

## The Current knowledge Towards Infective Endocarditis Prophylaxis Among General Dental Practitioners in Zliten-Libya

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### Article information

### Abstract

#### Key words

*Infective endocarditic, Antibiotic prophylaxis, Knowledge, Dental practitioners.*

*Received 31/01/2024,  
Accepted 06 /04/ 2024,  
Available online 16 /04 /  
2024*

The aim of this study was to evaluate the knowledge of general dental practitioners, in private and governmental dental clinics in Zliten, regarding the current American Heart Association (AHA) guidelines for infective endocarditis prophylaxis. This surveying was carried out using a descriptive, closed ended questionnaire which was circulated among 200 general dental practitioners in private and governmental dental clinics in Zliten-Libya. Data was analysed using SPSS. The frequency and percentage of respondents were determined using a descriptive statistics. The effect of the work sector and professional experience on responses was evaluated using Chi-square test ( $P < 0.05$ ). The questionnaire has been completed by 145 general dentists with overall response rate of 72%. The majority of respondents recommended antibiotic prophylaxis for prosthetic heart (92.4%) followed by rheumatic heart disease (89%), mitral valve prolapse (85.5%), history of infective endocarditis attack (84%), bypass surgery (76.5%), patient with pacemaker (70.3%) and peripheral vascular grafts with patches (69%). 84% of participants advocated antibiotic prophylaxis for teeth extraction followed by abscess drainage (80%), endodontic treatment (79%) and apicoectomy (64%). 50.7% and 46.2% of respondents identified the correct prophylactic regimen for patients not allergic and allergic to penicillin, respectively. 60% of participants used multiple antibiotic doses for endocarditis prophylaxis. Working sector and professional experience exhibited no impact on all the responses. The general dental practitioners in Zliten should be encouraged to follow the current AHA guidelines for infective endocarditis prophylaxis.

## I. INTRODUCTION

Infective endocarditis (IE) is a severe, uncommon infection of the endocardium induced mainly by bacteria, particularly Streptococci and Staphylococci, Enterococci species, and rarely by fungi or viruses [1, 2]. The disease targets heart inner lining, particularly the valves, and is considered a life-threatening condition with high morbidity and mortality rates [3, 4]. IE primarily results from microbial adhesion and proliferation on a damaged endocardium surface [5]. Several congenital and acquired conditions may induce the damage and enhance the adherence of microorganisms to the endocardium, thereby increasing the risk of developing infective endocarditis. This includes rheumatic heart disease [6], prosthetic valve replacement [7], congenital heart disease (CHD) [8], and a previous history of IE [9]. During invasive dental procedures, such as teeth extraction and periodontal treatment, bacteraemia occurs due to the entry of microorganisms into blood and results in endocarditis in high risk patient [10]. Despite improvement in diagnostic aids and appropriate treatment, infective endocarditis exhibited a high mortality up to 25% [11]. Therefore, the priority was directed towards the prevention of IE rather than active treatment [12]. The prophylactic administration of antibiotics in high risk patients, reduces the duration and magnitude of bacteraemia and prevent the development of IE [13]. The most commonly used guidelines for antibiotic prophylaxis against IE are issued by the American Heart Association (AHA) [11]. Other organizations proposed guidelines for antibiotic prophylaxis include United Kingdom's National Institute for Health and Care Excellence (NICE) and the European Society of Cardiology (ESC) [14-16]. The efficiency of antibiotic prophylaxis in the prevention of IE was exposed to several debates [17, 18]. In addition, concerns were raised regarding the correlation between dental procedures and the pathogenesis of infective endocarditis [19]. Furthermore, considerations were raised regarding the adverse reactions and cost of antibiotics used in prophylactic regimes [20,21]. Moreover, maintaining proper oral health is considered a crucial factor in reducing bacteraemia rather than the use of antibiotic prophylaxis [22]. This leads to a significant revision of the guidelines recommended by different

organizations. In 2007 and 2009, antibiotic prophylaxis was restricted by AHA and ESC to those with a high risk for IE, respectively [14, 16]. NICE in 2008, however, recommended complete withholding of use of antibiotic prophylaxis for IE [15]. This recommendation was then modified into "antibiotic prophylaxis is not routinely used" [23]. However, there has been much debate regarding NICE recommendations [1,24, 25].

The knowledge of general dental practitioners regarding updated guidelines and recommendations for IE prophylaxis is an extremely important issue. Several studies have been conducted to evaluate the knowledge and awareness of dental surgeons regarding IE prophylaxis in different regions [26–32]. According to our knowledge, no similar studies were conducted in Libya. Therefore, the aim of this study was to assess and evaluate the general dental practitioner's knowledge (based on AHA guidelines) towards IE prophylaxis in either private or governmental dental clinics in Zliten-Libya.

## II. MATERIALS AND METHODS

This cross-sectional and descriptive investigation was performed utilizing a self administered, closed ended survey questionnaire that had been modified from previous study [31]. The questionnaire composed of 9 questions, with 4 demographical and 5 relative to the various aspects of participants' knowledge regarding IE prophylaxis based on AHA guidelines [14].

The survey questionnaire was hand distributed to the respondents and the study was undertaken in the period between July 2023 and September 2023.

The study included general dental practitioners working in either governmental or private clinics in Zliten, Libya. The survey excluded dental specialists or general dentists not registered in the local dental syndicate. The sample size was estimated online utilizing Raosoft sample size calculator with 5% margin error and 95% confidence interval. The study was voluntary for all of the participants. A guarantee of confidentiality was made regarding both participant's privacy and outcomes. The ethical approval for conducting of this research (NRCTTD.H.1/24) was obtained from the scientific and ethical committee of the National Research Centre for Tropical and Transboundary Diseases-

Zintan, Libya. The data was entered into an Excel spreadsheet and SPSS 26 (IBM, Armonk, NY, USA) was used for the analysis. Descriptive statistics were used to ascertain the distribution and frequency of the participants responses. The influence of the work sector and professional experience on the responses was evaluated using the chi-square test ( $p < 0.05$ ).

### III. RESULTS

**Table 1:** The demographic data of the study participants (frequency/%).

Demographic characteristics	No (%)
<b>Gender</b>	
Male	75 (52)
Female	70 (48)
<b>Age</b>	
25-35	76(52)
36-46	65 (45)
>46	04 (3)
<b>Years of professional experience</b>	
1-6	60 (41.3)
7-12	57 (39.3)
>12	25 (19.4)
<b>Working sector</b>	
Governmental	24 (16.5)
Private	96 (66.2)
Both	25 (17.3)

**Table 2:** The dentists' responses (frequency/%) on question regarding the clinical conditions that required antibiotic prophylaxis against IE.

Indicate the clinical condition/s which associated with high risk for infective	
Answer options	No (%)
History of rheumatic fever	69 (47.5)
History of infective endocarditis	122 (84)
History of bypass surgery	111 (76.5)
Mitral valve prolapses	124 (85.5)
Rheumatic heart diseases	129 (89)
Prosthetic heart valve	134 (92.4)
Patient with pacemaker	102 (70.3)
Peripheral vascular grafts and patches	100 (69)
Cardiac transplantation recipients with valvular disease	94 (65)
Unrepaired cyanotic congenital heart diseases (CHD)	49 (34)
Completely repaired congenital heart (CHD) diseases with prosthetic material or device (during the first 6 months of the procedure)	82 (57)

The survey questionnaire was delivered to 200 dentists, completed and received from 145

participants with an overall a response rate of 72%. Table 1. Shows the demographical data of the survey respondents. Among the total survey participants, 52% were male and 48% were female. 52% and 45% of respondents exhibited an age range of 25-35 and 36-46 years, respectively. Only 3.0% of survey respondents were >46 years. Regarding the respondents professional experience, 41.3% had 1-6 years, 39.3% had 7-12 years while only 19.4% had > 12 years. 66.2% of study participants were practicing dental treatment in the private sector while 16.5% in governmental and 17.3% in both sectors.

The survey respondents were questioned on the clinical conditions that required antibiotic prophylaxis. The majority of respondents (92.4%) indicated prosthetic heart valve followed by rheumatic heart diseases (89%), mitral valve prolapse (85.5%), history of infective endocarditis attack (84%), bypass surgery (76.5%), patient with pacemaker (70.3%) and peripheral vascular grafts and patches (69%). In addition, 65% and 57% of participants recommended antibiotic prophylaxis for patients with cardiac transplantation recipients with valvular disease and completely repaired CHD with prosthetic material or device (during the first 6 months of the procedure), respectively. The lowest percentage of replies were for rheumatic fever (47.5%) and unrepaired cyanotic CHD (34%). (Table 2). The working sector exhibited no significant association with any of the responses (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.60 $\pm$ 0.2,  $p > 0.05$ ). In addition, no significant association existed between the responses and the professional experience (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.59 $\pm$ 0.23,  $p > 0.05$ ).

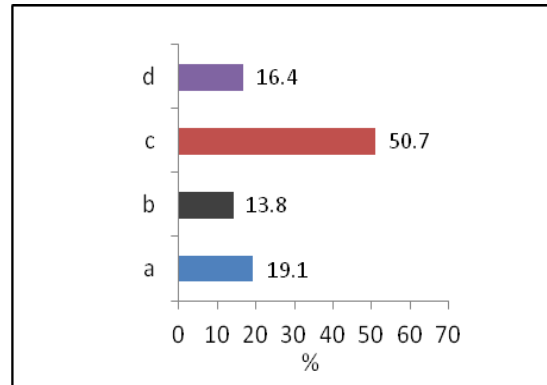
The survey participants were asked about the dental procedures that called for antibiotic prophylaxis. The majority of the participants (84%) indicated teeth extraction followed by incision and drainage of intraoral or extraoral abscess (80%), endodontic treatment (79%), apicoectomy (64%), implant surgical procedure (61%), subgingival placement of retraction cords (54.5%), placement of rubber dam without risk of gingival damage (53%), placement of removable orthodontic or prosthetic appliances (40%) and scaling and root planning (31%). The lowest proportion of answers were for placement of matrix band without gingival damage (1.4%), placement of orthodontic brackets (2.0%), intraligamentary local anesthesia (10.3%) and intraoral radiograph (13%). (Table 3). The working sector exhibited no significant association with any

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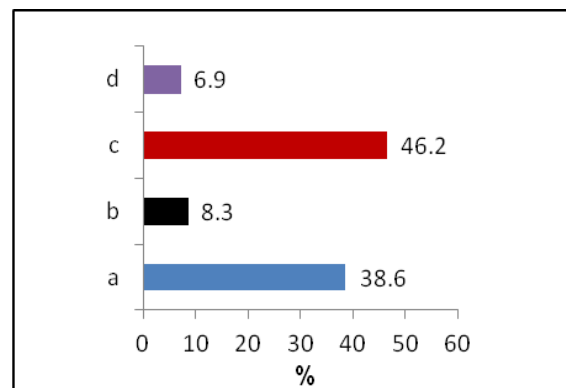
of the responses (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.49 $\pm$ 0.14,  $p>0.05$ ). In addition, no significant association existed between the responses and the professional experience (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.55 $\pm$ 0.22,  $p>0.05$ ).

**Table 3:** The dentists' responses (frequency/%) on the question regarding the dental procedures that required antibiotic prophylaxis against IE.

Answer options	No/(%)
Intraoral radiograph	19 (13)
Placement of removable orthodontic or prosthetic appliances	58 (40)
Incision and drainage of intraoral or extraoral abscess	116 (80)
Scaling and root planning	45 (31)
Endodontic treatment before creation of an apical stop	114 (79)
Subgingival placement of retraction cords	79(54.5)
Placement of rubber dam without risk of gingival damage	77 (53)
Intraligamentary local anesthesia	15 (10.3)
Extraction of teeth	122 (84)
Placement of matrix band without gingival damage	2.0 (1.4)
Implant surgical procedure	89 (61)
Placement of orthodontic brackets	3.0 (2.0)
Apicoectomy	93 (64)



**Figure 1:** The survey participants' responses (%) on the question regarding the appropriate antibiotic prophylaxis protocol against IE for an adult patient not allergic to penicillin. (a) Amoxicillin 3 g orally 2 hrs before the dental procedure, (b) Ampicillin 500 mg orally 60 minutes before the dental procedure, (c) Amoxicillin 2.0 g orally 30-60 minutes before the dental procedure, (d) Ampicillin 1.0 g IM or IV immediately before the dental procedure.

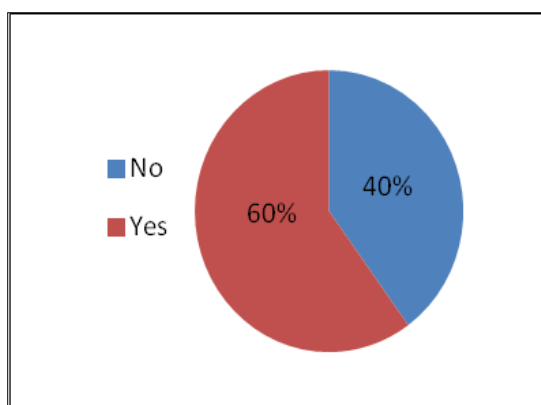


**Figure 2:** The survey participants' responses (%) on the question regarding the appropriate antibiotic prophylaxis protocol against IE for an adult patient allergic to penicillin. (a) Clindamycin 2.0 g orally 2.0 hours before the dental procedure, (b) Cephalexin 500 mg orally 60 minutes before the dental procedure, (c) Azithromycin 500 mg orally 30-60 minutes before the dental procedure, (d) Cefazolin 500 mg IM or IV immediately before the dental procedure.

Regarding the prophylactic protocol, results showed that 50.7% of survey respondents selected the correct protocol for antibiotic prophylaxis for patients not allergic to penicillin while 49.3% selected the wrong answer (Fig. 1). The working sector exhibited no significant association with any of the responses (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.35 $\pm$ 0.16,  $p > 0.05$ ). In addition, no significant association existed between the responses and the professional experience (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.42 $\pm$ 0.27,  $p > 0.05$ ).

Only 46.2% of survey participants indicated the correct regimen for antibiotic prophylaxis for adult patients allergic to penicillin while 53.8% selected the wrong options (Fig. 2). The working sector exhibited no significant association with any of the responses (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.25 $\pm$ 0.10,  $p > 0.05$ ). In addition, no significant association existed between the responses and the professional experience (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.55 $\pm$ 0.33,  $p > 0.05$ ).

In answer to the question regarding the use of multiple postoperative antibiotic doses, 60% of respondents indicated the use of antibiotic for a duration of three days after the clinical procedure while only 40% of participants recommended only a single preoperative dose (Fig. 444 3). The working sector exhibited no significant association with any of the responses (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.08 $\pm$  0.014,  $p > 0.05$ ). In addition, no significant association existed between the responses



**Figure 3:** The survey participants' responses (%) on the question regarding the use of multiple antibiotic doses for IE prophylaxis.

and the professional experience (Mean Pearson's Chi-square  $p$  value  $\pm$  SD=0.24 $\pm$ 0.02,  $p > 0.05$ ).

#### IV. DISCUSSION

This survey is primarily directed for gathering data from general dental practitioners, in Zliten-Libya, regarding the current knowledge of antibiotic prophylaxis against IE based on AHA guidelines [11,14]. Patients with a high risk of IE frequently attend the dental clinics seeking dental services. Since the general dental professionals are in the first line in offering a variety of dental procedures, therefore collection of data regarding their current knowledge in antibiotic prophylaxis against IE is extremely significant.

The vast majority of survey respondents in this study (97%) exhibited age range between 25-46 years, with 80.6% of survey participants having professional experience between 1 to 12 years. In addition, 52% of general dental practitioners are males. Furthermore, the general dentists in Zliten are working predominately (66.2%) in the private sector. According to our knowledge, no previous demographic data is available regarding the general dentists in Zliten. The response rate in the current study was relatively high (72%). A Similar study conducted among general dentists in Dominican Republic reported a high response rate of 78% [27].

The results of this study revealed that patients with prosthetic heart valves, rheumatic heart diseases, mitral valve prolapsed and a history of IE were indicated by the majority of participants as high risk for IE and therefore, required antibiotic prophylaxis. In accordance with AHA guidelines, prosthetic heart valve and previous attack of IE are one of the clinical conditions that called for antibiotic prophylaxis, in contrast however with mitral valve prolapse and rheumatic heart diseases [11,14].

Several studies reported that the majority of general dentists selected prosthetic heart valves and previous attack of IE as cardiac conditions that required antibiotic prophylaxis [26-28,33,34]. According to AHA guidelines, the history of bypass surgery, implantable devices such as pacemakers, rheumatic heart diseases and peripheral vascular grafts and patches (including those used for haemodialysis) are not indicated for antibiotic prophylaxis [11,14].

In the present study, the former conditions have been overestimated for the risk of IE. 76.5% and 70.3% of respondents recommended antibiotic prophylaxis for

patient with bypass surgery and pacemaker, respectively. 89% and more than two thirds (69%) of our study participants considered the rheumatic heart diseases and peripheral vascular grafts and patches as situations which required antibiotic prophylaxis. Overestimation of rheumatic heart diseases for IE risk by dentists has been previously reported (26,27). One surveying study showed that more than one third (39%) of dentists are not following AHA guidelines regarding patient with mitral valve prolapsed (35). Dentists considered mitral valve prolapse and rheumatic heart disease as the main indications for antibiotic prophylaxis (34). Unrepaired cyanotic CHD, cardiac transplantation recipients with valvular disease and completely repaired CHD with prosthetic material or device (during the first 6 months of the procedure) are listed in AHA guidelines as a high risk situations for IE and demand antibiotic prophylaxis [11,14]. In the present study however, unrepaired cyanotic CHD has been underestimated and indicated only by one third of respondents (34%) for IE prophylaxis. Cardiac transplantation recipients with valvular disease and completely repaired CHD with prosthetic material or device (during the first 6 months of the procedure) are indicated for antibiotic prophylaxis by approximately two-thirds (65%) and more than half of respondents (57%), respectively. The survey participants in this study were either overestimated or underestimated the IE risk for several clinical situations and cardiac disorders. Improper estimation of the risk of certain cardiac disorders and a knowledge deficit among dentists regarding current guidelines to prevent IE have been reported in several studies [33,36,37]. Insufficient knowledge regarding identification of the risk level for cardiac disorders may lead to either imprudent use of antibiotics or enhance the risk of IE attack.

According to the current AHA guidelines, antibiotic prophylaxis is advocated for all dental procedures that including the manipulation of either gingival or mucosal and periapical tissues [38]. Based on the former guidelines, the majority of participants in present study were capable of identifying several dental procedures that required antibiotic prophylaxis. In the present study, the respondents mainly indicated antibiotic prophylaxis for teeth extraction (84%), incision&drainage of abscesses (80%) and endodontic treatment before creation of an apical stop

(79%). This is consistent with another study [27] which reported that the majority (70.7%) of general dental practitioners recommended antibiotic prophylaxis for teeth extraction and drainage of abscesses. The former study however, showed that antibiotic prophylaxis for endodontic treatment is recommended by approximately only one-third of respondents (32.4%). In accordance with our results, earlier study [30] reported that the vast majority of dentists recommended antibiotic prophylaxis for teeth extraction (98%), soft tissue surgery (97%) and endodontic treatment (85%). In the present study, more than one half (54.5%), approximately two-thirds (64%) and (61%) of study participants indicated antibiotic prophylaxis for placement of subgingival retraction cord, apicoectomy and implant surgical procedure, respectively. The former dental procedures are recommended by AHA guidelines for antibiotic prophylaxis [14].

According to AHA guidelines, scaling & root planning and intraligamentary local anesthesia are clinical procedures which may enhance the risk for IE and required antibiotic prophylaxis [5,14]. In the present study however, scaling&root planning and intraligamentary local anesthesia have been underestimated for the risk of IE. Less than one-third (31%) and only 10.3% of the study respondents recommended antibiotic prophylaxis for scaling&root planning and intraligamentary local anesthesia, respectively. Underestimation of general dental practitioners regarding antibiotic prophylaxis for intraligamentary local anesthesia and scaling&root planning has been previously reported [27,39]. In addition, the placement of rubber dam without risk of gingival damage has been overestimated in this study. More than half of the study participants (53%) recommended antibiotic prophylaxis for rubber dam placement without risk of gingival damage, which in contrast with AHA guidelines [5,14]. In the present study, overestimation and underestimation of respondents for the risk factor for some dental procedures may revealed their deficient knowledge.

Antibiotic prophylaxis is effective among patients that exhibited a high risk for IE [40]. Proper selection of antibiotic protocol is critical issue in IE prophylaxis. Amoxicillin is the most commonly used antibiotic in IE prophylaxis for patients not allergic to penicillin [31,33]. 50.7% of our study participants could identify the correct answer regarding antibiotic prophylaxis protocol for patients not allergic to

penicillin. More than half of respondents (53.8%) however, could not select the correct answer on question regarding antibiotic prophylaxis protocol for patient allergic to penicillin. This may reflect deficient knowledge and unawareness of general dental practitioners in this study regarding the guidelines for antibiotic prophylaxis protocol. One study revealed that less than half of dentists used appropriate antibiotic for IE prophylaxis [28]. In another study, the majority of dentists prescriptions for IE prophylaxis are inconsistent with AHA guidelines [41]. According to AHA guidelines, antibiotic should be administered preoperatively as a single dose and within a specific time [38]. Our study however, indicated that less than half of respondents (40%) are using single antibiotic dose for IE prophylaxis. This is inconsistent with previous study which reported that the dentists prefer single antibiotic dose for IE prophylaxis [26]. Postoperative administration of antibiotics and use of multiple doses for IE prophylaxis is not recommended, as it may result in either adverse drug reactions or interactions and additional financial strain on the patient [42].

## V. CONCLUSION

The majority of survey participants in this study tend to identify the main high risk cardiac conditions that required antibiotic prophylaxis (prosthetic valve, history of infective endocarditis, cardiac transplantation recipients with valvular disease and completely repaired CHD with prosthetic material or device). Unrepaired cyanotic CHD, however, a high risk cardiac condition, has been underestimated and not indicated for antibiotic prophylaxis by the majority of respondents. In addition, several low risk conditions (mitral valve prolapse, rheumatic heart diseases, patient with pacemakers, bypass surgery and peripheral vascular grafts and patches) have been overestimated by the majority of study participants and indicated for antibiotic prophylaxis. The majority of participants were capable of identifying most of dental procedures that required antibiotic prophylaxis, namely the teeth extraction, incision/drainage of abscesses, implant surgical procedure, apicoectomy, endodontic treatment before creation of an apical stop and subgingival placement of retraction cords. The survey participants however, underestimate the risk of scaling/root planning and intraligamentary local anaesthesia while overestimate the risk of placement of rubber dam.

One half of the study respondents were aware regarding the proper antibiotic regimen for an adult patient not allergic to penicillin. However, less than one half of study participants were aware regarding the appropriate antibiotic protocol for an adult patient allergic to penicillin. In addition, the majority of study respondents were using multiple antibiotic doses for IE prophylaxis. The general dental practitioners should be encouraged to strictly follow the current AHA guidelines for IE antibiotic prophylaxis, particularly regarding the assessment of patients' risk factors, dental procedures that may enhance the risk for IE and antibiotic prophylactic regimens. The work sector and professional experience exhibited no impact on any of the responses.

**Acknowledgement:** The authors deeply grateful for the study participants for their significant contribution .

**Conflicts of interest:** There are no conflicts of interest.

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## المعرفة الحالية للوقاية من التهاب شغاف القلب المعدي بين ممارسي طب الاسنان العام في زليتن-ليبيا

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### الملخص

كان الهدف من هذه الدراسة هو تقييم معرفة ممارسي طب الأسنان العاملين في عيادات الأسنان الخاصة والحكومية في زليتن بالوقاية من التهاب شغاف القلب المعدي بالاستناد الي المبادئ التوجيهية الحالية لجمعية القلب الأمريكية (AHA). تم إجراء هذا المسح باستخدام استبيان وصفي مغلق تم توزيعه على 200 من ممارسي طب الأسنان العام في عيادات الأسنان الخاصة والحكومية في زليتن-ليبيا. تم تحليل البيانات باستخدام برنامج SPSS. تم تحديد التكرار والنسبة المئوية للمستجيبين باستخدام الإحصاء الوصفي. كذلك تم تقييم تأثير قطاع العمل والخبرة المهنية على الاستجابات باستخدام اختبار مربع كاي ( $P < 0.05$ ). تم إكمال الاستبيان من قبل 145 طبيب أسنان عام بمعدل استجابة إجمالي قدره 72%. أوصى غالبية المشاركين بالعلاج الوقائي بالمضادات الحيوية للقلب الاصطناعي (92.4%)، يليه مرض القلب الروماتيزمي (89%)، وهبوط الصمام التاجي (85.5%)، وتاريخ الإصابة بالتهاب الشغاف المعدي (84%)، والجراحة الالتفافية (76.5%)، ومن يستخدم جهاز تنظيم ضربات القلب (70.3%) وطعوم الأوعية الدموية الطرفية باستخدام الرقع (69%). أيد 84% من المشاركين العلاج الوقائي بالمضادات الحيوية لقلع الأسنان متبوعاً بتصريف الخراج (80%)، والعلاج اللبّي (79%)، واستئصال القمة (64%). حدد 50.7% و46.2% من المشاركين النظام الوقائي الصحيح للمرضى الذين لا يعانون من حساسية وحساسية للبنسلين، على التوالي. استخدم 60% من المشاركين جرعات متعددة من المضادات الحيوية للوقاية من التهاب الشغاف. لم يظهر قطاع العمل والخبرة المهنية أي تأثير على جميع الردود. ينبغي تشجيع أطباء الأسنان العاملين في زليتن على اتباع إرشادات جمعية القلب الأمريكية الحالية للوقاية من التهاب الشغاف المعدي.

استلمت الورقة بتاريخ  
2024/01/31، وقبلت  
بتاريخ 2024/04/06،  
ونشرت  
بتاريخ 2024/04/16  
**الكلمات المفتاحية:**  
التهاب  
الشغاف، المضادات  
الحيوية الوقائية، المعرفة  
أطباء الاسنان