

Inappropriate use of beta-blockers among medical and dental students at King Saud University, Riyadh

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ABSTRACT

Aim: Self-medication and inappropriate beta-blocker use have been commonly reported among students. This study aimed to determine the prevalence of inappropriate self-prescription of beta-blockers among medical and dental students. **Methods:** We conducted a cross-sectional study using a validated self-administered questionnaire distributed via online Google document to all undergraduate medical and dental students, including interns, of King Saud University, Riyadh, Saudi Arabia. **Results:** Out of 1,240 emails sent, 885 students (627 [70.8%] medical students and 258 [59.2%] dental students) responded to the survey (response rate, 71.4%). Beta-blockers were used by 198 students (22.4%) during their college years, of which 147 (16.6%) used it ≤ 5 times. The most common reason of using beta-blockers was to relieve stress and anxiety. The most common sources of information for use were their colleagues/fellow students. Self-prescribed beta-blockers were used by 123 students (13.9%). The usual dose consumed was 20 mg in 84 students (9.5%), while 15 (1.7%) experienced side effects. Although male students used beta-blockers more than females, females used beta-blockers at significantly higher doses (>20 mg). Medical students consumed more beta-blockers than dental students did (33.7% versus 0%, $P = 0.001$). Students in their senior years continued self-prescription and beta-blocker use longer than their juniors. Continued use was associated with their current academic level, who prescribed the drug, their usual dose, and awareness of complications. **Conclusion:** Two in ten students inappropriately used beta-blockers to relieve their anxiety and stress during examinations, and most of them were self-prescribed.

Keywords: Beta-blockers, inappropriate use, medical dental students, prevalence, self-prescription

Introduction

Beta-blockers are often used to treat patients with heart failure, hyperthyroidism, and have anxiety-relieving effect but can be life-threatening when taken in overdose.^[1-6]

The practice of self-medication is common not only among medical and allied health students but among many other

individuals.^[7-9] Medical and allied health students self-medicate because they have a better drug knowledge, and they have the access of procuring the drug from colleagues and friends.^[10-14] Among medical and dental students, academic stress is the most common reason for taking drugs inappropriately brought about by abnormal sleeping patterns and their desire to cope up with reviewing their lectures in preparation for examinations.^[15] Stress affects students' behavior, academic performance, and their attitudes toward patient care later, with increasing stress levels as the years of study progressed, with the highest in their third and final years, and students take anxiety-relieving drugs to cope up with stress.^[14,21] One of the most common drugs that

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is being inappropriately used by medical and dental students are beta-blockers.^[22-25] Anxious students using beta-blockers before exams reported significant improvements in examination performance.^[23] Although there were reports of untoward effects with self-medication and inappropriate use of these drugs including hypotension and the increased risk for psychiatric morbidity.^[22,24]

This study aimed to determine the prevalence of inappropriate beta-blocker use among medical and dental students at King Saud University, Riyadh, Saudi Arabia, and determine and correlate the inappropriate use with demographic characteristics with respect to outcomes regarding anxiety and stress relief.

Materials and Methods

We conducted a cross-sectional study using a validated self-administered questionnaire among medical and dental students enrolled at the King Saud University in Riyadh, Saudi Arabia 08 November 2018. The questionnaire was developed by the investigators, and several reviews of the possible questions to be included in the survey were conducted by the research team. A pilot study was conducted among ten medical and dental students to assess the understandability, reliability, and clarity of the questionnaire. A repeat survey of the same pilot respondents was conducted a week later and Cronbach's alpha was calculated at 0.89. The final questionnaire consisted of questions about the respondents' demographic profile (without identifiers such as name, student number, contact details, and address), and 18 multiple choice questions regarding the use of beta-blockers.

Questionnaires were distributed to all second to fifth-year medical and dental students, including interns, using Google document emailed to the students. Students were given two weeks to complete the online survey and were reminded after one week through follow-up emails. Non-responders were identified through a rundown of collected responses and were reminded again after two weeks via email to maximize participation in the survey. Participation was voluntary. Sample size was calculated based on two-sided significance level (1-alpha) at 95% and power of study (1-beta, %chance of detecting) of 80. The calculated sample size was 348. The study was approved by the Institutional Review Board of the College of Medicine, King Saud University (IRB- 18-3404).

Data collected were analyzed using the Statistical Package for Social Sciences version 23.0 (SPSS Inc., IBM, Armonk, New York, USA). All categorical variables including sex and academic year were presented as numbers and percentages. Chi-square test was performed to determine the significant relationship between categorical variables, and an independent t-test was performed for continuous variables. Regression analysis was conducted to determine the significant factors associated with the continuous use of beta-blockers among students. A P value ≤ 0.05 was considered statistically significant.

Results

Out of the 1,240 emails sent, 885 students responded to the survey (response rate 71.4%). There were 471 (53.2%) males and 414 (46.8%) females. Moreover, 627 (70.8%) students were from the College of Medicine and 258 (29.2%) were from the College of Dentistry. There were 264 (29.8%) students from the pre-clinical years (first year to third year), and 621 (70.2%) from the clinical years (fourth year to internship).

The use of beta-blockers of any type was reported by 198 students (22.4%) at any time during their college years, while 93 (10.5%) were currently using beta-blockers. Of the 198 students who have used or still use beta-blockers, 147 (16.6%) had used it five times or less, 33 (3.7%) had used it more than ten times, and 18 (2.0%) used it at least five times but not more than ten times [Table 1].

The most common sources of information to use beta-blockers were their colleagues or fellow students ($n = 90$, 10.2%) and doctors or nurses ($n = 51$, 5.8%). Self-prescribed beta-blockers were used by 123 students (13.9%), 42 (4.7%) were prescribed by their doctors, and 33 (3.7%) were prescribed by their colleague. The usual dose consumed was 20 mg in 84 students (9.5%), and 18 students (2.0%) noticed that their dose increased over time. There were 174 students (19.7%) who claimed that they found consuming beta-blockers effective in reducing anxiety, and 168 students (19.0%) would recommend using beta-blockers to their fellow students. There were 342 students (38.6%) who believed that there were side effects with the inappropriate use of beta-blockers, whereas 591 (66.8%) believed that consuming beta-blockers without medical supervision could result in complications. Fifteen students (1.7%) had experienced side effects after using beta-blockers, the most common of which was hypotension ($n = 9$, 1.0%), shortness of breath, and fainting [Table 2].

Sub-analysis of the factors among the 198 students who inappropriately used beta-blockers showed that male students used beta-blockers more as compared to females by almost 10% (100% versus 90.4%, $P = 0.038$). However, female students used significantly higher doses of beta-blockers (>20 mg) as compared to males (66.6% versus 45.8%, $P = 0.031$). Female students were significantly more aware of the possible side effects and complications as compared to male students (71.4% versus 45.8%, $P < 0.001$).

Medical students consumed more beta-blockers (at least > 5 times) as compared to dental students (33.7% versus 0%, $P = 0.001$) and used beta-blockers more often than dental students before or during OSCE (60.0% versus 29.7%, $P < 0.001$), with a statistically significant difference in both cases. Doctors and nurses as well as friends were the most common sources of information for medical students (52.5%, $P < 0.001$), whereas the Internet was the most common source among dental students (51.4%, $P < 0.001$). Awareness regarding possible complications with beta-blockers was significantly more

Table 1: Inappropriate use of beta-blockers by medical and dental students

	n	Percentage
Used beta-blockers (any type) at any time during college years	198	22.4
Still using beta-blockers	93	10.5
Number of times have used beta-blockers		
5 times or less	147	16.6
6 to 10 times	18	2.0
More than 10 times	33	3.7
Situations when they use beta blockers the most		
Before an objective structured clinical examination	108	12.2
Before an oral or poster presentation	51	5.8
During final examination	18	2.0
Others	21	2.4
Reasons for using beta-blockers		
Medical reasons	6	0.7
Peer pressure	18	2.0
Relieve anxiety	171	19.3
Others	3	0.3

Table 2: Sources of information, prescription, doses, effectiveness, and other parameters with respect to the inappropriate use of beta-blockers among medical and dental students

Variables	n	Percentage
Sources of information		
Colleagues (fellow students)	90	10.2
Doctors and nurses	51	5.8
Friends	21	2.4
Internet	30	3.4
Others	6	0.7
Who prescribed the drug for them		
Their colleague	33	3.7
Their doctor	42	4.7
Themselves	123	13.9
Usual dose of beta-blockers used		
Less than 20 mg	78	8.8
20 mg	84	9.5
40 mg	15	1.7
Depends on the activity	21	2.4
Needed to increase the dose over time	18	2.0
Effective in reducing anxiety	174	19.7
Will recommend beta-blockers to their colleagues	168	19.0
Believes that there are possible side effects on use of beta-blockers	342	38.6
Aware of possible complications from taking beta-blockers	591	66.8
Experienced side effects during or after use of beta-blockers	15	1.7
Hypotension	9	1.0
Shortness of breath	5	0.7
Fainting	1	0.1

prevalent among medical students than in dental students (71.9% versus 21.6%, $P < 0.001$).

Students in their clinical years continued to use beta-blockers as compared to students in the pre-clinical and internship years (52.0% versus 0% versus 30.8%, $P = 0.001$). Similarly,

students in the clinical and internship years used beta-blockers for anxiety relief before their OSCEs (87.3% versus 33.3%, $P < 0.001$). Interns practiced significantly more self-prescription as compared to students in the lower academic years (69.2% versus 36.0% versus 0%, $P < 0.001$), and interns showed a tendency to increase their dosage over time ($P = 0.003$).

Regression analysis showed that continued use of beta-blockers among medical and dental students was associated with their current academic level ($B = 3.498$, $SE = 0.827$, $P < 0.001$), who prescribed the drug ($B = 2.934$, $SE = 0.774$, $P < 0.001$), their usual dose of beta-blockers ($B = -2.645$, $SE = 1.176$, $P = 0.025$), awareness of complications after use ($B = -1.864$, $SE = 0.748$, $P = 0.013$).

Discussion

We found a prevalence of 22.4% in beta-blocker usage, and 13.9% were self-prescribed. This rate is relatively lower (by 7.6%) than that previously reported by Al-Mohrej *et al.* in 2016.^[25] Furthermore, we found out that the use of beta-blockers was significantly higher among male students, by approximately 9.6%, probably because male students experienced more peer pressure and anxiety as compared to females. There are more male students enrolled in our college as compared to females, which could have some effect on their anxiety and stress due to academic competition.

We also found a direct relationship between use of beta-blockers and the academic year levels. Junior students used beta-blockers significantly lesser as compared to their senior counterparts. This confirms the findings of Al-Mohrej *et al.* and Montgomery *et al.* in 2011.^[25,26] The use of beta-blockers on multiple occasions (>five times) among students prior or during examinations was alarmingly high at 74%. Almost 40% of students experienced moderate to severe stress during these examinations based on a previous study; hence, they resorted to consumption of these drugs to relieve the stress.^[27,28] Much more alarming is the fact that one in three of the students consumed beta-blockers as recommended by their peers and 60% of the consumption was not prescribed. This corroborates with studies showing that self-medication practices are prevalent among medical students from other institutions and in other countries like India.^[29-31] Fortunately, 55.6% of our respondents stopped the use of beta-blockers probably due to their knowledge and fear of the side effects of these drugs.^[30]

Surprisingly, 62.1% of our respondents were aware of the side effects of beta-blockers, but continued consumption of the drug, and most of these students were in their clinical years. Whether these students knowingly ignored the potential dangers of self-medication of beta-blockers or they were just overwhelmingly obscured by their stress and anxiety and their need to perform better during the examinations is unclear. OSCE and other examinations are significantly more strenuous and exasperating with little amount of time to prepare during clinical years.

One of the most important implications of this study is the practice of self-medication and the students' potential to acquire the drug without prescription. Most of our participants were able to obtain these drugs from friends and peers because they were more likely to have friends working in the hospital or pharmacies who could provide them with these drugs. Furthermore, there was a tendency for students to continue self-medication of these drugs since most of them did not experience untoward side effects, probably because they did not have any inherent medical conditions that predisposes them to complications. However, some students experienced untoward effects such as hypotension and fainting. The consequences of inappropriate use and self-medication practice, especially among students, should be monitored because there could be unforeseen concomitant reactions that could occur anytime and anywhere.

The issue of self-medication and much more inappropriate use of drugs among physicians and medical/dental students remains to be significant and needs to be a concern for primary care physicians. This has been embedded within the culture of medical professionals and even medical and dental students since they found it "acceptable" because of their being knowledgeable of the repercussions brought about by the intake of the drug. On the other hand, these behaviors should be addressed by primary care physicians not only because of the possible drug side effects and the long-term complications, but this can also pose risk for occupational hazards both in the practice of medicine and in the medical institution as well.

There were several limitations to this study. It would have been ideal if we could have acquired the students' examination results, particularly the OSCE results, to assess the association between anxiety relief and intake of beta-blockers. Furthermore, the veracity of the students' responses may not reflect their true experience may be out of fear, discomfort regarding the discussion about the issue, or reluctance to disclose their experience. We find this very important because if there is no significant effect of using beta-blockers on their examination scores, then the effect is only to relieve their anxiety and stress. This can form a basis for information dissemination campaigns, particularly among medical and dental students, regarding the inappropriate use of these drugs because they are the ones who can acquire these drugs from their friends and from the pharmacy easily without prescription. Additionally, there is a need to regulate the dispensing and prescribing of beta-blockers when it is not indicated, especially among students, since prolonged use of beta-blockers may result in alteration of the sodium channels, which will increase the QRS intervals and prolong the QT intervals resulting in future cardiovascular morbidity.^[32] Moreover, education and information dissemination campaigns targeting the issue of inappropriate use of any drug without prescription and indication should be implemented.

Key points

- There was a high prevalence of inappropriate use of beta-blockers among medical and dental students (22.4%)
- Of these inappropriate uses of beta-blocker, 13.9% were self-prescribed.
- Male students inappropriately use beta-blockers than female students.
- The inappropriate use of beta-blockers was directly proportional to the academic year level of students.
- The practice of taking this beta-blockers mostly by peer influence and is not even recommended by physicians.
- Despite their awareness, there is the continued consumption of these beta-blockers and some of them experience side effects.
- Students easily were able to obtain these drugs even without prescription and the most common sources are their friends and colleagues.
- There is a need for primary care physicians to break this chain of being an "acceptable" habit because there can be serious repercussions on the inappropriate and unprescribed use of these drugs.

Conclusion

Two in ten medical and dental students inappropriately used beta-blockers to relieve their anxiety and stress during examinations, and most of them self-prescribed these drugs. There were 15 reported incidences of hypotension, shortness of breath, and fainting side effects with the use of beta-blockers in these students. There is a need to regulate the dispensing and prescribing of beta-blockers when not indicated, especially among students.

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Conflicts of interest

There are no conflicts of interest.

References

1. Ge PS, Runyon BA. The changing role of beta-blocker therapy in patients with cirrhosis. *J Hepatol* 2014;60:643-53.
2. Swedberg K, Komajda M, Böhm M, Borer J, Robertson M, Bs C, *et al.* Effects on outcomes of heart rate reduction by ivabradine in patients with congestive heart failure : Is there an influence of beta-blocker dose? *JACC* 2012;59:1938-45.
3. Treating Anxiety Disorders. NIH MedlinePlus the Magazine [Internet]. [cited 2018 Jul 9]. Available from: <https://medlineplus.gov/magazine/issue/fall10/articles/fall10pg15.html>.
4. Beta blockers-Mayo Clinic [Internet]. [cited 2018 Jul 9]. Available from: <https://www.mayoclinic.org/diseases-conditions/high-blood-pressure/in-depth/beta-blockers/ART-20044522>.
5. Marazzi G, Campolongo G, Pelliccia F, Quattrino S, Cacciotti L, Miano M, *et al.* Bisoprolol better than atenolol as ad on therapy to ACE inhibitors in blood pressure control. *J Hypertens* 2018;36:e43.
6. Albertson TE, Dorey AA, Richards JR, Murin S. Beta-blocker overdose: Progressive treatment options. In: *Beta-Blockers:*

- Physiological Pharmacological and Therapeutic Implications. Nova Science Publishers, Inc.; 2018. p. 121-146.
7. Tesfamariam S, Anand IS, Kaleab G, Berhane S, Woldai B, Habte E, *et al.* Self-medication with over the counter drugs, prevalence of risky practice and its associated factors in pharmacy outlets of Asmara, Eritrea. *BMC Public Health* 2019;19:159.
 8. Tuyushimire J, Okoya F, Adebayo AY, Humura F, Lucero-Prisno Iii DE. Assessment of self-medication practices with antibiotics among undergraduate university students in Rwanda. *Pan Afr Med J* 2019;33:307.
 9. Jember E, Feleke A, Debie A, Asrade G. Self-medication practices and associated factors among households at Gandar Town, Northwest Ethiopia: A cross-sectional study. *BMC Res Notes* 2019;12:153.
 10. Lukovic JA, Miletic V, Pekmezovic T, Trajkovic G, Ratkovic N, Aleksic D, *et al.* Self-medication practices and risk factors for self-medication among medical students in Belgrade, Serbia. *PLoS One* 2014;9:e114644.
 11. Pandya RN, Jhaveri KS, Vyas FI, Patel VJ. Prevalence, pattern and perceptions of self-medication in medical students. *Int J Basic Clin Pharmacol* 2013;2:275-80.
 12. Kasulkar AA, Gupta M. Self medication practices among medical students of a private institute. *Indian J Pharm Sci* 2015;77:178-82.
 13. Garbutt JM, Highstein G, Jeffe DB, Dunagan WC, Fraser VJ. Safe medication prescribing: Training and experience of medical students and housestaff at a large teaching hospital. *Acad Med* 2005;80:594-9.
 14. Mehta RK, Sharma S. Knowledge, attitude and practice of self-medication among medical students. *IOSR J Nur Health Sci* 2015;4:89-96.
 15. Waqas A, Khan S, Sharif W, Khalid U, Ali A. Association of academic stress with sleeping difficulties in medical students of a Pakistani medical school: A cross sectional survey. *PeerJ* 2015;3:e840.
 16. Zhang N, Walton DM. Why so stressed? A descriptive thematic analysis of physical therapy students' descriptions of causes of anxiety during objective structured clinical exams. *Physio Canada* 2018;70:356-62.
 17. Iqbal S, Gupta S, Venkatarao E. Stress, anxiety & depression among medical undergraduate students & their socio-demographic correlates. *Indian J Med Res* 2015;141:354-7.
 18. Wahed WAY, Hassan SK. Prevalence and associated factors of stress, anxiety and depression among medical Fayoum University students. *Alexandria J Med* 2017;53:77-84.
 19. Fawzy M, Hamed SA. Prevalence of psychological stress, depression and anxiety among medical students in Egypt. *Psychiatry Res* 2017;255:186-94.
 20. Moutinho ILD, de Castro Pecci Maddalena N, Roland RK, Granero Lucchetti AL, Cerrato Tibiriça SH, da Silva Ezequiel O, *et al.* Depression, stress and anxiety in medical students: A cross-sectional comparison between students from different semesters. *Rev Assoc Med Bras* 2017;63:21-8.
 21. Ediz B, Ozcakir A, Bilgel N. Depression and anxiety among medical students: Examining scores of the beck depression and anxiety inventory and the depression anxiety and stress scale with student characteristics. *Cogent Psychol* 2017;4:1283829.
 22. Butt JH, Dalsgaard S, Torp-Pedersen C, Køber L, Gislason GH, Kruuse C, *et al.* Beta-blockers for exams identify students at high risk of psychiatric morbidity. *J Child Adol Psych* 2017;27:266-73.
 23. Mahabbat N. Attitude and practice towards the use of beta-blockers among medical students, KSA, 2015. From: Diabetes Expo 2015 Conferenceseries Ltd. Available from: <https://diabetesexpo.com/middleeast/abstract/2015/attitude-and-practice-towards-the-use-of-beta-blockers-among-medical-students-ksa-2015>
 24. Drew PJ, Barnes JN, Evans SJ. The effect of acute beta-adrenoceptor blockade on examination performance. *Br J Clin Pharmacol* 1985;19:783-6.
 25. Al-Mohrej OA, Al-Bani WM, AlShaalan NS, Aldahash RA, Alyamani AM, Almodaimegh HS. Prevalence of self-prescribing propranolol among medical and dental students in Riyadh, Saudi Arabia: A Cross-sectional study. *Health Prof Educ* 2018;4:16-26.
 26. Montgomery AJ, Bradley C, Rochfort A, Panagopoulou E. A review of self-medication in physicians and medical students. *Occup Med* 2011;61:490-7.
 27. Rahman AA, Al Hashim BN, Al Hiji NK, Al-Abbad Z. Stress among medical Saudi students at college of medicine, King Faisal University. *J Prev Med Hyg* 2013;54:195-9.
 28. Raheel H, Naeem N. Assessing the objective structured clinical examination: Saudi family medicine undergraduate medical students' perceptions of the tool. *J Pak Med Assoc* 2013;63:1281-4.
 29. Ibrahim NK, Alamoudi BM, Baamer WO, Al-Raddadi RM. Self-medication with analgesics among medical students and interns in King Abdulaziz University, Jeddah, Saudi Arabia. *Pak J Med Sci* 2015;31:14-8.
 30. Kumar N, Kanchan T, Unnikrishnan B, Rekha T, Mithra P, Kulkarni V, *et al.* Perceptions and practices of self-medication among medical students in coastal South India. *PLoS One* 2013;8:e72247.
 31. AlShaalan NS, Alyamani AM, Al-Mohrej OA, Aldahash RA, Almodaimegh HS, Al-Bani WM. Prevalence of self-prescribing propranolol among medical and dental students in Riyadh, Saudi Arabia: A Cross-sectional Study. *Heal Prof Educ* 2016;4:16-26.
 32. Love JN, Love J, Howell JM, Litovitz TL, Klein-Schwartz W. Acute beta blocker overdose: Factors associated with the development of cardiovascular morbidity. *J Toxicol: Clin Toxicol* 2000;38:275-81.