

## Knowledge of General Dentists and Senior Dental Students about Indications of Antibiotic Prophylaxis in Yazd, Iran

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### Abstract

**Introduction:** In patients susceptible to infection, after dental procedures which lead to soft tissue manipulation or bleeding, the occurrence of bacteremia is probable. Hence, antibiotic prophylaxis is very important in this group of patients. The purpose of this study was to assess the level of awareness of senior dental students and general dental practitioners in the city of Yazd about the indications of antibiotics prophylaxis and the proper way of prescribing the prophylactic regimens. **Materials and methods:** This study is a cross-sectional descriptive-analytical study. To collecting data, prepared questionnaires distributed among 60 general dentists and 60 senior students. **Results:** The mean of knowledge scores of senior dental students and general dentists were  $55.43 \pm 11.10$  and  $55.06 \pm 7.94$  respectively. Both groups showed acceptable levels of knowledge. **Conclusion:** The levels of knowledge of senior dental students and general dental practitioners were desirable and this may be due to the participation of practitioners in relevant re-training programs or allocation of related academic resources in this area during their education.

**Key words:** Knowledge, Indications, Antibiotic, Prophylaxis.

### Introduction

One of the major indications of antibiotics in dentistry is prophylaxis before dental treatments (1). The aim of prescription of prophylactic antibiotics is to prevent the infection or the spreading of infection in some patients with special systemic conditions (2).

The incidence of infection in other parts of the body following some dental procedures is probable in these following situations: existence of artificial heart valves, synthetic graft material used for extra-cardiac vessels, history of endocarditis, congenital heart diseases, uncontrolled systemic or metabolic disorders which impair the immune system such as advanced liver failure, alcohol consumption, renal failure requires hemodialysis, uncontrolled diabetes, systemic lupus erythematosus, immunosuppressive drugs usage, history of organ transplantations, sickle cell anemia, history of splenectomy, blood dyscrasias, radiotherapy or chemotherapy and HIV-positive patients (3, 4). Not prescribing antibiotics in such cases may lead to serious complications threatening the health and quality of life in patients and on the other hand, inappropriate prescription of antibiotics may also create complications such as drug resistance, allergic reactions, hyperaesthesia and imposing additional costs to the patients (4). So, dentists should first evaluate the benefits of prophylaxis then prescribed it if they are superior to the risks of side effects (5). With regard to the mentioned issues, it seems that new generation of dentists should be fully aware of the problems of increased antibiotic resistance. Besides that proper application and

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prescription of antimicrobial drugs must be emphasized in dentistry educational protocols (6).

Most previous studies have only assessed the awareness of dentists about the requirement of prophylaxis in infective endocarditis cases and have not investigated other indications of prophylaxis; so, this study has been conducted to investigate the level of the knowledge of senior dental students and general dentists of the city of Yazd about overall indications of prophylactic antibiotics and the proper way of antibiotics' prescription.

### Materials and Methods

This study was approved by the ethical committee of Shahid Sadoughi University of medical sciences and after obtaining the approval code (IR.SSU. REC. 1394.223), in December of 2016, all of the senior students of Faculty of Dentistry of Shahid Sadoughi University of medical sciences (60 5th and 6th year-students) and 60 of about 350 general dentists in the city of Yazd were included by census method and random sampling method, respectively. A questionnaire containing demographic information (gender, age, work experience and participation in re-training courses (for dentists) and some questions related to the knowledge of participants about prophylaxis area, was provided for data collection. All participants were informed about the aim of this study and those who did not consent to participate in the study, were replaced with other cases. After completion of questionnaires, a brochure (pamphlet) containing full description about indications of prophylaxis and the proper way of prescription of prophylactic antibiotic was given to each participant in order to inform them or update their previous information about this subject.

The questionnaire was given to 10 dentistry professors in our faculty to assess content validity. Then, after editorial changes according to their comments, it was given to 10 general dentists and the reliability was acceptable. (Cronbach's alpha was 0.78). After the confirmation of both validity and reliability, 120 questionnaires were given to the main participants. Questionnaires in which more than half of the questions were remained blank, were excluded. For each correct answer score 3, for each wrong answer zero and for the lack of knowledge (I do not know) score 1 were considered and then total knowledge scores were calculated. If the percentage of correct answers was below 25%, it was considered as totally undesirable, 25-49% as undesirable, 50-75% as desirable and 75-100% was considered as totally desirable. Appropriate

answers were selected on the basis of American Heart Association (AHA) and American Dental Association (ADA) protocols which were mentioned in two dentistry text books: Carranza's clinical periodontology (2015) and Burket's oral medicine (2015).

Obtained data were analyzed using T- Test and one-way Anova.

### Result

A whole number of 60 dental students and 60 dentists participated in this study and the average age of students and dentists were  $24.53 \pm 0/67$  and  $40.14 \pm 5.49$ , respectively. Students were included 22 females and 38 males and dentists included 41 females and 19 males. Using t- test, There was no relationship between the total score of knowledge and age, neither in the group of students (p-value: 0.38) nor among the dentists (P-value = 0.183) and also there was no relationship between the total score of knowledge and gender in dentists' (P-value = 0.235) and students' groups (p-value: 0.814). The mean score of total knowledge in senior students was  $55.48 \pm 7.94$  and in dentists was  $53.06 \pm 11.10$ . There was no significant difference between the mean total knowledge scores of two groups (p-value: 0.173).

All of the students (100%) obtained their knowledge from their academic undergraduate courses. Among general dentists, 56.7% of participants reported the history of taking part in re-training programs related to antibiotic prophylaxis and they introduced academic dentistry text books (68.3%) as their first source and the re-training programs (16.7%) as the second source of knowledge about this subject. Other less important sources were their clinical experience over time (6.7%), Internet data bases (5%) and colleagues (3.3%), respectively. According to ANOVAs and t-tests, Knowledge score of dentists had no significant relationship with their work experience (p-value = 0.225) and the year of graduation from dental faculty. (P-value = 0.24).

In Table 1, the frequency of participants' answers to this main question: "Which systemic problems require prophylaxis?" is mentioned. "Which dental procedures require prophylaxis?" is stated in Table 2. The systemic problems require prophylaxis and the dental procedures before which prophylaxis is needed (true answers) are distinguished by a star mark in tables. The containing of Table 3 is the explanation of the frequency of participants' answers to these questions: "What are the proper oral or venous antibiotic regimens for prophylaxis in adults and children?"

**Table1.** The frequency of participants' answers to this question:  
Which systemic problems require prophylaxis?

<b>Awareness of the systemic problems requiring prophylaxis</b>	<b>Group</b>	<b>True</b>	<b>False</b>	<b>Don't know</b>
*1. Congenital disease( Tetralogy of Fallout)	Dentist	40%(24)	31.7%(19)	28.3%(17)
	Student	66.7% (40)	31.7%(19)	1.7%(1)
2. Rheumatic heart disease	Dentist	23.3%(14)	75%(45)	1.7%(1)
	Student	21.7%(13)	78.3%(47)	-----
3. Patients with MI history during less than 6 months ago	Dentist	31.7%(19)	65%(39)	3.3%(2)
	Student	21.7%(13)	75%(45)	3.3%(2)
* 4. Patients with the history of arthroplasty during last year	Dentist	66.7%(40)	25%(15)	8.3%(5)
	Student	66.7%(40)	25%(15)	8.3%(5)
* 5. Heart transplant	Dentist	73.3%(44)	23.3%(14)	3.3%(2)
	Student	80%(48)	16.7%(10)	3.3%(2)
6. With a history of coronary artery bypass	Dentist	48.3%(29)	46.7%(28)	5%(3)
	Student	56.7%(34)	31.7%(19)	11.7%(7)
7. Mitral valve disease with or without regurgitation	Dentist	41.7%(25)	50%(30)	8.3%(5)
	Student	56.7%(34)	31.7%(19)	11.7%(7)
* 8. Uncontrolled diabetes	Dentist	61.7%(37)	26.7%(16)	11.6%(7)
	Student	80%(48)	18.3%(11)	1.7%(1)
9. Permanent pacemakers	Dentist	58.3%(35)	33.3%(20)	8.3%(5)
	Student	60%(36)	36.7%(22)	3.3%(2)
*10. Lupus patients with a history of joint replacement at any time	Dentist	53.3%(32)	35%(21)	11.7%(7)
	Student	65%(39)	23.3%(14)	11.7%(7)
*11. Hemodialysis	Dentist	46.7%(28)	48.3%(29)	5%(3)
	Student	46.7%(25)	50%(30)	3.3%(2)
*12. Patients with prosthetic heart valves	Dentist	98.3%(59)	1.7%(1)	-----
	Student	93.3%(56)	6.7%(4)	-----

**Table 2.** The frequency of participants' answers to this question:  
Which dental procedures require prophylaxis?

Dental procedures requiring prophylaxis	Group	True	False	Don't know
*1. Scaling & root planning	Dentist	58.3%(35)	25%(15)	16.7%(10)
	Student	55%	45%	-
*2. Gingival probing	Dentist	48.3%(29)	46.7%(28)	5%(3)
	Student	38.3%(23)	58.3%(35)	3.3%(2)
3. PDL injection	Dentist	51.7%(31)	45%(27)	3.3%(2)
	Student	35%(21)	60%(36)	5%(3)
*4. Periodontal surgery	Dentist	68.3%(41)	31.7%(19)	-
	Student	96.7%(58)	3.3%(2)	-
5. Block injection	Dentist	65%(39)	31.7%(19)	3.3%(2)
	Student	43.3%(26)	55%(33)	1.7%(1)
6. Root canal therapy	Dentist	56.7%(34)	43.3%(26)	-
	Student	30%(18)	68.3%(41)	1.7%(1)
*7. Extraction	Dentist	71.7%(43)	28.3%(17)	-
	Student	86.7%(52)	11.7%(7)	1.7%(1)
*8. Implant placement	Dentist	75%(45)	20%(12)	5%(3)
	Student	91.7%(55)	6.7%(4)	1.7%(1)
9. Removing sutures	Dentist	73.3%(44)	25%(15)	1.7%(1)
	Student	88.3%(53)	11.7%(7)	-
10. Restorative Dentistry	Dentist	75%(45)	23%(14)	1.7%(1)
	Student	90%(54)	10%(6)	-
*11. Insert wedges between the teeth	Dentist	36.7%(22)	63.3%(38)	-
	Student	35%(21)	58.3%(35)	6.7%(4)
*12. Gingival plaque removal	Dentist	41.7%(25)	58.3%(35)	-
	Student	23.3%(14)	71.7%(43)	5%(3)

**Table 3.** The frequency of participants' answers to these questions: What are the proper oral or venous antibiotic regimens for prophylaxis in adults and children?

Antibiotic regimen for prophylaxis	Group	True	False	Don't know
1. Standard oral prophylactic regimen in adults	Dentist	53.3%(32)	46.7%(28)	-----
	Student	68.3%(41)	25%(15)	6.7%(4)
2. Standard oral prophylactic regimen in children	Dentist	55%(33)	23.3%(14)	21.7%(13)
	Student	66.7%(40)	15%(9)	18.3%(11)
3. If allergic to penicillin, first choice for oral antibiotic prophylaxis regimen in adults	Dentist	76.7%(46)	16.7%(10)	6.7%(4)
	Student	80%(48)	10%(6)	10%(6)
4. Regimen of injectable antibiotic prophylaxis in adults	Dentist	59.4%(35)	28.3%(17)	13.3%(8)
	Student	53.3%(32)	28.3%(17)	18.3%(11)
5. If allergic to penicillin, first choice for injectable antibiotic prophylaxis in adults	Dentist	55%(33)	33.3%(20)	11.7%(7)
	Student	70%(42)	20%(12)	10%(6)
6. If you forgot to prescribe antibiotics before a dental procedure, how long after the treatment, the use of antibiotics would be effective?	Dentist	25%(15)	48.3%(29)	26.7%(16)
	Student	21.75%(13)	45%(27)	33.3%(20)

## Discussion

Previous studies have mainly investigated the level of knowledge of dentists about prescription of antibiotic prophylaxis in infective endocarditis cases. However, this study has investigated the level of knowledge of participants about all clinical conditions requiring prophylaxis.

In this study, the target group consists of dentists and senior dental students and this is consistent with the target group in the study of Ahmadi-Motamayel et al. (3) about knowledge of endocarditis, conducted in the city of Hamadan. In contrast, Al-Hammad et al. (7) has merely investigated the level of knowledge and performance of general dental practitioners in Riyadh.

In the study of Al-fawzan et al. (8), the knowledge of dental and medical students were compared and the knowledge levels of both groups were moderate. In the study of Ghaderi et al. (9) the level of awareness of general dentists regarding the prophylaxis for prevention of infective endocarditis was reported as moderate. In the study of Ahmadi-Motamayel et al. (3), the knowledge of general dentists about dental drugs and antibiotic prophylaxis was reported as moderate, while it was at a desirable level for students and the difference was statistically significant. However, in the present study, knowledge scores were desirable in both groups of senior dental students and dentists. Apart from probability of having different levels of awareness, this inconsistency in the studies' results may be attributed to the different design of the questionnaires, different scoring methods, considering the item of "I do not know" or the selection of various target groups as participants.

In both groups, there was no significant relationship between their knowledge scores and their gender which is consistent with the study of Zarei et al. (2) conducted in (2). In the study of Al-Hammad et al. (7), knowledge and gender had no significant relationship, too; while in the study of Ghaderi et al. (9) and in the study of Ahmadi-Motamayel et al. (3), the level of knowledge of male dentists was significantly higher than females. In contrast, in the study of Chitsazi et al. (10) the level of knowledge of female dentists was significantly higher than males.

In the present study, there was no significant relationship between the knowledge scores and the age of both groups which may be due to the low dispersion of participants' ages. In the study of Zarei et al. (2) and study of Ahmadi-Motamayel et al. (3), knowledge also had no significant relationship with participants' age.

In this study, there was no significant relationship between the level of knowledge and dentists' work experience which was consistent to Al-Huwayrini et al. study (11). It showed that the acquired work experience over time, cannot improve the theoretical knowledge

about the proper regimen of antibiotics or the indications of antibiotic prophylaxis in patients and the information should be refreshed by personal postgraduate studies or by participating in re-training programs.

As previously mentioned, in this study, level of knowledge of participants was investigated in three areas of systemic problems, dental procedures requiring antibiotic prophylaxis and the quality of prescription of prophylaxis regimen. In both groups, the mean scores of knowledge about the proper way of prescription of prophylaxis regimen were less than the other two items.

Most dentists participating in this study reported their textbooks as the main source of their knowledge which is consistent with the results of the study conducted by Ahmadi-Motamayel et al. (3). About fifty seven percent of dentists mentioned their participation in re-training courses and this issue may be one of the causes of desirable level of knowledge of dentists in the present study. In some previous studies (7, 9) participants were not asked about their sources of knowledge or the history of taking part in re-training programs and this can be cited as one of the strength points of this study.

The mean scores of dental students were more than dentists; however, this difference was not statistically significant. In the study of Al-fawzan et al. (8), the knowledge score of medical students was higher than dentists. However, this difference was not statistically significant, too. In the study of Roozbehani et al. (12), senior dental students and newly graduated dentists had more knowledge on principles of antibiotic prophylaxis in children with heart diseases, compared with their more experienced colleagues. This is probably due to their presence in the academic environment, easier access to scientific resources and using updated information.

Among students participating in the study, the least knowledge score was 21% and it was obtained for this question: "When we forget to use prophylaxis for a patient on time, how much time will we have to use antibiotics effectively?" where only 13 out of 60 students chose the correct answer that is 2 hours. Among dentists, the least knowledge score was 23% and it was obtained for this question: "Does a history of rheumatic heart disease necessitate prophylaxis?" and only 14 out of 60 dentists chose the correct answer which is no. In the study of Ahmadi-Motamayel et al. (3), the least knowledge score for dentists was 7% and it was obtained for this question: "If we forget to prescribe antibiotics before dental procedures, how much time will we have to prescribe antibiotics?" (In Sadr et al. (13) study, the question which was mostly answered wrongly by the dentists (the only group of participants in that study) was prescription of 2 g cephalexin one hour before dental practices in cases with previous allergic reaction towards penicillin.

Regarding dental procedures which needed prophylaxis (Table 2), most dentists (75%) knew that implant surgery needs prophylaxis, followed by tooth extraction (71.7%). However, 63.3% of this group thought wrongly that prophylaxis is not needed for interdental wedge placement. Most of the students knew that periodontal surgery (96.7%) and implant placement surgery (91.7%) need prophylaxis but more than two third of them (71.7%) didn't know that subgingival scaling require prophylaxis. In Ryalat. study (14), most of the dentists (87.4%) thought that surgical tooth extractions need Prophylaxis, followed by periodontal surgery (88.2%) and implant surgery (84.3%) (14). It is better to be mentioned that in our study, tooth extraction was not divided into surgical and simple but in Ryalat study (14) this division was considered.

In the study of awareness of the most commonly systemic conditions requiring prophylaxis, both dentists (98.3%) and students (93.3%) chose prosthetic heart valves, which was consistent with the results of Ryalat and Hashemipour (14, 15) but in Al Fawzan study (8) only 32% of dental students were able to recognize that Prosthetic heart valves are accompanied with high risk of endocarditis and need prophylaxis. Interestingly, about half of the dentists in this study thought wrongly that prophylaxis is still recommended for some low-risk heart diseases such as mitral valve disease with or without regurgitation or having a history of coronary artery bypass. It may be due to the lack of updated information about new protocols of prophylaxis.

In assessment of awareness about proper antibiotic regimens for prophylaxis, more than half of the participants of both groups selected penicillin family as their first choice which was at lower level in comparison with studies of Hashemipour et al.(15) (65.8%) and Zarei et al.(2) (80%). Seventy-six percent of dentists said they would select the proper alternative antibiotics (clindamycin or azithromycin) when patients were allergic to penicillin, while this result was 80% in students which was not significantly different. This could be due to frequent mentioning of this subject in different dentistry textbooks over and over during academic education. In the study of Hashemipour et al. (15), Students' knowledge about this subject was more than two-folds in comparison with the knowledge of dentists. In the study of Zarei et al. (2), only 30% of participants were aware of proper alternative antibiotics in allergic cases (2).

Among students participating in the present study, the highest knowledge score was 96.7% and it was obtained for this question: "Does periodontal surgery require antibiotic prophylaxis?" and 58 out of 60 students chose the correct answer. Among dentists, the highest knowledge score was 98.3% and it was obtained for this question: "Does a patient with a history of prosthetic

heart valve need antibiotic prophylaxis before dental procedures?" and 59 out of 60 dentists chose the correct answer which is yes.

In the students group, the minimum score (21%) was gained for this question: "If in a patient who requires prophylaxis, you forgot to prescribe antibiotics before a dental procedure, how long after the treatment, the use of antibiotics would be effective? Only 13 out of 60 students selected the correct answer: 2 hours later. In the dentists group, the minimum score of knowledge was 23%, which was related to this question: "Does a patient with a history of heart rheumatism require prophylaxis?" Which only 14 out of 60 dentist had selected No as the correct answer. In the study of Ahmadi- motemayel et al. (3), the minimum score for knowledge in the dentists group was 7% and it was related to this question: "If antibiotic prescription is forgotten, how long can antibiotics be prescribed after dental treatment?" Which was consistent with our students group.

Despite the desirability of the level of knowledge of senior dental students and dentists in the city of Yazd, due to the importance of antibiotic prophylaxis in specific clinical conditions and in some dental procedures, it is suggested to hold training courses on this subject and to organize effective re-training programs in order to improve the knowledge or to update the information of dentists. Obviously, these scientific data exist systematically on medical information data bases; so, facilities such as easy access to high-speed Internet network can be beneficial for general dental practitioners in health centers.

Considering the importance of this issue, it is suggested to investigate the level of knowledge of dentists and physicians in other health centers of Yazd to address possible shortcomings. Data were collected using questionnaires and some general dentists did not cooperate well in the completion and delivery of questionnaires and this was one of the limitations of this study.

## Conclusion

The levels of knowledge of senior dental students and general dentists about the proper way of prescription of prophylactic antibiotics regimens for special systemic conditions and dental procedures were desirable and this might be due to the participation of dentists in relevant re-training courses and allocation of educational resources to this area.

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