

Physicians' knowledge and practice attitudes toward infective endocarditis antibiotic prophylaxis guidelines in Saudi Arabia



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Objectives: To assess the physicians' knowledge and practice attitudes toward the infective endocarditis antibiotics prophylaxis guidelines in Saudi Arabia. Moreover, to determine whether there is knowledge-to-practice discrepancy.

Methods: A cross-sectional study was performed using a self-administered questionnaire. A questionnaire was distributed among physicians dealing with congenital heart disease patients in Saudi Arabia, from January 7, 2016 to August 30, 2016. The questionnaire designed to calculate three scores: a knowledge score, a practice score, and a knowledge-to-practice discrepancy score. A *t* test was used for a mean comparison between the three scores and a Pearson correlation coefficient for correlation.

Results: A total of 121 physicians completed the survey. The respondents were predominantly pediatric cardiologists (84%). The mean knowledge score for infective endocarditis prophylaxis in various cardiac lesions was 8.6 \pm 3.2 SD out of 14, and the mean practice score was 7.6 \pm 3 SD out of 14. The mean discrepancy score was 1.1 \pm 3 SD. There was a positive significant correlation between knowledge and discrepancy scores, $r = 0.533$, $n = 121$, $p = 0.001$, using Pearson correlation analysis. Almost 39% of our population had a discrepancy score of +1 or more.

Conclusions: The knowledge about antibiotics prophylaxis of infective endocarditis in various cardiac lesions was less than optimal. Even in the presence of knowledge, there is a practice-to-knowledge discrepancy, with an over-prescribing attitude for low-risk cardiac lesions that correlates significantly with more knowledgeable physicians. We recommend that physicians be up-to-date and follow the most recent guidelines.

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1. Introduction

Infective endocarditis (IE) is a rare but devastating condition wherein the innermost lining of the heart is infected [1]. It may involve more than one valve, which can progress to severe valvular insufficiency and heart failure. It can also progress to abscess formation, septic emboli, stroke, and organ ischemia [2].

This disease is uncommon, with an incidence rate of 15 cases per 100,000 persons per year in the United States (US) [3]. In Saudi Arabia, there is a lack of country-wide epidemiological data; however, there are a few single-center studies that showed a higher incidence than international figures [4,5]. Because of the high mortality of this condition, physicians worldwide have been prescribing antibiotic prophylaxis (AP) for decades [6]. The first American Heart Association (AHA) guidelines that recommended AP to prevent IE were published in 1955. Since then, AHA updated their guidelines with a dramatic change in 2007 to recommend a much more restrictive use of antibiotics. The AHA 2007 guidelines cease to suggest AP for moderate-risk heart lesions and prior to gastrointestinal or genitourinary procedures [6].

The role of AP was met with more skepticism in the United Kingdom (UK). The National Institute for Clinical and Health Care Excellence (NICE) in the UK advised a complete cessation of prophylactic antibiotics prior to dental and non-dental procedures, except in predefined circumstances, such as previous IE. It also advised focus on patient education about the condition and maintaining good oral hygiene as the only prophylactic measure [7].

These guidelines defy long-term expectations and established practice among physicians worldwide. There is an expected gap between guidelines and clinical practice, which can result from many factors, including lack of knowledge, personal bias, and implementation difficulties.

In Saudi Arabia, there are no local guidelines for IE prophylaxis. Also, very few studies have been conducted to assess clinicians' knowledge, attitudes, and practices toward the guidelines, but the clear majority of these studies targeted dentists and dental staff [8,9]. In this study, we aim to assess the knowledge and practice of using AP for IE among physicians who regularly treat patients who have congenital heart disease in Saudi Arabia and to discover whether there is knowledge-to-practice discrepancy.

Abbreviations

IE	Infective endocarditis
AP	antibiotic prophylaxis
AHA	American Heart Association
NICE	National Institute for Clinical and Health Care Excellence

2. Materials and methods

This study is an observational cross-sectional study. The survey was distributed both electronically (via email list) and personally using paper-based self-administered questionnaires in multiple hospitals in Saudi Arabia from January 7, 2016 to August 30, 2016. The study was approved by the institutional review board. The data was collected through a secured website. Our inclusion criteria were any pediatric cardiologists, adult congenital cardiologists, and cardiothoracic surgeons who are practicing in Saudi Arabia and dealing with congenital heart disease. Physicians not dealing regularly with congenital heart disease were excluded. The questionnaire was composed of two main sections. The first section dealt with demographical data. The second section was formulated to test the physicians' knowledge and current practice with regard to prescribing preprocedural AP to prevent IE in patients with specific pre-existing heart diseases, including 14 cardiac lesions (although only two types of lesions were indicated for this treatment as per AHA 2007 guidelines). Each cardiac lesion included a knowledge domain (whether the lesion is indicated as per guidelines) and an actual practice domain (whether respondent would prescribe prophylaxis); correct answers received a score of 1 and wrong answers received a score of 0; a third domain was calculated for each lesion by subtracting the knowledge domain from the practice domain. This domain was used to illustrate any knowledge-to-practice discrepancy (as we defined it as: answering the correct answer on knowledge (1 point) and the wrong answer on actual practice point (0 point), subtraction of the knowledge point from the practice point results in a 1-point discrepancy). For each of the three domains (knowledge, practice, and discrepancy), participants' points were summed to calculate the final score out of the score of 14 (number of cardiac lesions). Note that a high discrepancy score indicates a high level of antibiotic overuse. The following statistical tests were used: a *t* test for mean comparison between our knowledge (K), practice (P),

and discrepancy (D) scores and demographics and a Pearson correlation coefficient to correlate between the scores mentioned previously. The statistical analysis performed using IBM® SPSS® Statistics Version 21.

3. Results

A total of 140 physicians were surveyed. Nineteen were excluded either due to incomplete data or because they were not dealing with congenital heart disease on a regular basis. Forty participants responded to the online questionnaire, and the rest responded to self-administered paper-based questionnaire. The respondents were predominantly pediatric cardiologists [95 (78.5%)], males

[105 (86.8%)], and aged >40 years [66 (54%)]. The demographics are summarized in Table 1.

The majority of the participants reported that they followed the guidelines most of the time (84.3%), and the AHA guidelines were the guidelines that they were most aware of [103 (85.1%)], followed by the European Society of Cardiology (ESC) guidelines by 46% of the respondents.

The mean K score for participants was 8.6 ± 3.2 out of 14 for indications in various cardiac lesions. The mean P score was 7.6 ± 3 out of 14. The mean D-score was 1.1 ± 3.0 . A *t* test analysis of the means of demographical data, such as age, experience, and position, and the means of the three scores did not demonstrate any statistically significant trends (Table 2). A Pearson correlation of the D score and K score showed a positive significant correlation between the two scores ($r = 0.533$, $n = 121$, $p = 0.001$).

The mean correct score for the need of AP for different cardiac lesions was 62% and 73% for various procedures. The knowledge and current practice of prescribing preprocedural AP against IE for patients with specific pre-existing heart diseases are depicted in Table 3. There is inappropriate IE prophylaxis recommendation for low-risk lesions, reaching up to 76% for some cardiac lesions with a knowledge-to-practice discrepancy ranging from 4% to 29% for various cardiac lesions. This overprescribing attitude is attributed not only to a lack of knowledge but also to personal bias (knowledge-to-practice discrepancy). Further analysis of respondents showed that 39% of our population had a D score of +1 or more.

Participants' self-perception of their knowledge about international guidelines on a scale from above average, to average, to below average were 26%, 67%, and 7%, respectively.

The majority of respondents (84%) believe that there is a necessity for local country guidelines,

Table 1. Demographic details of questionnaire respondents ($n = 121$).

Demographic variable	$n = 121$	%
<i>Age, yr</i>		
≤40	55	45.4
>40	66	54.5
<i>Sex</i>		
Male	105	86.8
Female	16	13.2
<i>Duration of independent practice, yr</i>		
≤10	68	56.2
>10	51	42.1
<i>Specialty and position</i>		
Pediatric cardiology		
Consultants/assistant consultants	72	78.5
Fellow, registrar, and residents	23	
Cardiac surgery		
Consultants/assistant consultants	11	9
Fellow, registrar, and residents	2	
Others specialties		
	15	12.4
<i>Position</i>		
Consultants/assistant consultants		
	94	77.7
Fellow, registrar, and residents		
	27	22.3

Table 2. A *t* test analysis of knowledge, practice, and discrepancy scores and means of demographical variables.

		Mean knowledge score, n (%)	p	Mean practice score, n (%)	p	Mean discrepancy score, n (%)	p
Age, yr	≤40	8.11 (74)	0.464	7.84 (51)	0.145	0.29 (51)	0.194
	>40	9.03 (66)		7.36 (66)		1.66 (66)	
Sex	Male	8.80 (105)	0.343	7.50 (104)	0.123	1.29 (104)	0.271
	Female	7.56 (16)		8.00 (14)		0.35 (14)	
Experience, yr	≤10	8.55 (68)	0.685	7.60 (66)	0.592	0.90 (66)	0.755
	>10	8.76 (51)		7.70 (50)		1.18 (50)	
Specialty	Pediatric cardiology	9.07 (95)	0.680	7.75 (93)	0.353	1.30 (93)	0.684
	Other	7.03 (26)		6.84 (25)		0.36 (25)	
Position	Consultant	9.19 (72)	0.336	7.81 (72)	0.023	1.37 (72)	0.295
	Other	7.81 (49)		7.15 (46)		0.67 (46)	

Table 3. The knowledge, current practice, and discrepancy of prescribing preprocedural antibiotic prophylaxis against infective endocarditis for patients with various cardiac lesions.

Cardiac lesion	Indicated as per AHA (Yes/No)	Correct answer, %	Cardiologists prescribing prophylaxis, %	Discrepancy, %
Bicuspid aortic valve with severe aortic stenosis	No	49	73.6	29
Rheumatic heart disease with moderate aortic insufficiency	No	34	76	15
Dilated cardiomyopathy with severe mitral regurgitation	No	51	62	15
AVSD with mitral regurgitation	No	43	67	15
Acyanotic Ebstein anomaly	No	56	50	14
Audible large PDA	No	56	53	12
Mitral valve prolapse with regurgitation	No	56	54	12
Cardiac transplantation without cardiac valvular disease	No	39	66	11
Transposition of the great vessels S/P arterial switch without residual lesions	No	76	31	11
S/P repair of TOF with trans-annular patch current moderate regurgitation	No	35	74	9
ASD secundum	No	91	13	6
Fully repaired VSD (after 6 mo)	No	91	12	4
Previous infective endocarditis	Yes	88		
Prosthetic cardiac valve	Yes	98		
Average		62	50.7	11.3

AHA = American Heart Association; ASD = atrial septal defect; AVSD = atrioventricular septal defect; PDA = patent ductus arteriosus; S/P= status post; TOF = tetralogy; VSD = ventricular septal defect.

and 35% respondents thought that the international guidelines were not applicable to the Saudi population.

4. Discussion

This is the first study to describe knowledge and practice patterns toward IE prophylaxis among cardiologists in Saudi Arabia. The mean correct score for the need of AP were 62% and 73% for different cardiac lesions and various procedures, respectively. This was slightly lesser than that expected of our study physicians who deal with congenital heart diseases on a regular basis. The knowledge among dentists in another local study at Taibah University, Saudi Arabia showed that participants had an average knowledge level of 47% on cardiac conditions requiring prophylaxis [8].

There is a significant overprescribing pattern among our sample population. The average rate of prescribing antibiotics for low-risk cardiac lesions was 50.7% for the 12 cardiac lesions, with the highest cardiac lesion being rheumatic heart disease with moderate aortic insufficiency (Table 3).

Nonadherence to guidelines is not uncommon and has been documented in other studies [10,11] Pharis et al. [10] showed a significant heterogeneity toward IE prophylaxis among

multinational pediatric cardiologists, with a significant proportion prescribing IE prophylaxis despite it not being recommended by the 2007 AHA guidelines. Another study performed in 2013 showed a persistent pattern of nonadherence to AHA guidelines among pediatric cardiologists in the US, with 56% reporting that they do not follow the AHA guidelines exclusively [11]. These studies did not assess knowledge and practice independently. Recent secular trend study performed in UK showed increasing incidence of IE since introduction of the 2008 NICE guidelines [12]. On the other hand, similar a study done in US showed no significant change in hospitalization rates of IE from the pre-AHA guideline era (2000–2007) to the post-AHA guideline era (2007–2011) [3].

The NICE guidelines recommend complete cessation of prophylactic antibiotics prior to dental and non-dental procedures, which in many cardiologists' view could put more patients at the risk of IE. More than a third of cardiologists and cardiovascular surgeons in UK admit they do not follow the NICE guidelines and still recommend AP for high-risk lesions [13].

Our study is designed to assess the knowledge and practice simultaneously for each type of cardiac lesion. Based on this objective, it was feasible to understand whether an inappropriate recommendation of IE prophylaxis is a result of the lack

of knowledge or conscious disagreement with recommended guidelines. To our knowledge, this is the first study that describes the knowledge-to-practice discrepancy. The rate of discrepancy between knowledge and practice (i.e., recommendation of AP for low-risk cardiac lesions despite the correct knowledge) was averaged at 11.3% for all low-risk cardiac lesions, and 39% of all respondents demonstrated a discrepant practice in one or more lesion types.

It was interesting to note that there was a significant positive correlation between the K score and the D score (Pearson correlation coefficient $r = 0.553$). This trend suggests that more knowledgeable physicians tend to disagree with the international guidelines.

There was also a higher D score with respondents who are consultants versus nonconsultants, aged >40 years versus <40 years, and with experience of >10 years; however, none of these demographic features were statistically significant. Patel et al. [14] reported similar findings that highly experienced pediatric cardiologists compared with their less experienced counterparts continue to administer preprocedural AP against IE even when it is not recommended.

The reasons for the discordant practices are multifactorial and include dissatisfaction with the guidelines or the belief that international guidelines are not applicable to the local population. In our study, 15% of our population was not satisfied with the AHA guidelines, 35% admitted that they prescribe AP as a precautionary measure and believe that the AHA guidelines are too restrictive regarding the use of antibiotics.

The majority of respondents (84%) believe that there is a necessity for local country guidelines and 35% thought that the international guidelines are not applicable to the Saudi population. The international guidelines are based on the most recent evidence and implementation of the guidelines with high credibility; however, a valid concern over the applicability of the international guidelines for the local population must be addressed, and the establishment of local evidence-based guidelines should be considered.

5. Conclusions

Our study showed that the knowledge of indications of AP for different cardiac lesions is below expected among physicians dealing with congenital heart disease in Saudi Arabia. There is a significant overprescribing attitude for low-risk cardiac lesions and procedures, which is a result of both

lack of knowledge and conscious disagreement of IE prophylaxis guidelines.

6. Limitations

The survey used for this study has not been previously validated. The small sample size, due to the limited number of physicians dealing with congenital heart disease in Saudi Arabia, could have contributed to a lack of detection of demographic predictors of discrepancy practice.

7. Recommendations

We recommend that physicians be up-to-date with the most recent international IE prophylaxis guidelines. Further studies are needed to investigate the epidemiology of IE in Saudi Arabia and establish relationship with preventive measures.

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