;33(2):208-210.
22. Rathi K, Raeefuddin A. Pakistan prevalence survey in acute pharyngitis. J Pak Med Assoc. 2014;64(8):928-31.
23. Alper Z, Uncu Y, Akalin H, Ercan I, Sinirtas M, Bilgel G. Diagnosis of acute tonsillopharyngitis in primary care: a new approach for low-resource settings. J Chemother. 2015;25(13):148-155.
24. Atlas SJ, McDermott SM, Mannone C, Barry MJ. The role of point of care testing for patients with acute pharyngitis. J Gen Intern Med. 2005;20(8):759-761.
25. Kumar R, Sharma YP, Thakur JS, Patro BK, Bhatia A, Singh IP et al. Streptococcal pharyngitis, rheumatic fever and rheumatic heart disease: Eight-year prospective surveillance in Rupnagar district of Punjab, India. Natl Med J India. 2014;27(2):70-75.
26. Llor C, Madurell J, Balaguй-Corbella M, Gymez M, Cots JM. Impact on antibiotic prescription of rapid antigen detection testing in acute pharyngitis in adults: a randomised clinical trial. Br J Gen Pract. 2011; 61(586):244-251.
27. Mehta N, Schilder A, Fragaszy E, ER Evans H, Dukes O, Manikam L, et al. Antibiotic prescribing in patients with self-reported sore throat. J Antimicrob Chemother. 2017;72(3):914-922.
28. Margolis DJ, Fanelli M, Kupperman E, Papadopoulos M, Metlay JP, Xie SX, et al. Association of pharyngitis with oral antibiotic use for the treatment of acne: a cross-sectional and prospective cohort study. Arch Dermatol. 2012;148(3):326-332.
29. Roberts L, Connolly L, Kirse J, Evans K, Poehling A, Peters R, et al. Detection of group A Streptococcus in tonsils from pediatric patients reveals high rate of asymptomatic streptococcal carriage. BMC Pediatr. 2012;12(1):3.
30. Itzhak B, Gober A. Effect of smoking cessation on the respiratory functions. Turk J Fam Pra. 2015;19(3):130-135.
31. Marom T, Cinamon U, Itskoviz D, Roth Y. Changing trends of peritonsillar abscess. Am J Otolaryngol. 2010;31(3):162-167.
32. Lin RH, Huang CC, Tsou YA, Lin CD, Tsai MH, Chen JH, et al. Correlation between Imaging Characteristics and Microbiology in Patients with Deep Neck Infections: A Retrospective Review of One Hundred Sixty-One Cases. Surg Infect. 2014;15(6):794-799.
33. Karevold G, Kvestad E, Nafstad P, Kvaerner KJ. Respiratory infections in schoolchildren: co-morbidity and risk factors. Arch Dis Child. 2006;91(5):391-395.
34. Herman LL, Padala SA, Annamaraju P, Bashir K. Angiotensin converting enzyme inhibitors (ACEI) [Internet]. Treasure Island: StatPearls Publishing; 2020. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430685/

35. Mitchell P. Swollen Tonsils Caused by Allergies (Ear and Throat Conditions). Retrieved from http://www.livestrong.com/article/545736-swollen-tonsils-caused-by-allergies/
36. Karunanayake CP, Albritton W, Rennie DC, Lawson JA, McCallum L, Gardipy PJ, et al. Ear infection and its associated risk factors in first nations and rural school-aged Canadian children. Int J Pediatr. 2016;16(5):10.