

Prevalence of Antibiotics Use among National Guard Primary Care Physicians In Jeddah for Upper Respiratory Tract Infections

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ABSTRACT

Background: One of the major contributors of development of antibiotics resistance is excessive use of antibiotics.

Objectives: To assess antibiotics prescription in Upper Respiratory Tract Infection (URTI) at the National Guard Primary Health Care (PHC) Centers in Jeddah, Kingdom of Saudi Arabia.

Material and Methods: A cross-sectional design was followed to include 390 upper respiratory tract infection patients (90 from Bahra center, 195 from Iskan Jeddah center and 105 from the Specialized Polyclinic center), whose data were recorded at BESTCare system during the period from 1/8/2016 to 31/1/2017.

Results: "Nonspecific URTI" was the main diagnosis assigned to participant patients (29%), followed by pharyngitis and sore throat (21.5% and 18.7%, respectively), and rhinosinusitis (15.9%). Otitis media cases constituted (11.5%). Antibiotics were prescribed to 44.1% of URTI patients. Augmentin was the main prescribed antibiotic (19.7%), followed by Amoxicillin (10%) and Azithromycin (9.7%). Regarding Centor score, 96.6% were un-scoreable. Guidelines for management of URTI were followed only in 12.6% of cases. Documentation was mainly not complete in all study PHC centers, with no statistically significant difference according to PHC center.

Conclusions: "Nonspecific URTI" was the main diagnosis assigned to participant patients (29%), followed by pharyngitis and sore throat (21.5% and 18.7%, respectively),

and rhinosinusitis (15.9%). Otitis media cases constituted (11.5%). Antibiotics were prescribed to 44.1% of URTI patients. Augmentin was the main prescribed antibiotic (19.7%), followed by Amoxicillin (10%) and Azithromycin (9.7%). Regarding Centor score, 96.6% were un-scoreable. Guidelines for management of URTI were followed only in 12.6% of cases. Documentation was mainly not complete in all study PHC centers, with no statistically significant difference according to PHC center. Guidelines for management of URTI were followed only in 12.6% of cases.

Keywords: Antibiotics, Prevalence, Primary Care Physicians, Resistance, Upper Respiratory Tract Infections (URTI).

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INTRODUCTION

Most upper respiratory tract infection (URTI) patients (i.e., pharyngitis, tonsillitis, rhinitis, sinusitis, otitis media, and bronchitis) at primary care centers receive antibiotics.¹ Viral URTI is the most common type and it is usually self-limited. Therefore, antibiotics have minimal effect that is mostly negligible.^{2,3} Nevertheless, antibiotics are frequently prescribed for URTI, while watchful waiting for the disease to run its course is the preferred approach for them.⁴ One of the major contributors of development of antibiotics resistance is excessive use antibiotics, especially broad-spectrum ones.⁵

Non-indicated use of antibiotics exposes the patients to unnecessary adverse effects^{6,7}, and depletes the hospital resources. If resistance rates keep raising, we may find our health providers short of therapeutic options. Thus, we need to limit it, and try our best to prevent, or at least hinder this growing problem. Decreasing inappropriate antibiotics use is the most effective method to achieve this goal.⁸ In a study done in 2013, an anonymous survey was distributed to all providers, which explored familiarity with and barriers to guideline adherence.⁹ The survey was collected by a non-participant clerical staff member.⁹

Response rate was 88%, most providers completed medical school in the preceding five years.¹⁰ The majority (86%) of respondents believed that they did not know the treatment guidelines 'very well', and 83% believed a 'lack of knowledge of the guidelines' contributed to their decision to prescribe antibiotics.¹⁰ Only 20% of respondents believed they prescribed antibiotics according to the guidelines more than 75% of the time and 80% indicated that the lack of clinical decision support tools might have been a factor influencing a decision to prescribe antibiotics.^{9,10}

The present study aimed to assessing the effect of (theoretically) using the American Academy of Family Physicians Guidelines as a standard of care for primary care physicians in management of upper respiratory tract infection at National Guard Primary Care Centers in Jeddah.

SUBJECTS AND METHODS

It is a cross-sectional study included upper respiratory tract infection patients at the National Guard Primary Care Centers in Jeddah during 1/8/2016 to 31/1/2017. Inclusion criteria were sore throat, rhinosinusitis, otitis media, bronchitis/nonspecific cough illness and nonspecific upper respiratory tract infection whereas exclusion criteria were active malignancy, immunocompromised state, more than one visit for the same presentation in one month during the study period, concurrent use of antibiotics for another etiology, chronic sinusitis and elderly, i.e., 60 years and older patients. Based on a study in 2015 carried out by the Quality Department in the National Guard that measured the percentage of antibiotics prescribed for diagnosed cases of URTI in Primary Health Care Centers for quality improvement projects. All visits of Upper Respiratory Tract Infection (URTI) in Specialized Polyclinics, Bahra and Iskan Jeddah centers regardless of being bacterial or viral infections were collected. It is to be noted that in 2015 the quality team at primary health care centers – western region reported that the prevalence of antibiotics prescription among URTI cases for a period of 8 months (from January to August 2015) was 40.86%.

Based on that study data analysis, the estimated standard deviation was 0.46. The sample size was calculated to be 382 URTI patients during the time of this study (i.e., 1/8/2016 to 31/1/2017). The sample size was calculated using The Research Advisors-2006. With a confidence interval of 95%, a margin of error of 5% and an estimated standard deviation of 0.46, the calculated minimal sample size was 382, as follows:

- 95% Z score = 1.96
- CI 95%
- SD (Standard Deviation) = ± 0.46
- Margin error = +/- 5%

$$\text{Sample size} = (Z\text{-score})^2 * \text{St Dev}^2 * (1 - \text{StDev}) / (\text{margin of error})^2$$

$$((1.96)^2 * 0.46(1 - 0.46)) / (0.05)^2$$

$$(3.8416 * 0.2484) / 0.0025$$

$$0.9543 / 0.0025 = 381.72$$

Accordingly, at least the data of 382 subjects were needed. Therefore, according to proportionate allocation, the researcher could collect the data for 390 URTI patients as follows: 90 from Bahra center, 195 from Iskan Jeddah center and 105 from the Specialized Polyclinic center.

The data of 390 URTI patients were collected according to every center visits percentage of the total visits in 2016 included in the

study. After getting the raw data for all URTI visits from the Best Care information warehouse, randomization was carried out by (<https://www.random.org/integers/>). Random Number Generator for each center separately, if a visit is excluded by the criteria then used to choose the next random visit number until having met the required sample size.

The information center was asked for the collected data by BESTCare system of URTI patients from 1/8/2016 to 31/1/2017. Data were kept in the principal investigator's E-mail as it is a safe place and no one has access to it.

The study research hypothesis was implementation of upper respiratory tract infection guidelines of American Academy of Family Physicians on daily practice among primary health care family physicians in Ministry of National Guard Health affairs - Jeddah region will decrease prescription of antibiotics.

All data were confidential and encrypted so as no patient or physician could recognize. All data were kept in a safe place. Access was limited to the principal investigator only. The chi square test of significance was applied using the Statistical Package for Social Sciences (SPSS version 25) in order to determine differences according to primary care centers. P-values less than 0.05 were considered as statistically significant.

RESULTS

Table (1) shows that the data of most cases were those of Iskan Jeddah (50%) followed by those of Specialized Polyclinics (26.9%) and then Bahra (23.1%). Most cases were less than 10 years old (43.8%) or 10-19 years old (17.9%). Only 11.5% aged 40 years old or above. Males constituted 58.7% of cases.

Table (2) shows that the most frequently data missed to be documented by physicians regarding upper respiratory tract infections were related to presence or absence cervical lymph nodes (90%), presence or absence congested nose (86.7%) and presence or absence of sputum (84.4%). On the other hand, the least being missed were presence or absence of cough (5.4%), presence or absence of earache (6.4%), erythematous or bulging tympanic membrane (8.2% and 0/2%. Respectively). The most frequently documented "present symptoms and signs" were tonsillar erythema (57.9%), cough (46.4%) and sore throat (43.1%), while the most frequently absent documented symptoms were tonsillar exudate (64.1%), crackles (57.2%) and wheezing (53.6%).

Table (3) shows that "nonspecific URTI" was the main diagnosis assigned to participant patients (29%), followed by pharyngitis and sore throat (21.5% and 18.7%, respectively), and rhinosinusitis (15.9%). Otitis media cases constituted (11.5%), while bronchitis and cough constituted 2.3% and 1%, respectively.

Table (4) and Figure (1) show that antibiotics were prescribed to 44.1% of upper respiratory tract infection patients. Augmentin was the main prescribed antibiotic (19.7%), followed by Amoxicillin (10%) and Azithromycin (9.7%).

Table (5) shows that only 7.7% of data documented for patients with upper respiratory tract infections were complete (Figure 2). Regarding Centor score, 96.6% were un-scoreable. Guidelines for management of URTI were followed only in 12.6% of cases.

Table (6) shows that the main diagnostic symptoms and signs for patients of URTI at Bahra primary care center were sore throat (54.4%) and unspecified URTI (20%). At Iskan Jeddah, the main diagnostic symptoms and signs for patients of URTI were

unspecified URTI (35.4%), pharyngitis and rhinosinusitis (25.1% for both). The main diagnostic symptoms and signs for patients of URTI at the Specialized Polyclinic were unspecified URTI (24.8%)

and pharyngitis (21.9%). Differences in recorded diagnoses according to primary care centers were statistically significant (p<0.001).

Table 1: Characteristics of study sample (n=390)

Characteristics	No.	%
Setting		
Bahra	90	23.1
Iskan Jeddah	195	50.0
Specialized Polyclinic	105	26.9
Age groups		
<10 years	171	43.8
10-19 years	70	17.9
20-29 years	50	12.8
30-39 years	54	13.8
40+ years	45	11.5
Gender		
Female	161	41.3
Male	229	58.7

Table 2: Documented clinical findings of patients with upper respiratory tract infections

Clinical Findings	Not		Presence of a clinical finding				Not written	
	Applicable	Absent	Present			No.	%	
	No.	%	No.	%	No.	%	No.	%
Sore throat	31	7.9	3	0.8	168	43.1	188	48.2
Cough	22	5.7	13	3.3	181	46.4	174	44.6
Fever	3	0.8	140	35.9	149	38.2	98	25.1
Sputum	30	7.7	11	2.8	20	5.1	329	84.4
Runny nose	25	6.4	6	1.5	123	31.5	236	60.5
Congested nose	26	6.7	2	0.5	24	6.2	338	86.7
Cervical lymph nodes	24	6.2	11	2.8	4	1.0	351	90.0
Tonsillar erythema	20	5.1	47	12.1	226	57.9	97	24.9
Tonsillar exudate	21	5.4	250	64.1	11	2.8	108	27.7
Wheezing	19	4.9	209	53.6	16	4.1	146	37.4
Crackles	19	4.9	223	57.2	2	0.5	146	37.4
Earache	324	83.1	3	0.8	38	9.7	25	6.4
Ear discharge	325	83.3	12	3.1	12	3.1	41	10.5
Erythematous TM	320	82.1	13	3.3	25	6.4	32	8.2
Bulging TM	315	80.8	30	7.7	9	2.3	36	9.2

TM: Tympanic membrane

Table 3: Main upper respiratory tract infection (URTI) diagnoses

Main diagnostic symptoms and signs	No.	%
Cough	4	1.0
Bronchitis	9	2.3
Otitis media	45	11.5
Rhinosinusitis	62	15.9
Sore throat	73	18.7
Pharyngitis	84	21.5
Nonspecific URTI	113	29.0

Table 4: Prescribed antibiotics to upper respiratory tract infection patients

Prescription of antibiotics	No.	%
No	218	55.9
Yes:	172	44.1
Augmentin	77	19.7
Amoxicillin	39	10.0
Azithromycin	38	9.7
Cefprozil	7	1.8
Clarithromycin	5	1.3
Gentamicin	4	1.0
Cefuroxime	2	0.5

Table 5: Fulfilled documentation and guidelines adherence

Characteristics	No.	%
Complete documentation		
No	360	92.3
Yes	30	7.7
Centor score		
Not applicable	93	23.8
Applicable	297	73.6
Unscoreable	287	96.6
Scorable	10	3.4
0	1	0.3
1	2	0.7
2	4	1.3
3	1	0.3
4	2	0.7
Guidelines adherence		
May be	42	10.8
No	12	3.1
Unable	287	73.6
Yes	49	12.6

Table 6: Diagnostic symptoms and signs for patients of upper respiratory tract infection (URTI) according to their primary care centers

Main diagnostic symptoms and signs	Bahra		Iskan Jeddah		Specialized Polyclinic	
	No.	%	No.	%	No.	%
Cough	1	1.1	1	0.5	2	1.9
Bronchitis	2	2.2	1	0.5	6	5.7
Otitis media	6	6.7	19	9.7	20	19.0
Rhinosinusitis	2	2.2	49	25.1	11	10.5
Sore throat	49	54.4	7	3.6	17	16.2
Pharyngitis	12	13.3	49	25.1	23	21.9
Unspecified URTI	18	20.0	69	35.4	26	24.8

p<0.001

Table 7: Prescribed antibiotics for cases of URT according to their primary care centers

Prescribed antibiotics	Bahra		Iskan Jeddah		Specialized Polyclinic	
	No.	%	No.	%	No.	%
No	56	62.2	115	59.0	47	44.8
Yes	34	37.8	80	41.0	58	55.2
Augmentin	18	20.0	40	20.5	19	18.1
Amoxicillin	4	4.4	18	9.2	17	16.2
Azithromycin	8	8.9	12	6.2	18	17.1
Cefprozil	1	1.1	6	3.1	0	0.0
Clarithromycin	1	1.1	1	0.5	3	2.9
Gentamicin	1	1.1	2	1.0	1	1.0
Cefuroxime	1	1.1	1	0.5	0	0.0

p=0.017

Table 8: Fulfilled documentation and guidelines adherence according to their primary care centers

Characteristics	Bahra		Iskan Jeddah		Specialized Polyclinic		P Value
	No.	%	No.	%	No.	%	
Complete documentation							
No	86	95.6	181	92.8	93	88.6	0.176
Yes	4	4.4	14	7.2	12	11.4	
Centor score							
Scored	1	1.1	7	3.6	2	1.9	<0.001
Un-scoreable	80	98.7	142	95.3	65	97.0	
Not applicable	9	10.0	46	23.6	38	36.2	
Guidelines adherence							
No	0	0.0	7	3.6	5	4.8	0.002
Yes	3	3.3	25	12.8	21	20.0	
May be	7	7.8	21	10.8	14	13.3	
Unable	80	88.9	142	72.8	65	61.9	

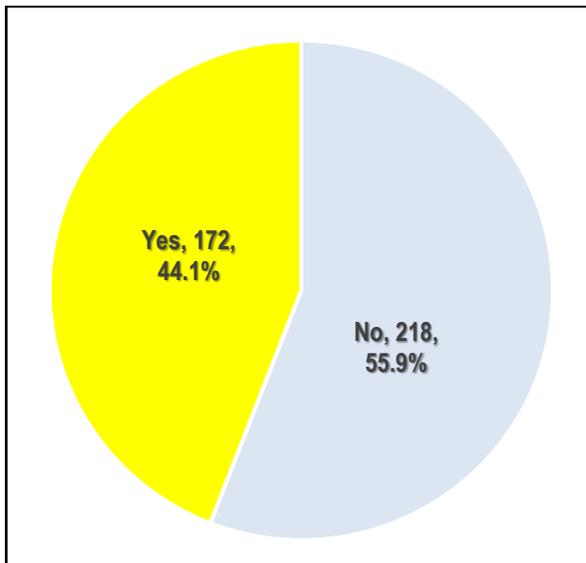


Figure 1: Antibiotics prescription for URTI cases

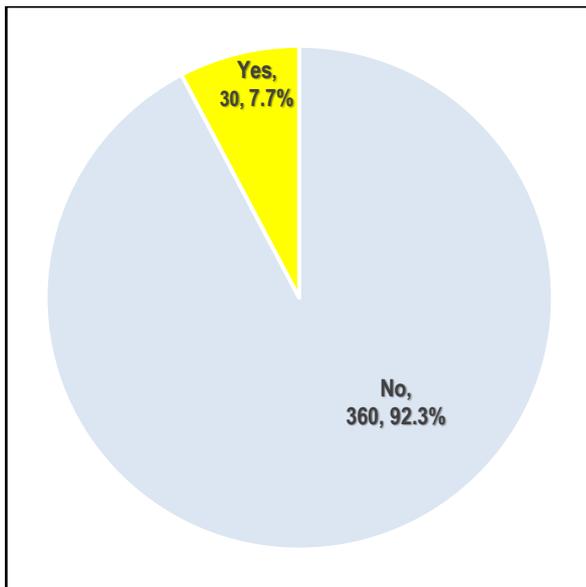


Figure 2: Complete documentation for URTI cases

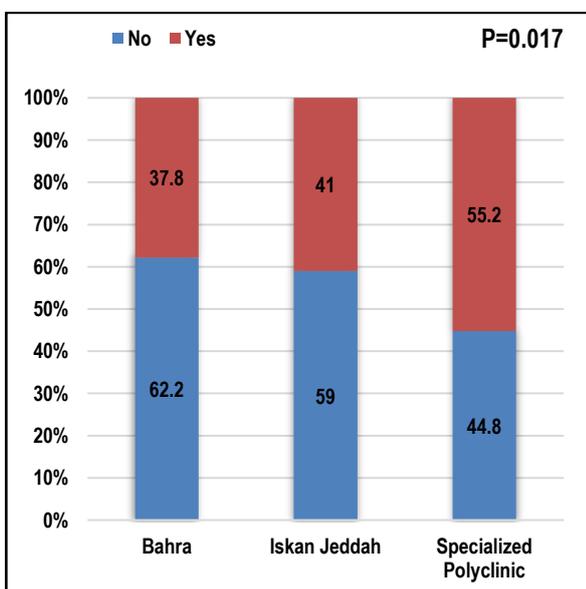


Figure 3: Antibiotics prescription for cases of URTI according to their primary care centers

Table (7) and Figure (3) show that the highest percentage of prescribing antibiotics for patients with URTI was at the Specialized Polyclinic Primary Care Center (55.2%), mainly Augmentin and Azithromycin (18.1% and 17.1%, respectively), followed by Iskan Jeddah Primary Care Center (41%), mainly Augmentin and Amoxicillin (20.5% and 9.2%, respectively) and Bahra Primary Care Center (37.8%), mainly Augmentin and Azithromycin (20% and 8.9%, respectively). Difference in antibiotics prescriptions according to primary care centers was statistically significant ($p=0.017$).

Table (8) shows that documentation was mainly not complete in all study primary care centers, with no statistically significant difference according to primary care center. Centor score was mainly un-scoreable in all study primary care centers, with a statistically significant difference according to primary care center, especially at Bahra primary care center ($p<0.001$). Guidelines adherence was highest at the Specialized Polyclinic primary care center (20%), followed by Iskan Jeddah (12.8%) and Bahra primary care center (3.3%), with a statistically significant difference according to primary care center ($p=0.002$).

DISCUSSION

Antibiotics are targeted to kill or inhibit the growth of bacteria and have no effect on viral agents.¹¹ Nevertheless, it is often inappropriately used to treat viral infections, such as most upper respiratory tract infections.¹²

Therefore, this study aimed to assess management of upper respiratory tract infection (URTI) at the National Guard Primary Care Centers in Jeddah according to the American Academy of Family Physicians guidelines. This study showed that most recorded cases of URTI were children. This finding is in accordance with that of Neumark¹³, who stated that children are more susceptible to respiratory infections than adults. They noted that this, may, among other things, be due to the not yet attained immunity to the many viruses and bacteria that can cause respiratory infections and their common close person-to-person contact. The most frequently recorded symptoms and signs for patients with URTI in the present study were tonsillar erythema, cough and sore throat, while the least frequent symptoms were tonsillar exudate, crackles and wheezing. Similarly, Bisno et al.¹⁴ noted that symptoms of URTIs commonly include cough, sore throat, runny nose, nasal congestion, headache, low grade fever, facial pressure and sneezing. Color or consistency changes in mucous discharge to yellow, thick, or green are the natural course of viral upper respiratory tract infection and not an indication for antibiotics. Meneghetti¹⁵ added that, in group A beta hemolytic streptococcal pharyngitis/tonsillitis there is usually erythema, swelling, or exudates of the tonsils or pharynx

Results of the present study showed that "nonspecific upper respiratory tract infection" was the main diagnosis assigned to the data of patients, followed by pharyngitis and sore throat, and rhinosinusitis. However, differences in recorded diagnoses according to primary care centers were statistically significant. This is in accordance with that reported by Fendrick et al.¹⁶, in USA, who stated that, nonspecific URTI is the most common cause of physician visits. Acute pharyngitis accounts for 1% to 2% of all visits to outpatient clinics and emergency departments.¹⁷ Wilson¹⁸ added that acute rhinosinusitis develops in 0.5% to 2% of cases of viral URIs, with approximately 20 million cases of acute

sinusitis occur annually in the United States. The significant differences in recorded diagnoses according primary care center location may indicate bias in recording URTI patients' information among health care providers and the lack of standardization in health care data entry.

This study revealed that antibiotics were prescribed to almost one half of URTI patients, with Augmentin being the main prescribed antibiotic, followed by Amoxicillin and Azithromycin. The highest percentage of prescribing antibiotics was at the Specialized Polyclinic Primary Care Center, mainly Augmentin and Azithromycin, followed by Iskan Jeddah Primary Care Center, mainly Augmentin and Amoxicillin and Bahra Primary Care Center, mainly Augmentin and Azithromycin. These results may be explained by the differential distribution of physicians at the study settings, where the Bahra Primary Care Center is known to have most of the newly graduated assistant and associate consultants, while the Specialized Polyclinic Primary Care Center is known to have most of the staff physicians. Gill et al.¹⁹ reported that, among a large outpatient ambulatory network of more than 52,000 cases of URI antibiotics were prescribed in 65% of patients. Gonzales et al.²⁰, in USA, stressed that, although most URTIs are usually viral, a high percentage are treated with antibiotics. Hersh et al.²¹ stressed that appropriate diagnosis is the foundation for making judicious decisions about prescribing antibiotics for cases of URTI. They noted that, for treatment of bacterial acute otitis media, sinusitis, and pharyngitis have used amoxicillin or amoxicillin-clavulanate, which are the first-line recommended agents for antibiotic therapy for these conditions.

The improper prescription of antibiotics for URTI cases was discussed by several authors. Grijalva et al.²² stated that, although viruses are the causative agents for most URTIs, antibiotics continue to be inappropriately widely prescribed for these illnesses. Costelloe et al.²³ stated that patients who receive antibiotics for URTI become at least twice as likely to harbor organisms that are resistant to antimicrobial agents for the next 12 months, compared with those who did not receive antibiotics. Unnecessary adverse effects of antibiotics and the development of antimicrobial resistance can be reduced by the judicious use of antibiotics. Healthcare providers should be aware of the self-limited nature of most URTIs and the hazards of inappropriate use of antibiotics for the individual and also for the community.

Since documentation is a critical part of the medical endeavor, the present study revealed a very important aspect related to using the hospital information system adopted by the National Guard Ministry of Health in Jeddah (BESTCare). Documentation of data for URTI patients was mostly incomplete, with no statistically significant difference according to primary care center. The most frequently missed data regarding URTI were related to cervical lymph nodes, congested nose and sputum. On the other hand, the least being missed were cough, earache, erythematous or bulging tympanic membrane. Regarding Centor score, 96.6% were unscorable, mainly in Bahra Center. Guidelines for management of URTI were followed only in 12.6% of cases at P-Value equal to 0.002 statistically significant difference, and at the highest percentage in the Specialized Polyclinic primary care center. This finding indicates that National Guard primary care physicians in Jeddah currently using the hospital information system (BESTCare) that was recently adopted by the Ministry of National Guard - Health Affairs need to fulfill the entered data pertinent to

URTI to achieve best use of this health information system in primary health care provision to URTI patients.

This important issue was noted by several authors. Keenan et al.²⁴ concluded that formal recordkeeping practices (documentation into the medical record) are failing to fulfill their primary purpose, of supporting information flow that ensures the continuity, quality and safety of care. Strauss and Corbin²⁵ noted that medical care requires information flow before and after each task or task sequence to maintain continuity of care. Tasks are not isolated but build on one another to achieve patient goals. Therefore, data completeness is important. In Norway, Stokke and Kalfoss²⁶ found several gaps in documentation of health care, e.g., diagnoses, planned interventions, and projected outcomes. Taylor²⁷ found that most care plans did not convey the specific information necessary to carry out the required procedure. Keenan et al.²⁴ stated that, while computerization has been reported to solve the problem of incomplete records, the evidence on this seems to be mixed. Larrabee et al.²⁸ found that completeness increases over time after system implementation, with expected gains not being realized until one year after implementation.

LIMITATIONS

The present study followed a cross sectional design, which is generally quick, easy, and cheap to perform. However, since data on each participant are recorded only once it would be difficult to infer the temporal association between a risk factor and an outcome. Therefore, only an association, and not causation, can be inferred from a cross-sectional study.²⁹ Moreover, although the present study relied mainly on documented data, yet, documentation gaps were commonly found. Therefore, some of the obtained data could not be properly assessed or compared according to the American Academy of Family Physicians Guidelines as a standard for management of upper respiratory tract infections by primary care physicians.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, several points can be concluded. The most frequently recorded symptoms and signs for patients with URTI in Jeddah are tonsillar erythema, cough and sore throat. Nonspecific upper respiratory tract infection is the main diagnosis assigned to URTI patients, followed by pharyngitis and sore throat. Antibiotics are prescribed to almost one half of URTI patients, with Augmentin being the main prescribed antibiotic, followed by Amoxicillin and Azithromycin. Antibiotics are more prescribed at the Specialized Polyclinic Primary Care Center. Documentation of data for URTI patients is mostly incomplete in all primary care centers. Regarding the Centor score, almost all pharyngitis cases are unscorable, especially in Bahra Center. It is recommended that primary care physicians should be trained on guidelines for proper management of URTI and judicious prescription of antibiotics. Moreover, primary care physicians should be trained to apply the Centor score for pharyngitis cases. Primary health care providers should be instructed to complete patients' data into the BESTCare Hospital Information System. It is recommended to design a standard user-friendly form for recording important data related to URTI in order to ease the documentation burden and to minimize missing data. Further studies are needed to assess management of URTI at primary care centers all over the Saudi Kingdom.

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