



### RESEARCH ARTICLE

## KNOWLEDGE ABOUT PRESCRIBING ANTIBIOTICS FOR PATIENTS WITH ACUTE PHARYNGITIS AND ITS ASSOCIATE FACTORS AMONG PRIMARY HEALTH CARE PHYSICIANS AT MINISTRY OF HEALTH MAKKAH AL-MUKARRAMAH CITY, 2016.

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### Abstract

**Aim of Study:** To assess the knowledge and associated factors regarding prescribing antibiotics for patients with acute pharyngitis among primary health care (PHC) physicians at Ministry of Health (MOH) in the Holy city of Makkah, 2016.

**Methodology:** A cross-sectional study design was followed to include 140 PHC physicians in the study area.

**Results:** Mean age of participants was 33.3±7.2 years, 33.6% were males, 70% had MBBS Degree, 50.7% had <5 years of experience in PHC, 40% had less than 20 patients' daily flow, 28.6% prescribed antibiotics to 1-5 acute pharyngitis patients during the past week, 17.9% denied presence of antibiotic prescription policy. About two-thirds of participants read about prescribing antibiotics for acute pharyngitis and their main source for reading was UPTODATE. The main indications to prescribe antibiotics for acute pharyngitis cases were patient's condition (59.3%) and bacterial infections (27.9%). PHC physicians' knowledge was suboptimal (Mean±SD =14.4±2.6 out of 18). Participants' knowledge scores did not differ significantly according to their personal characteristics, but differed significantly according to average daily patients' flow (p=0.005), and the used type of medical records system at PHC center (p=0.011). Participants' knowledge scores were significantly higher among those who read about prescribing antibiotics for acute pharyngitis (p=0.003).

**Conclusions:** PHC physicians' knowledge regarding antibiotics was very good. Although most of them did not apply any policy for antibiotics prescription. The MOH should provide clear policy and guidelines for a rational antibiotics prescription plan and organize continuing medical education workshops to PHC physicians.

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### Introduction:-

Antibiotics have been discovered in 1940's and became a great invention in the history of medicine by reducing infectious diseases that cause illness and death. One of these diseases is GABHS pharyngitis that represents 10-30% of the cases of acute pharyngitis in adult. <sup>(1)</sup> Although sore throat is one of the most common illnesses that requires

seeking medical care in primary health care setting,<sup>(2)</sup> the physicians must have clear guidelines for the management such as: clinical scoring using modified centor criteria to reduce the irrational antibiotic prescriptions.

Unfortunately, the infectious organisms become more resistant and make the treatment of simple infections challenging. According to the CDC at least 23,000 people die annually in the USA as a direct result of infections of bacteria that are resistant to antibiotics. And this major problem in public health is due to complex causes.<sup>(4)</sup> one of them is prescribing antibiotic inappropriately.<sup>(5)</sup>

This study aimed to assess the knowledge and associated factors regarding prescribing antibiotics for patients with acute pharyngitis among primary health care (PHC) physicians at Ministry of Health (MOH) in the Holy city of Makkah, 2016.

### Methodology:-

A cross-sectional study design was implemented among general practitioners and family medicine physicians of PHC at MOH in the three major urban sectors, the Holy city of Makkah during the study period (2016). A self-constructed questionnaire was used to collect data after validating it (face and content validity) by three consultants one of them is a statistician and test the reliability by retesting 10 % of participants within two weeks interval, in order to compare the answers and to obtain an average Cronbach's alpha of 0.8. The questionnaire consists of two parts: (First socio-demographic and second assessment of the knowledge including 1. General knowledge about Pharyngitis. 2. Knowledge about modified centor criteria. And 3. Knowledge about Prescribing Antibiotics for given clinical cases).

Regarding knowledge questions (1-18), a score of 1 was given to right answer which is the first choice for all questions except number 36 the right answer is the second choice. The total score was computed by summation of scores and it was 18, the range was (0-18). Then the score was transformed to a percentage which was categorized into knowledgeable (who will get >60 of), and poor (who will get < 60).

four categories and the years of experience was divided into three categories based on previous studies.<sup>(6)</sup> While the patients' flow was divided into three categories and frequency of prescription divided into three categories based on experience.

Using SPSS (Statistical Package for the Social sciences) version 21 for data analysis. Data were presented as number (percentage) for categorical data, and as mean  $\pm$  SD for continues data. Shapiro Wilk statistic test was used to test normality. Kruskal Wallis test (KW) or Mann Whitney U test (U) were used to comparing participants' knowledge grades according to different socio-demographic characteristics and sector characteristics. P-value of <0.05 was considered as statistically significant.

A reliability analysis was carried out on the knowledge part of the questionnaire comprising 18 items. Cronbach's alpha showed the questionnaire to reach acceptable reliability,  $\alpha = 0.700$ .

### Results:-

#### Response Rate:-

The study included 140 physicians with a response rate of 92.7%. Personal characteristics of study sample Table (1) show that about one-third of participants (37.9%) aged below 30 years, while about half of them (50.7%) aged 30-40 years. About one-third of participants (33.6%) were males. Almost two-thirds of participants (60%) were Saudi. Most participants (70%) had MBBS degree. About half of participants (50.7%) had less than five years of experience, while 35% had 5-10 years of experience. (Table 1)

Sixty-five percent (65%) of participants read about prescribing antibiotics for acute pharyngitis. Their main sources of reading were UPTODATE (41.4%). Few other minor sources include AAFP (5.7%), the internet (2.8%) and BMJ (2.1%). On the other hand, only 5.7% of participants attended a CME about antibiotics for acute pharyngitis, mostly through attending a FAME course (50%) or attending a conference (25%).

The results show that 40% of participants' PHC centers had less than 20 patients' daily flow, while 39.3% of participants' PHC centers had 20-40 patients' daily flow. More than one fourth of PHC physicians (28.6%) prescribed antibiotics to 1-5 acute pharyngitis patients during the past week, while 17.1% prescribed antibiotics to more than five patients with acute pharyngitis. Regarding PHCC's antibiotic prescription policy, 17.9% denied its

presence, about two thirds (62.1%) stated that they do not know if there is any while only 28 participants (20%) stated that they have PHCC antibiotic policy. Out of those 28 participants who have antibiotics' prescription policy, 26 (18.6%) apply it. Regarding used medical record system at PHC centers, 48.6% used paper files while 51.4 used prescription only.

Figure (1) shows that the main indications to prescribe antibiotics for acute pharyngitis cases were patient's condition (59.3%), secondary bacterial infections (27.9%) or parent's or patient's demand (5.7%). (Figure 1)

Table (2) shows that in 6 items of the 15 items (40%) the rate of correct answer was more than 90%, in 3 items (26.7%) the rate of correct answer was more than 80%, in 3 items (20%) the rate of correct answer was more than 60%, and in 2 items (13.3%) the rate of correct answer was at 50%. Also the results shows that the participants' knowledge gaps with highest "do not know" responses regarding acute pharyngitis were "Anti-streptolysin O titer may be helpful in determining a recent strep infection in a patient that has a possible post-streptococcal complication" and "No antibiotics are required for asymptomatic group A streptococcus carriers whose RADT (rapid antigen detection test) is repeatedly positive", with 19.3% do not know responses. Regarding Modified Center criteria, the highest participants' "do not know" responses were: "Modified Centor Criteria includes: Age of 15-44 years: 0 point" and "Modified Centor Criteria includes: Age of 45 years or older: -1 point" (16.4% and 17.9%), respectively). (Table 2)

The results show that the highest participants' response regarding the best antibiotic used in the treatment of acute bacterial pharyngitis was penicillin (90.7%), with oral administration as the best route for administration (92.1%) for 5-7 days (72.9%).

Table (3) shows that the mean score of participants' knowledge about acute pharyngitis was  $14.4 \pm 2.6$  ranged from 5 to 18, which indicates positive trend, where 92.9% were reported as knowledgeable, and only 7.1% had poor knowledge. (Table 3 and figure 2)

The results show that participants' knowledge scores did not differ significantly according to their personal characteristics. (Table 4)

Table (5) shows that participants knowledge scores about acute pharyngitis differed significantly according to average daily patients' flow ( $p=0.005$ ), prescribing antibiotics for acute pharyngitis last week ( $p=0.025$ ), and according to the used type of medical records system at PHCC ( $p=0.011$ ), as shown in Figures (12-14). However, it did not differ significantly according to having an antibiotics' prescription policy at PHCC or the application of that policy. (Table 5)

Table (6) shows that participants' knowledge mean scores were significantly higher among those who read about prescribing antibiotics for acute pharyngitis ( $p=0.003$ ). However, their knowledge did not differ significantly according to attendance CME about antibiotics for acute pharyngitis. (Table 6)

**Table 1:-**Personal characteristics of the study sample.

Personal characteristics	No.	%
<b>Age Group</b>		
<30 years	53	37.9
30-40 years	71	50.7
41-50 years	10	7.1
>50 years	6	4.3
<b>Range</b>	25-59	
Mean $\pm$ SD	$33.3 \pm 7.2$	
Median	31.5	
Quartile (25-75)	28-36.8	
95% Confidence Intervals	32.1-34.5	
<b>Gender</b>		
Male	47	33.6
Female	93	66.4
<b>Nationality</b>		

Saudi	84	60.0
Non-Saudi	56	40.0
<b>Qualifications</b>		
MBBS	98	70.0
Diploma in Family Medicine	18	12.9
Fellowship in Family Medicine	24	17.1
<b>Years of experience</b>		
<5 years	71	50.7
5-10 years	49	35.0
>10 years	20	14.3
Range	0-33	
Mean $\pm$ SD	6.4 $\pm$ 6.3	
Median	4	
Quartile (25-75)	2-9	
95% Confidence Intervals	5.3-7.5	

Data are presented as number and percentage or as Mean $\pm$  SD

**Table (2):-** Participants' responses regarding their general knowledge about pharyngitis.

Statements	True		False		Do not know	
	No.	%	No.	%	No.	%
A recent cough is a negative predictor for streptococcal pharyngitis	121	86.4	16	11.4	3	2.1
Antibiotics should be started within 8 to 10 days after presentation to reduce the risk of rheumatic fever from streptococcal pharyngitis	71	50.7	52	37.1	17	12.1
Anti-streptolysin O titer may be helpful in determining a recent strep infection in a patient that has a possible post-streptococcal complication	96	68.6	17	12.1	27	19.3
No antibiotics are required for asymptomatic group A streptococcus carriers whose RADT (rapid antigen detection test) is repeatedly positive	70	50.0	43	30.7	27	19.3
Modified Centor Criteria includes: Absence of Cough: 1 point	129	92.1	9	6.4	2	1.4
Modified Centor Criteria includes: Swollen and Tender Anterior Cervical Nodes: 1 point	135	96.4	4	2.9	1	0.7
Modified Centor Criteria includes: Temperature of 38°C: 1 point	134	95.7	5	3.6	1	0.7
Modified Centor Criteria includes: Tonsillar Exudates or Swelling: 1 point	134	95.7	5	3.6	1	0.7
Modified Centor Criteria includes: Age of 3-14 years: 1 point	119	85.0	10	7.1	11	7.9
Modified Centor Criteria includes: Age of 15-44 years: 0 point	88	62.9	29	20.7	23	16.4
Modified Centor Criteria includes: Age of 45 years or older: -1 point	86	61.4	29	20.7	25	17.9
Patients with four positive criteria should be treated with antibiotics	128	91.4	10	7.1	2	1.4
Patients with three positive criteria should be tested and treated if positive	114	81.4	21	15.0	5	3.6
Patients with two positive criteria should be tested and treated if positive	97	69.3	35	25.0	8	5.7
Patients with 0-1 positive criteria should be treated with analgesics and supportive care only	129	92.1	9	6.4	2	1.4

Data are presented as number and percentage

**Table (3):-**Participants' knowledge scores and level

Personal characteristics	No.	%
<b>Knowledge level</b>		
Knowledgeable	130	92.9
Non- knowledgeable	10	7.1
Range	5-18	
Mean $\pm$ SD	14.4 $\pm$ 2.6	
Median	15	
Quartile (25-75)	12-17	
95% Confidence Intervals	13.9-14.9	

**Table (4):-** Participants' knowledge scores according to their personal characteristics.

Personal characteristics	Median	Mean $\pm$ SD	Mean rank	P-value
<b>Age Group</b>				
• <30 years	15	14.3 $\pm$ 2.5	69.34	
• 30-40 years	15	14.3 $\pm$ 2.7	70.43	
• 41-50 years	15	15.3 $\pm$ 2.1	84.60	KW=1.841
• >50 years	13	13.5 $\pm$ 2.9	58.08	P=0.606
<b>Gender</b>				
• Male	14	13.7 $\pm$ 2.9	62.15	U=1793
• Female	15	14.7 $\pm$ 2.4	74.72	P=0.081
<b>Nationality</b>				
• Saudi	15	14.2 $\pm$ 2.6	68.75	U=2205
• Non-Saudi	15	14.5 $\pm$ 2.6	73.13	P=0.529
<b>Qualifications</b>				
• MBBS	14.5	14.3 $\pm$ 2.7	69.10	
• Diploma in Family Medicine	14.5	14.3 $\pm$ 2.2	67.44	F=0.409
• Fellowship in Family Medicine	15	14.8 $\pm$ 2.7	78.50	P=0.852
<b>Years of experience</b>				
• <5 years	15	14.5 $\pm$ 2.4	72.58	
• 5-10 years	14	14.0 $\pm$ 2.8	65.24	KW=1.394
• >10 years	14.5	14.7 $\pm$ 2.7	75.98	P=0.498

Data are presented as Mean $\pm$  SD (Min-Max)

Comparison was done using Kruskal Wallis test (KW) or Mann Whitney U test (U)

P value consider statistically significant as 0.05

**Table (5):-** Participants' knowledge scores according to their PHCC sector characteristics

Characteristics	Median	Mean $\pm$ SD	Mean rank	P-value
<b>Average daily patients' flow</b>				
• <20	15	14.8 $\pm$ 2.6	78.21	
• 20-40	13	13.5 $\pm$ 2.6	56.90	KW=10.453
• >40	15	15.1 $\pm$ 2.2	81.41	P=0.005
<b>Prescribing antibiotics for acute pharyngitis last week</b>				
• No	15	14.4 $\pm$ 2.8	72.01	
• 1-5 patients	15	15.0 $\pm$ 2.0	79.14	KW=7.383
• >5 patients	13	13.1 $\pm$ 2.6	51.33	P=0.025
<b>Does the PHCC have an antibiotics' prescription policy?</b>				
• No	14	14.5 $\pm$ 2.4	68.05	
• Yes	15	14.0 $\pm$ 3.2	67.76	KW=0.352
• Do not know	14	14.2 $\pm$ 2.7	72.07	P=0.839

Application of antibiotic policy at PHC center				
• No	14.5	14.2 $\pm$ 2.7	15.27	U=6.0
• Yes	11	14.5 $\pm$ 2.7	4.50	P=0.085
The used type of medical records system at PHCC				
• Paper file	14	13.7 $\pm$ 2.9	61.60	U=1842.5
• Prescription only	15	14.9 $\pm$ 2.2	78.91	P=0.011

Data are presented as Mean $\pm$  SD (Min-Max)

Comparison was done using Kruskal Wallis test (KW) or Mann Whitney U test (U)

P value consider statistically significant as 0.05

**Table (6):-** Participants' knowledge scores (Mean $\pm$ SD) according to their reading and attending CME about antibiotics for acute pharyngitis.

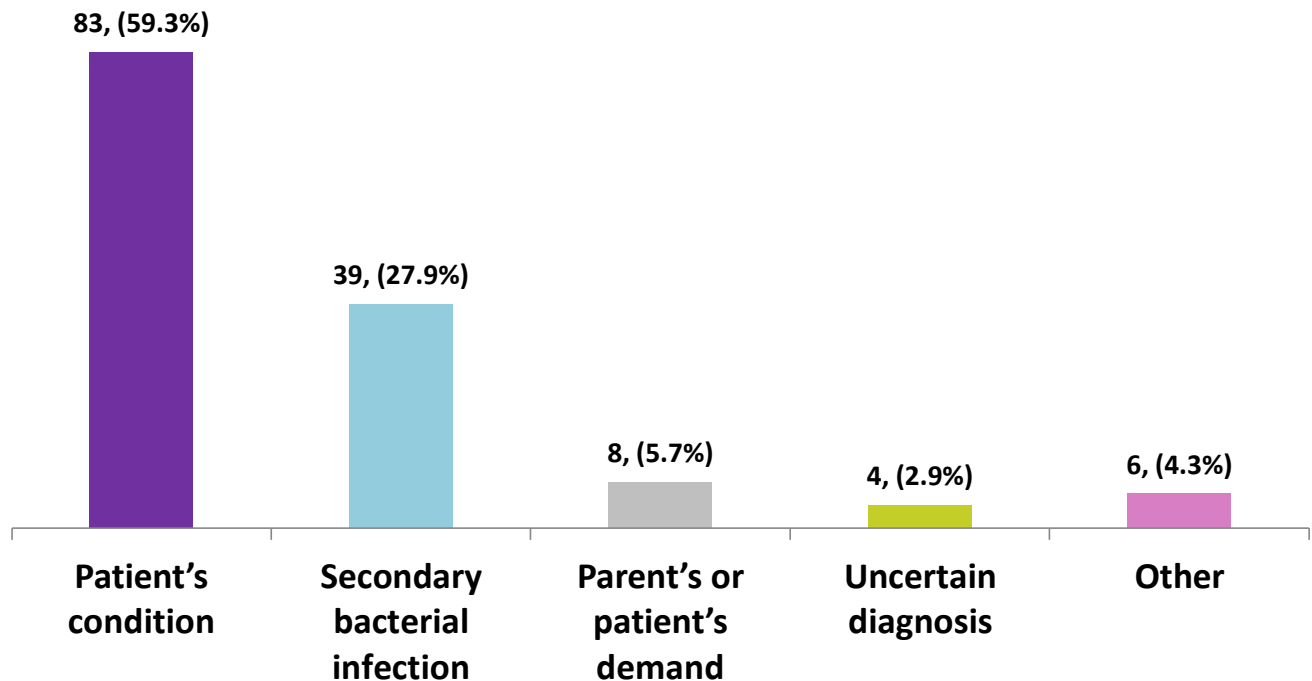
Characteristics	Median	Mean $\pm$ SD	Mean rank	P-value
Reading about prescribing antibiotics for acute pharyngitis.				
• No	13	13.4 $\pm$ 2.8	56.93	U=1564
• Yes	15	14.8 $\pm$ 2.4	77.81	P=0.003
Attending a CME about antibiotics for acute pharyngitis				
• No	14	14.3 $\pm$ 2.7	70.29	U=500
• Yes	15	14.8 $\pm$ 1.2	73.94	P=0.804

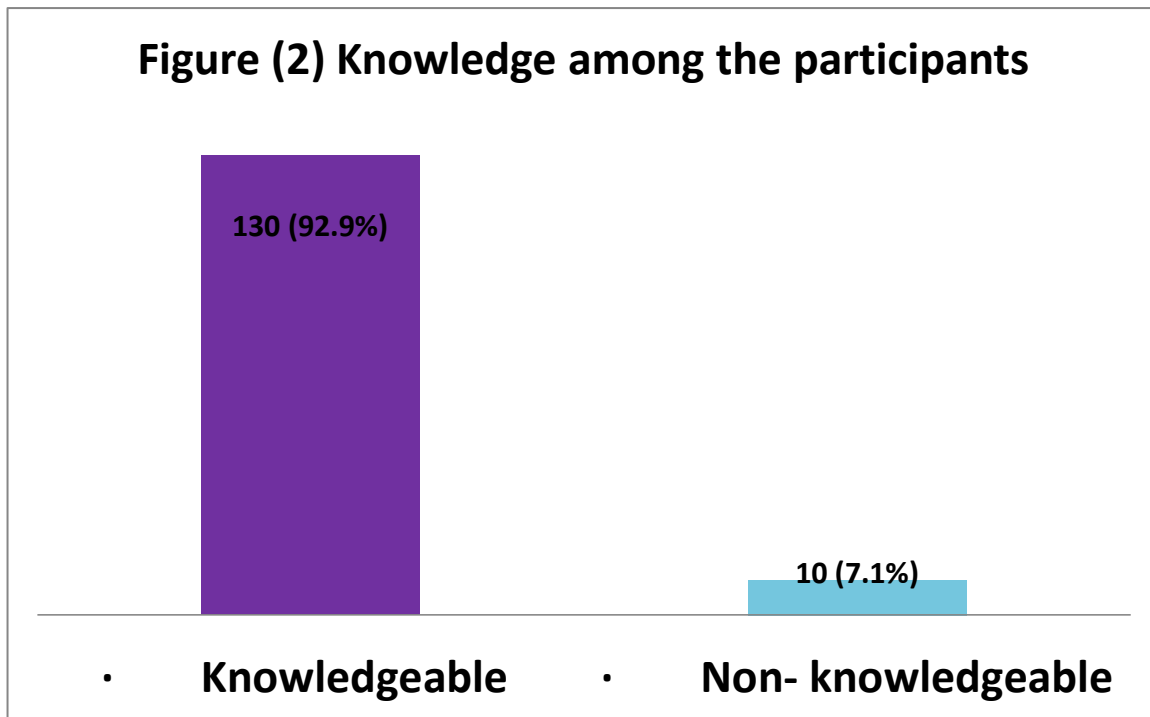
Data are presented as Mean $\pm$  SD (Min-Max)

Comparison was done using Mann Whitney U test (U)

P value consider statistically significant as 0.05

**Figure (1): Indications to prescribe antibiotics for acute pharyngitis**





### Discussion:-

This research aimed to assess the knowledge of PHC physicians at the Saudi Ministry of Health in the Holy city of Makkah about prescribing antibiotics for patients with acute pharyngitis and to determine the factors associated with prescribing antibiotics for patients with acute pharyngitis.

Results of the present study showed that during one week before the interview, 28.6% of PHC physicians prescribed antibiotics to 1-5 acute pharyngitis patients during the past week, while 17.1% prescribed antibiotics to more than five patients with acute pharyngitis.

These results indicate that acute pharyngitis is a common presenting disease at PHC clinics and that antibiotics for acute pharyngitis are commonly prescribed by PHC physicians at the Saudi Ministry of Health in the Holy city of Makkah.

This finding is in agreement with those reported by several researchers. In Aseer Region, Saudi Arabia, Al-Khaldi et al. (2005) stated that acute respiratory infections are the most common reasons for clinics visits to primary care physician.<sup>(7)</sup>

In Turkey, Mollahaliloglu et al. (2013) noted that the most common disease for prescribing antibiotics at primary health care facilities was acute pharyngitis (12.5%).<sup>(8)</sup>

In the Holy city of Makkah, alfetni et al. (2017) reported that 59% of the physicians prescribed antibiotics for 25% of the patients, while 26.1% prescribed antibiotics for half of the patients and only 14% prescribed antibiotics for 75% of the patients.<sup>(9)</sup>

China, Wang et al. (2014) reported a high rate of prescription of antibiotics for pharyngitis (about 75%), for which 40% were improperly prescribed.<sup>(10)</sup>

In Depok City, Indonesia, Andrajati et al. (2017) reported that antibiotics were most widely prescribed for acute pharyngitis patients (40.2%).<sup>(11)</sup>

While in Boston, Massachusetts, USA, Linder et al. (2006) reported lower rate in prescribing antibiotics (47%) than national rate.<sup>(12)</sup>

In Pakistan study Palla et al. (2012) reported that most of antibiotic prescriptions (80-90%) were ordered by general practitioners (GP), which induced a huge problem (antibiotic resistance) where several studies demonstrated the correlation between high rate of consumption antibiotics and high rate of resistance.<sup>(13)</sup>

Regarding PHCC's antibiotic prescription policy, only 20% of participants stated that they have PHCC antibiotic policy. Moreover, participants stated that the main indications to prescribe antibiotics for acute pharyngitis cases were patient's condition, secondary bacterial infections or parent's or patient's demand.

These findings obviously reflect the lack of clear guidelines or policies for prescribing antibiotics at PHC centers.

In Pakistan palla et al. (2012) that from 135 patients received antibiotics in total only 15 (11.1%) received appropriate antibiotics, where there was no association between antibiotic use and culture confirmation results ( $P = 0.75$ ).<sup>(13)</sup>

Also Indonesia, Yuniar et al. (2017) reported that from the 88.24% acute pharyngitis patients, 8.98% of antibiotics prescribed was for non-treatment option, they concluded that this irrational prescribing involves inappropriate indication, inappropriate drug selection, and inappropriate duration of administration.<sup>(14)</sup>

In Depok City, Indonesia, Andrajati et al. (2017) reported that to decrease the rate of irrational prescribing, in 2007, the Indonesian Ministry of Health developed strategies and interventions including a rational drug use course, an essential medicine list, and Standard Treatment Guidelines. Unfortunately, the level of adherence to clinical guidelines can be low among low- and middle-income countries.<sup>(11)</sup>

Boston, Massachusetts, USA, Linder et al. (2005) stated that clinicians showed in 66% of the visits no adherent to any guidelines even with the availability of three guidelines (CP empirical strategy, ACP test strategy & IDSA strategy). That indicated a problem in failing to follow any guideline at all due to several factors such as lack of knowledge and lack of familiarity.<sup>(12)</sup>

In Saudi Arabia, Bin Nafisaha et al. (2017) reported that there is antibiotics' overconsumption behavior, especially when it is not clinically indicated. Physicians' attitude is mainly due to patients' pressing demands and expectations. Therefore, to control of such pandemic of irrational prescription of antibiotics, guidelines and medical education for physicians is expected to minimize physicians from over-prescribing antibiotics.<sup>(15)</sup>

Little et al. (2013) noted that, although sore throat is one of the most common illnesses that requires seeking medical care in PHC settings, physicians must have clear guidelines for its management, (e.g., clinical scoring using modified Centor criteria) to reduce the irrational antibiotic prescriptions.<sup>(3)</sup>

Results of the present study showed that none of participant PHC physicians were using electronic health records in their daily practice.

Katić et al. (2007) emphasized the impact of using electronic health care records by stating that the implementation of information systems into PHC provides integrated and coordinated health care, improves quality and focuses on the healthcare user.<sup>(16)</sup>

Results of this study revealed that only 65% of participants read about prescribing antibiotics for acute pharyngitis and their main sources of reading were UPTODATE while few other minor sources included AAFP, the internet, and BMJ. Moreover, only 5.7% of participants attended a CME about antibiotics for acute pharyngitis, mostly through attending a FAME course or attending a conference. Moreover, participants' knowledge gaps regarding acute pharyngitis were "Anti-streptolysin O titer may be helpful in determining a recent strep infection in a patient that has a possible post-streptococcal complication" and "No antibiotics are required for asymptomatic group A streptococcus carriers whose RADT is repeatedly positive", with 19.3% do not know responses. Regarding Modified Center criteria, the highest participants' "do not know" responses were: "Modified Centor Criteria includes: Age of 15-44 years: 0 point" and "Modified Centor Criteria includes: Age of 45 years or older: -1 point" (16.4% and 17.9%), respectively).

It is to be noted that none of the participants in the present study reported certain guidelines as sources to read about prescribing antibiotics. This indicates the need for organizing continuing medical education courses by the Ministry



of Health to PHC physicians about guidelines for rational use of antibiotics for cases of acute respiratory infections and other indications. This measure is important for optimizing antibiotics prescription by PHC physicians.

Similar findings were reported by Hedin et al. (2014), who found that one-third of primary care physicians did not remember the Centor criteria and were therefore not able to use them. They added that while individual signs are not sufficient for the diagnosis of acute pharyngitis caused by group A streptococci, the Centor score is considered a well-calibrated decision rule for assessing the probability of group A streptococci.<sup>(17)</sup>

In the Democratic Republic of Congo, Thriemer et al. (2013) reported that sources of physicians' knowledge related to antibiotic prescribing included pharmaceutical companies (73.9%), antibiotic guidelines (66.3%), university courses (63.6%), internet-sites (45.7%) and WHO guidelines (26.6%).<sup>(18)</sup>

This study showed that the highest participants' answer regarding the best antibiotic used in the treatment of acute bacterial pharyngitis was penicillin (90.7%), with oral administration as the best route for administration (92.1%) for 5-7 days (72.9%).

In Jazan, Saudi Arabia Alakhali & Mohammed 2014 reported that the average number of antibiotics per prescription was  $1.45 \pm 0.58$ . More than half prescribed Cephalosporin group followed by aminoglycoside group (17.3%), penicillins (12.5%), macrolides (8.3%) and quinolones (0.69%).<sup>(19)</sup>

In Pakistan Palla et al. reported penicillin, ampicillin or amoxicillin to be the main antibiotics using in treating, while using erythromycin and first generation cephalosporins (CG) consider in two cases, first if there are patients with a non-life-threatening allergy to penicillin and second if the treatment with penicillin was failed.<sup>(13)</sup>

Schaad et al. (2002) reported that multiple daily dosing with penicillin V for ten days had been the standard treatment for streptococcal pharyngitis.<sup>(20)</sup> However, Brook (2002) added that short courses of amoxicillin, cephalosporins, and macrolides provide superior or equal efficacy to a 10-day course of penicillin therapy for treatment of group A pharyngotonsillitis.<sup>(21)</sup>

The present study showed that, out of a maximum of 18, participants scores (Mean $\pm$ SD) regarding their knowledge about acute pharyngitis was  $14.4 \pm 2.6$ , i.e., 80% of the maximum score. In addition, participants' knowledge scores did not differ significantly according to their PHCC.

These findings indicate that participants' knowledge is inadequate and further improvement in their knowledge regarding prescribing antibiotics for acute pharyngitis patients is necessary.

This finding is in agreement with that of several reports. In Hong Kong, Lam et al. (2009) reported inadequate knowledge of prescribing antibiotics is commonly prevalent among primary health care physicians.<sup>(22)</sup>

In Andonisia, Andrajati et al. (2017) reported inadequate knowledge of prescribing antibiotics is commonly prevalent among primary health care physicians,<sup>(11)</sup> although that a lot of physicians were interested in updating their knowledge.

Moreover, the WHO (2009) stressed lack of physician's knowledge as the main cause for inappropriate prescriptions of antibiotic therapy in primary health care.<sup>(23)</sup>

Rezal et al. Noted that the main reasons for inappropriate use of antibiotics include physicians' lack of knowledge and training regarding antibiotics, non-adherence to treatment guidelines, uncertainty over the diagnosis, fear of clinical failure, and pressure from patients to prescribe antibiotics.<sup>(24)</sup>

Gonzalez et al. 2015. Noted that the main reasons for inappropriate use of antibiotics include physicians' lack of knowledge and training regarding antibiotics, non-adherence to treatment guidelines, uncertainty over the diagnosis, fear of clinical failure, and pressure from patients to prescribe antibiotics.<sup>(25)</sup>

Results of the current study showed that participants' mean knowledge scores about antibiotics prescription for acute pharyngitis patients did not differ significantly according to their personal characteristics, having an antibiotics' prescription policy at PHCC or the application of that policy or according to attendance CME about antibiotics for acute pharyngitis. However, their knowledge differed significantly according to average daily patients' flow,

prescribing antibiotics for acute pharyngitis last week, and according to the used type of medical records system at PHCC and among those who read about prescribing antibiotics for acute pharyngitis.

Findings of the present study are in agreement with those of Bai et al. (2016), who reported no significant difference in physicians' knowledge scores regarding antibiotics prescription according to their age, gender, qualifications, or experience in medical practice. However, their knowledge scores differed significantly according to receiving training on antibiotics use. In addition, they noted that primary care physicians had a significantly lower mean knowledge score compared with physicians at other healthcare facilities. Therefore, primary healthcare physicians should be the target group for training intervention on antibiotic prescription.<sup>(26)</sup>

Sanchez et al. (2014) noted that modifying prescriber physicians' behavior is a complex and difficult endeavor, which includes several interventions, (e.g., continuing medical education through interactive group meetings, guidelines).<sup>(27)</sup>

Tennant et al. (2010) emphasized that continuing educational programs and institution-specific guidelines are needed to improve physicians' knowledge regarding antibiotics prescription.<sup>(28)</sup>

Gonzalez et al. (2015) supported the ability to modify prescriber physicians' knowledge and behavior, even it is a complex and difficult and includes several interventions, (e.g., continuing medical education through interactive group meetings, guidelines).<sup>(25)</sup>

Andrajati et al. (2017) emphasized that continuing educational programs and institution-specific guidelines are needed to improve physicians' knowledge regarding antibiotics prescription.<sup>(11)</sup>

### **Limitations:-**

1. The time span for conducting the study was limited to (May/October,2016)
2. The number of participants was limited to (140) physicians because some physicians were busy or unavailable during data collection.
3. Due to the widespread geographical distribution of the PHC centers within Makkah city, the study was carried out only in the three major urban sectors: Azzaher, Al/Kakiyyah and AlAdl.

### **Conclusion:-**

Based on the findings of the present study, the following can be concluded:

1. Almost half of PHC physicians prescribe antibiotics to their patients.
2. Most PHC physicians do not apply any policy for antibiotics prescription.
3. About one-third of PHC physicians do not read about prescribing antibiotics for acute pharyngitis.
4. Ministry of health booklets and guidelines do not constitute an important source for PHC physicians' knowledge.
5. The majority of PHC physicians do not attend any CME about antibiotics for acute pharyngitis.
6. PHC physicians' knowledge regarding antibiotics is suboptimal.
7. PHC physicians' knowledge do not differ significantly according to their personal characteristics. However, it significantly increases with higher daily patients' flow and prescribing antibiotics to more patients and reading about prescribing antibiotics for acute pharyngitis.

### **Recommendations: -**

Based on the findings of the present study, the following can be recommended:

1. The Ministry of Health should provide a clear policy and guidelines for rational antibiotics prescription to PHC physicians.
2. The Ministry of Health should plan and organize continuing medical education workshops about antibiotics prescription for acute pharyngitis to be attended by PHC physicians about antibiotics for acute pharyngitis.
3. Computer-based medical record system should be applied at PHC centers to help physicians to rationalize their antibiotics prescription.
4. Further studies on large sample, multicenter and national base are needed to explore PHC physicians' knowledge and practices regarding antibiotic prescription for common bacterial infections, other than acute pharyngitis.

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