

AWARENESS AMONG DENTAL STUDENTS ABOUT SUBLINGUAL ROUTE OF ADMINISTRATION

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Abstract: The aim of this study is to determine the understanding regarding sublingual route of administration among dental students. The purpose of this study is to create awareness and determine the understanding of the sublingual route of administration among dental students. This study was conducted based on a questionnaire which consists of 10 questions through a web-linked application called Survey Monkey. A convenient sample size of 100 consecutive dental students who are currently practicing in Chennai participated in the study. As an overall result, most of the participants are aware of the sublingual route of administration. As a conclusion, awareness on the sublingual route of administration among dental students in Chennai is adequate but certain knowledge has to be brushed up among them for a higher level. Furthermore, they need to be trained on these grounds to help them treat their patients with more consent and awareness.

Keywords: sublingual; route; administration; drug; metabolism

INTRODUCTION

Sublingual routes of administration of drugs are defined as the systemic delivery of drugs through the mucosal membranes lining the floor of the mouth to the systemic circulation.(Bi *et al.*, 1996) This provides immediate onset of pharmacological effects through the sublingual route.(Zhang, Zhang and Streisand, 2002) In case of dysphasia among all age groups or on reduced liquid intake have difficulties in swallowing the solid dosage forms.(Elder *et al.*, 2007) Sublingual administration of the drug means placement of drug such as dosage form under the tongue & drug reaches directly into the systemic circulation.(Khirwadkar and Dashora, 2012)

Sublingual drug delivery is an alternative approach to the central drug delivery. It avoids first pass metabolism in liver and gastric acid hydrolysis of drugs therefore shows an increase in oral bioavailability of drugs.(Birudaraj *et al.*, 2005) The principle hidden behind this route is when a chemical comes in contact with mucous membrane beneath the tongue, it diffuses through it because connective tissue beneath the epithelium contains a profusion of capillaries, the substance then diffuses into them and enters the venous circulation.(Ishikawa *et al.*, 2001)

Drug solutes are rapidly absorbed into the reticulated vein which lies underneath the oral mucosa & transported through the facial veins, internal jugular vein & brachiocephalic vein & then enter in systemic circulation.(Price *et al.*, 1997) The advantages of administering drugs using sublingual routes produce immediate systemic effect by enabling the drug to be absorbed quickly or directly through mucosal lining of the mouth beneath the tongue. It also helps in dose reduction. Moreover, it has a very fast onset of action and it improves bioavailability. This route also has fewer side effects.(Mahesh, Shastri and Sadanandam, 2010) It is effective in diseases like nausea, vomiting, migraine, schizophrenia and it doesn't need water for administering tablets.(Kurosaki *et al.*, 1991)

Sublingual routes of administration ease of drug administration gets increased. Sublingual area is much more permeable than the buccal area.(Sandri *et al.*, 2006) It also bypasses the GI tract and hepatic portal system and avoids hepatic first pass metabolism due

to this bioavailability of drug get increase. Rapid absorption due to high vascularization beneath the tongue.(Richman, Fox and Shangraw, 1965) The pH in the mouth is relatively neutral so the drug will be more stable, this eventually improves patient compliance.(Ghosh *et al.*, 2005) However, it also has disadvantages such as unsuitable for uncooperative or unconscious patients, unsuitable for bitter drugs, poor patient compliance,(Cilurzo *et al.*, 2008) administration of highly ionic drugs is not allowed and holding the dose in mouth is inconvenient,(Lachman, Speiser and Sylwestrowicz, 1963) if any is swallowed that portion must be treated as an oral dose and subjected to first pass metabolism.(De Boer, De Leede and Breimer, 1984)

Therefore, this study was aimed to determine the awareness of dental students regarding sublingual routes of administration of drugs. Here, the knowledge, practice and awareness of dental students were analyzed to educate the inadequate knowledge among them.

MATERIAL AND METHODS

A convenience sample size of 100 consecutive dental students who are currently pursuing in Saveetha Dental College, Chennai participated in the study. A cross-sectional observational online based study was conducted. Questionnaire was constructed on the Survey Monkey website with dichotomous responses and multiple choice questions. The questionnaire consists of 10 questions as shown in Table 1. A link containing these questionnaires was shared with all the participants and required them to answer the questions. All the responses were analysed and recorded.

QUESTIONS
Q1. Is a sublingual route better than an oral route of administration ?
Q2. Time taken by the drug to get into the system ?
Q3. The sublingual route bypasses the first-pass metabolism and hence facilitates rapid absorption of the drug into the systemic circulation.
Q4. What is the name of the drug administered sublingually to treat medical emergencies like angina ?
Q5. Are you aware of sublingual drug dispensing prosthesis ?
Q6. Sublingual drug dispensing prosthesis is useful for patients with?
Q7. How long does the patient need to wear the drug dispensing prosthesis ?
Q8. Bioavailability of which of these routes is better?
Q9. Advantages of sublingual route of administration?
Q10. Disadvantage of sublingual route of administration?

Table 1 shows the question asked in the questionnaire

RESULTS

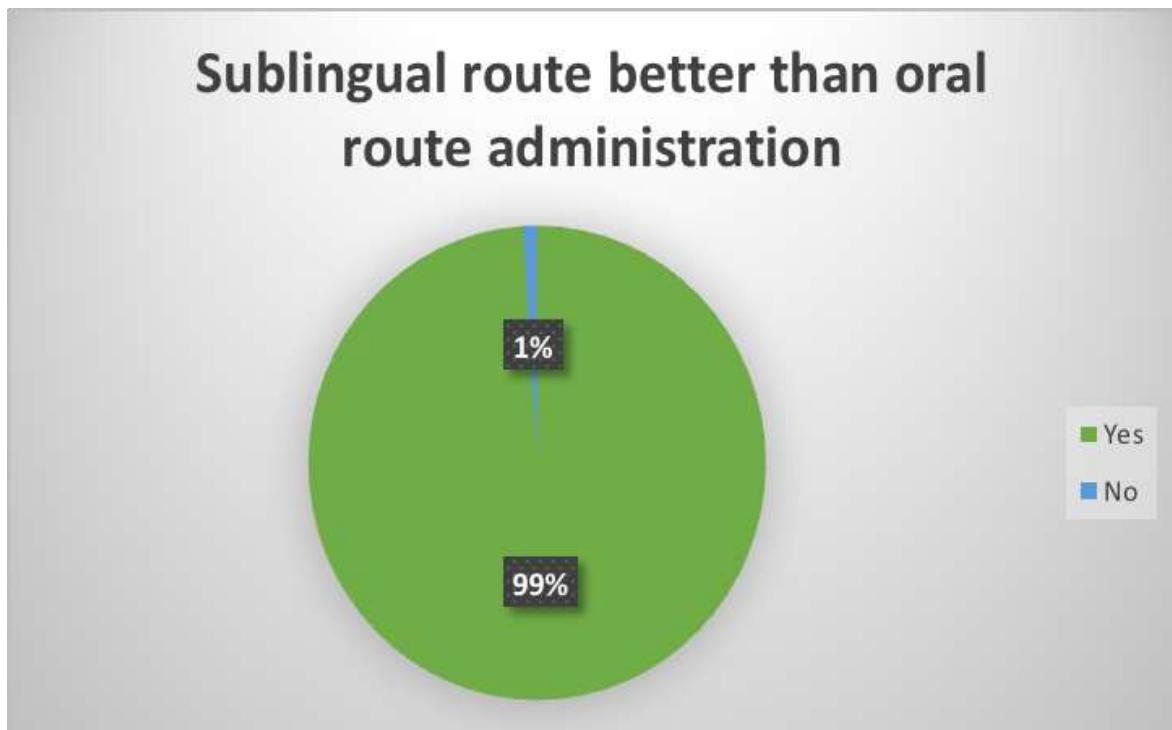


Figure 1 shows the answer answered by participants regarding better route of administration of drugs

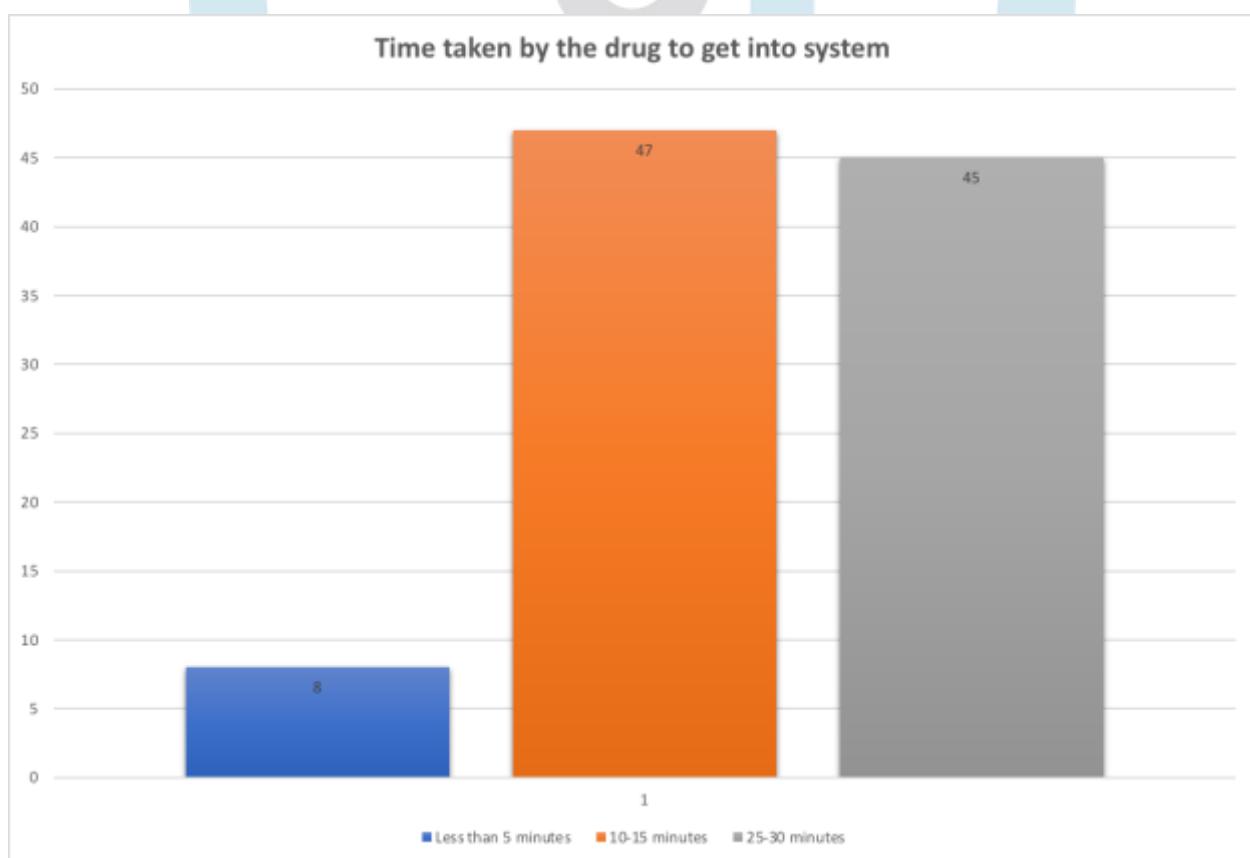


Figure 2 shows the answer answered by participants regarding time taken for the drug to get into system

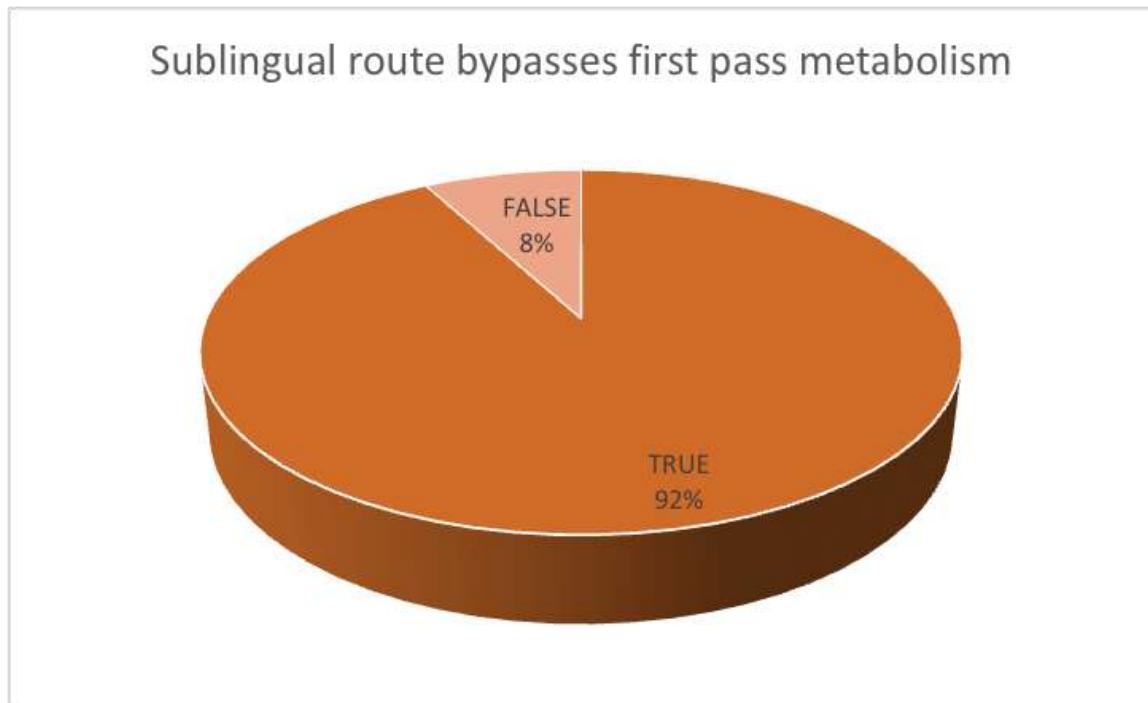


Figure 3 shows the answer answered by participants regarding a statement of sublingual route bypasses first pass metabolism

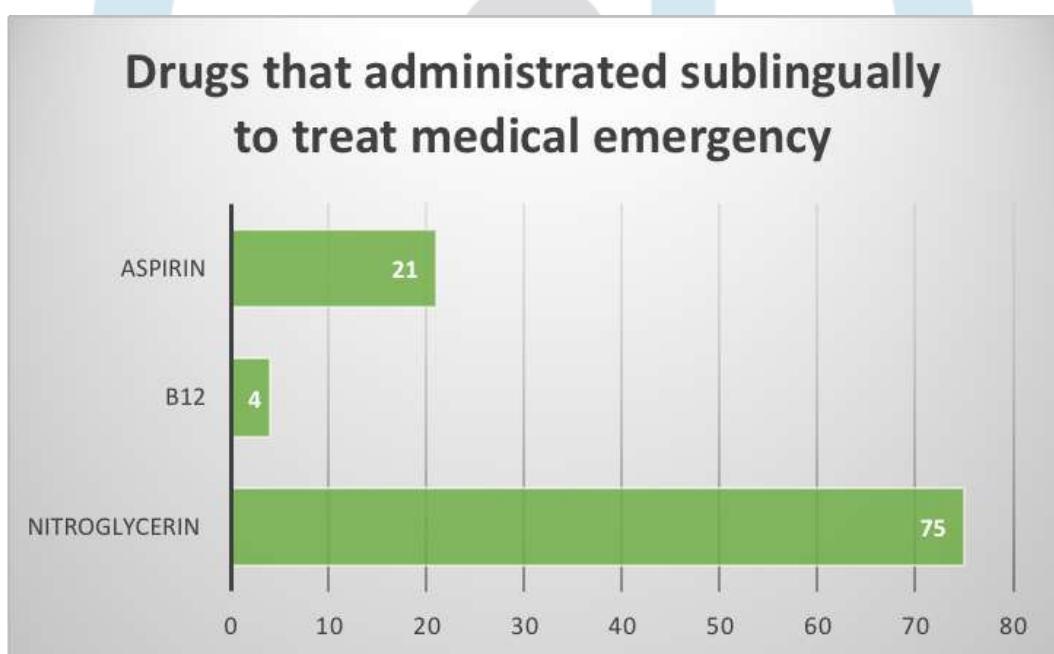


Figure 4 shows the percentage of answers by participants regarding examples of emergency drugs which administered sublingually



AWARE OF SUBLINGUAL DRUG DISPENSING PROSTHESIS

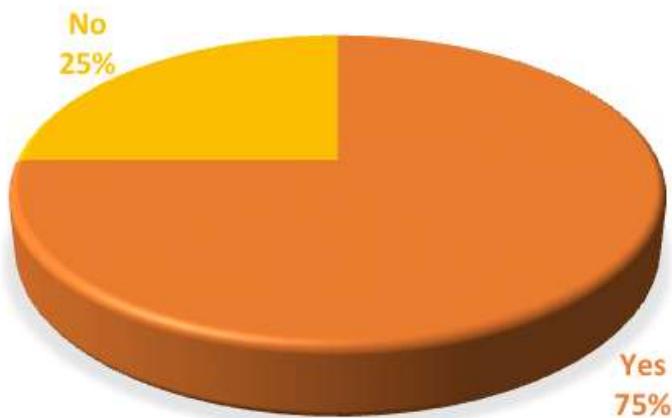


Figure 5 shows the percentage of answers by participants regarding awareness of sublingual drug dispensing prosthesis

Sublingual drug dispensing prosthesis useful for these patients

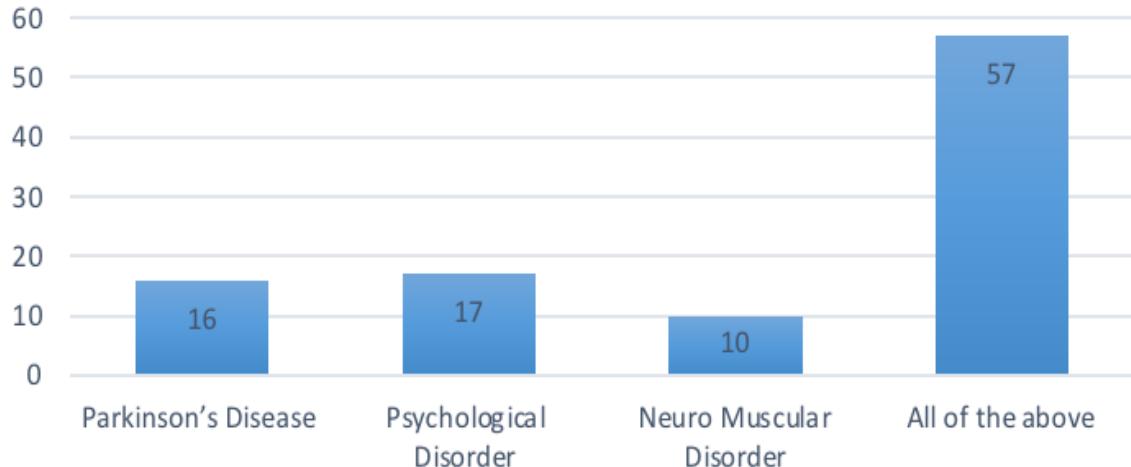


Figure 6 shows the percentage of answers by participants regarding sublingual drug dispensing prosthesis

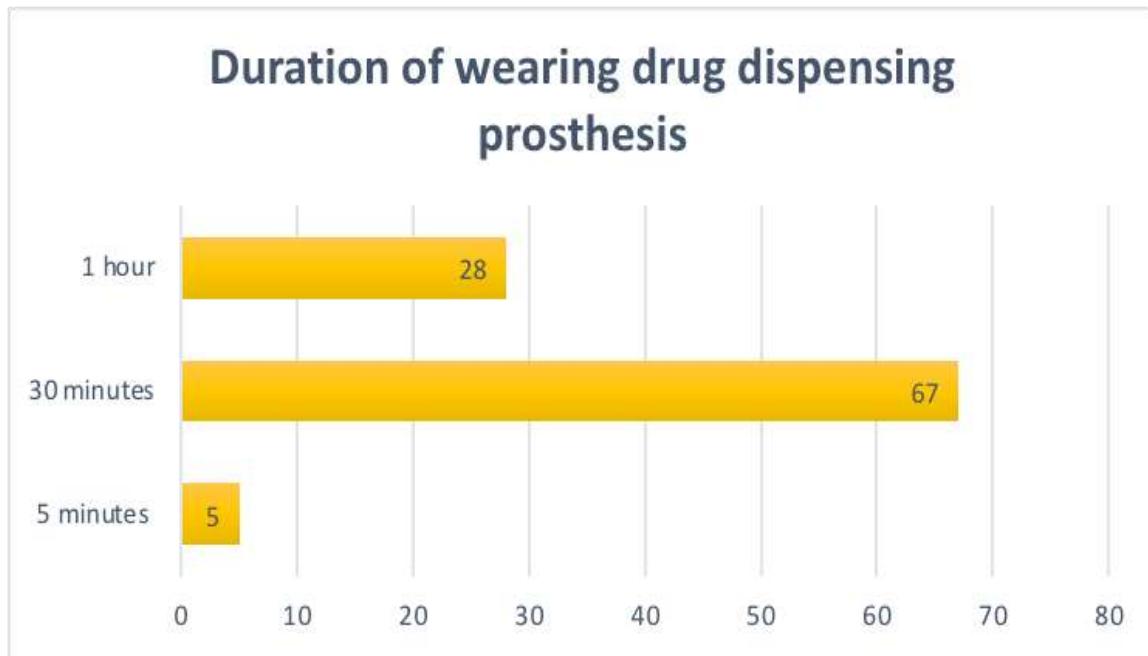


Figure 7 shows the percentage of answers by participants regarding the duration of patient wearing drug dispensing prosthesis

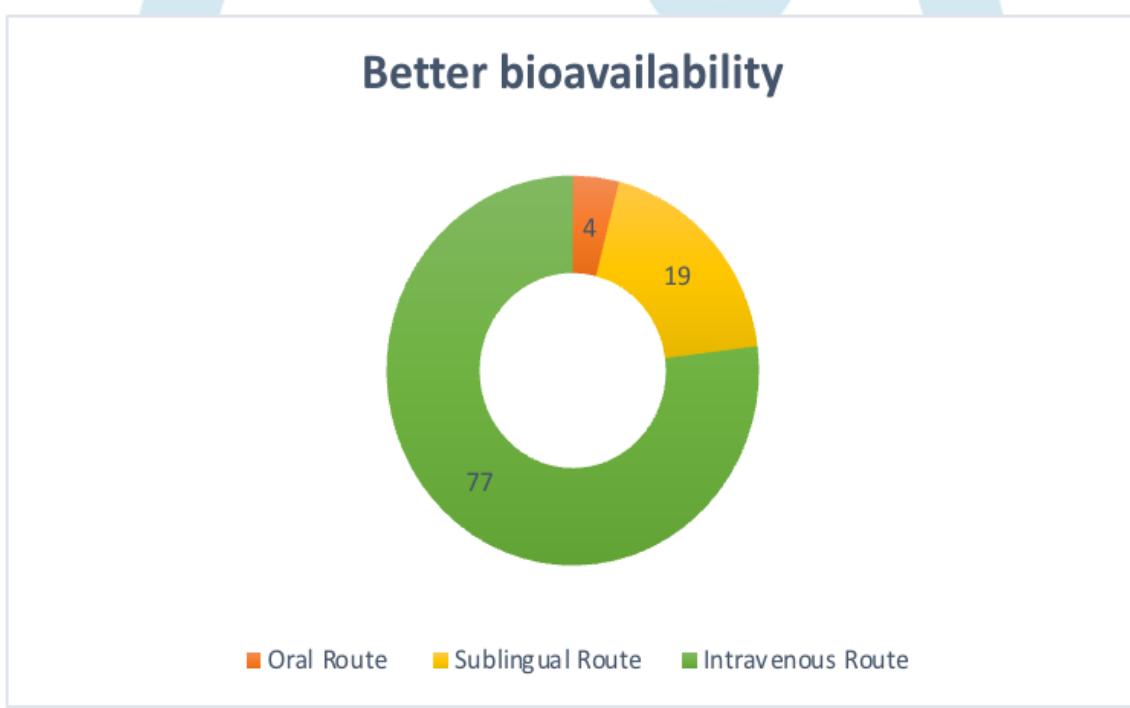


Figure 8 shows the percentage of answers by participants regarding the better bioavailability between these routes

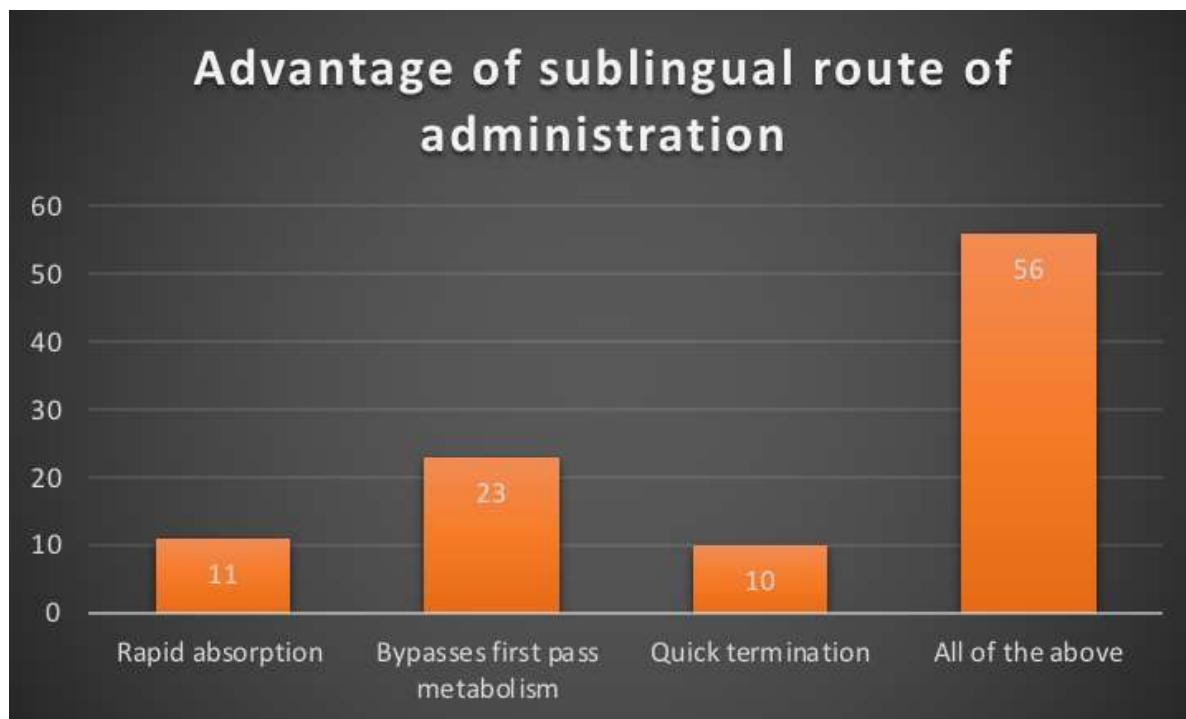


Figure 9 shows the percentage of answers by participants regarding the advantages of sublingual route of administration

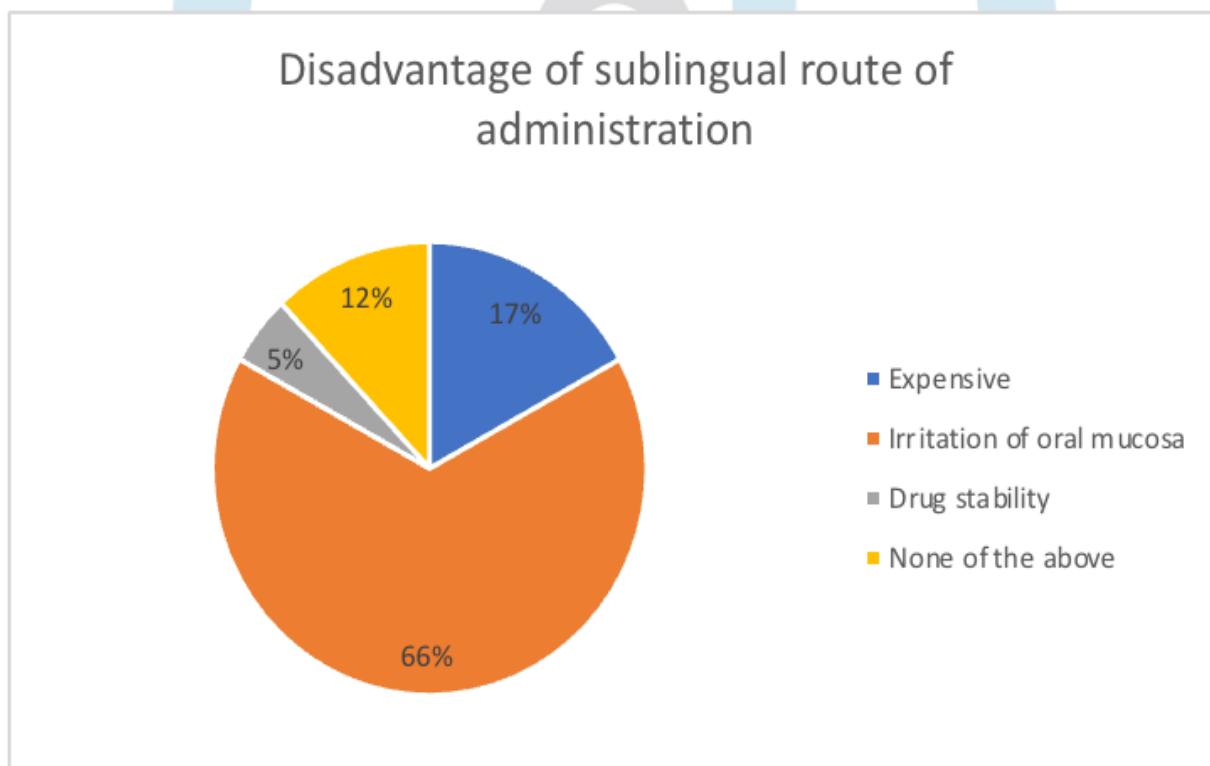


Figure 10 shows the percentage of answers by participants regarding disadvantages of sublingual route of administration

According to Figure 1, 99% of the dental students who participated in this study agreed with the statement stating that sublingual routes are better than oral routes of administration. Whereas, only 1% of them disagreed with the statement. Figure 2 showed that the majority (47%) of the participants displayed that the time taken by a drug to get into the system is 10-15 minutes. However, the remaining 45% and 8% of them chose the option 25-30 minutes and less than 5 minutes, respectively. 92% of the participants agreed that the statement of sublingual route bypasses the first pass metabolism and hence facilitates rapid absorption of the drug into the systemic circulation. Also, the remaining 8% of them disagreed with the statement, as shown in figure 3. Figure 4 showed about 75% of the participants chose nitroglycerin when asked about the name of drug administered sublingually to treat medical emergencies. Remaining 4% and 21% of them chose B12 and Aspirin, respectively.

Figure 5 displayed that 75% of the participants are aware of sublingual drug dispensing prosthesis. However, 25% had no clue about this prosthesis. Figure 6 showed that 16% of the participants chose Parkinson's disease when asked about sublingual drug dispensing

prosthesis is useful in patients. 17% of them choose psychological disorders, 10% of them neuromuscular disorders and finally 57% (majority) of them chose all the options. According to Figure 7, most (67%) of the participants think that a patient needs to wear for 30 minutes. Remaining 28% and 5% of them think 1 hour and 5 minutes, respectively. In Figure 8, it showed most (77%) of the bioavailability of which if these routes is better through intravenous routes. However, 4% and 19% of them chose oral route and sublingual route, respectively.

Advantages of sublingual route of administration was asked in Figure 9, 10% of them chose quick termination, 11% of them chose rapid absorption, 23% of them chose bypasses first pass metabolism and finally majority of the participants chose all of the options. Whereas, when asked about the disadvantages of sublingual route of administration, 5% of them chose the option drug stability, 66%(majority) chose irritation of oral mucosa, 12% of them thinks there is no suitable answer for this question.

DISCUSSION

Every dentist should have the basic knowledge to recognize, access, and manage a potentially life-threatening situation until the patient can be transported to a medical facility. Successful patient management relies on understanding the pathophysiologic processes and how to deal with them. Dealing with medical emergencies is not as difficult as most dentists perceive.(Al-Ghananeem, Malkawi and Crooks, 2006) Prevention of a medical emergency begins as soon as the patient enters your office and fills out the medical questionnaire. An accurate medical history is extremely important for the dentist to identify any predisposing factors that could give rise to an unforeseen event.(Allen, 2003) Emergencies do occur in dental offices: A survey of 4,000 dentists conducted by Khan (Khan, Kingsley and Caroline, 2017) and others revealed an incidence of 7.5 emergencies per dentist over a 10-year period.

Khan's survey found that 28% of emergencies occurred during root canal therapy and 37% during extraction procedures. These statistics suggest that fear, anxiety, pain, or discomfort may predispose some patients to an emergency situation. If the dentist is able to alleviate the patient's concerns and use adequate pain-control techniques, then a major step has been taken in preventing an emergency.(Fu *et al.*, 2004) Preparation for emergencies includes: Training all members of the office staff in recognizing and managing life-threatening situations; developing a team approach with individual responsibilities; conducting simulated emergency events; availability of emergency drugs in the dental office; and, most importantly, the knowledge of those drugs with the mode of administration. The drugs that should be promptly available to the dentist can be divided into two categories.(Dandagi *et al.*, 2009) The 1st category represents those that may be considered essential. The 2nd category contains drugs that are also very helpful and should be considered as part of the emergency kit. The precise composition of the drug kit can vary as the presence of the drugs in this latter group may depend on the nature of the dental practice.(Seager, 1998) This survey evaluated the knowledge of emergency drugs among dental students, and the results clearly show that nearly two-thirds of the responding students did not know most of the drug of choice to handle in an emergency situation like hypotension, epileptic seizures, and anaphylactic shock.

Foods rarely trigger asthma by themselves. Less than 5% of people are affected by food. Food can trigger asthma either as an intolerance reaction or as part of a food allergy. Some of the foods that may cause an allergic reaction include: Peanuts, eggs, shellfish, tree nuts, wheat sesame. The results of this study confirm that undergraduate dental students perceive a need for more intensive education in medical emergencies.(Mizumoto *et al.*, 2005) All in all, dental students were sensitive about their superficial knowledge of medical emergencies in the dental office, and they expect this topic to be an integral part of their education. Institutions offering undergraduate health courses should find the educational formats needed to build the confidence necessary for dental students and professionals to be active in stressful situations that threaten a patient's life.(Freston *et al.*, 2003)

CONCLUSION

Majority of the dental students within the study were aware of the discussed topic above. However, this study was limited to only a few dental institutes around Chennai and only 100 students participated. Further, study should be conducted in a larger scale area and sample size to get a proper overview regarding this topic within the dental students concerning the new advent technologies.

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CONFLICT OF INTEREST

The authors declare that there were no conflict of interest

REFERENCES

- Al-Ghananeem, A. M., Malkawi, A. H. and Crooks, P. A. (2006) 'Effect of pH on sublingual absorption of oxycodone hydrochloride', *AAPS PharmSciTech*, 7(1), pp. E163–E167.
- Allen, L. V. (2003) 'Rapid-dissolve technology: An interview with Loyd V. Allen, Jr., PhD, RPh', *Edmond*, 7(6), pp. 449–450.
- Birudaraj, R. *et al.* (2005) 'Buccal permeation of buspirone: mechanistic studies on transport pathways', *Journal of pharmaceutical sciences*, 94(1), pp. 70–78.

- Bi, Y. et al. (1996) 'Preparation and evaluation of a compressed tablet rapidly disintegrating in the oral cavity', *Chemical & pharmaceutical bulletin*, 44(11), pp. 2121–2127.
- Cilurzo, F. et al. (2008) 'Fast dissolving films made of maltodextrins', *European journal of pharmaceutics and biopharmaceutics: official journal of Arbeitsgemeinschaft fur Pharmazeutische Verfahrenstechnik e.V.*, 70(3), pp. 895–900.
- Dandagi, P. M. et al. (2009) 'pH-sensitive mebeverine microspheres for colon delivery', *Indian Journal of Pharmaceutical Sciences*, p. 464. doi: 10.4103/0250-474x.57303.
- De Boer, A. G., De Leede, L. G. and Breimer, D. D. (1984) 'Drug absorption by sublingual and rectal routes', *British journal of anaesthesia*, 56(1), pp. 69–82.
- Elder, E. J. et al. (2007) 'Preparation, characterization, and scale-up of ketoconazole with enhanced dissolution and bioavailability', *Drug development and industrial pharmacy*, 33(7), pp. 755–765.
- Freston, J. W. et al. (2003) 'Comparative pharmacokinetics and safety of lansoprazole oral capsules and orally disintegrating tablets in healthy subjects', *Alimentary Pharmacology & Therapeutics*, pp. 361–367. doi: 10.1046/j.1365-2036.2003.01455.x.
- Fu, Y. et al. (2004) 'Orally Fast Disintegrating Tablets: Developments, Technologies, Taste-Masking and Clinical Studies', *Critical Reviews in Therapeutic Drug Carrier Systems*, pp. 433–476. doi: 10.1615/critrevtherdrugcarriersyst.v21.i6.10.
- Ghosh, T. K. et al. (2005) 'Quick-Dissolving Oral Dosage Forms: Scientific and Regulatory Considerations from a Clinical Pharmacology and Biopharmaceutics Perspective', *DRUGS AND THE PHARMACEUTICAL SCIENCES*, 145, p. 337.
- Ishikawa, T. et al. (2001) 'Pharmacokinetics of acetaminophen from rapidly disintegrating compressed tablet prepared using microcrystalline cellulose (PH-M-06) and spherical sugar granules', *Chemical & pharmaceutical bulletin*, 49(2), pp. 230–232.
- Khan, A. B., Kingsley, T. and Caroline, P. (2017) 'Sublingual Tablets and the Benefits of the Sublingual Route of Administration', *Journal of Pharmaceutical Research*, 16(3), pp. 257–267.
- Khirwadkar, P. and Dashora, K. (2012) 'A REVIEW: FAST DISSOLVING DRUG DELIVERY SYSTEM: CURRENT DEVELOPMENTS IN NOVEL SYSTEM DESIGN AND TECHNOLOGY', *International Journal of Biomedical and Advance Research*. doi: 10.7439/ijbar.v3i2.316.
- Kurosaki, Y. et al. (1991) 'Regional variation in oral mucosal drug absorption: permeability and degree of keratinization in hamster oral cavity', *Pharmaceutical research*, 8(10), pp. 1297–1301.
- Lachman, L., Speiser, P. P. and Sylwestrowicz, H. D. (1963) 'Compressed Coated Tablets I', *Journal of Pharmaceutical Sciences*, pp. 379–390. doi: 10.1002/jps.2600520415.
- Mahesh, A., Shastri, N. and Sadanandam, M. (2010) 'Development of taste masked fast disintegrating films of levocetirizine dihydrochloride for oral use', *Current drug delivery*, 7(1), pp. 21–27.
- Mizumoto, T. et al. (2005) 'Formulation design of a novel fast-disintegrating tablet', *International journal of pharmaceutics*, 306(1-2), pp. 83–90.
- Price, T. et al. (1997) 'Single-dose pharmacokinetics of sublingual versus oral administration of micronized 17-estradiol', *Obstetrics & Gynecology*, pp. 340–345. doi: 10.1016/s0029-7844(96)00513-3.
- Richman, M. D., Fox, C. D. and Shangraw, R. F. (1965) 'PREPARATION AND STABILITY OF GLYCERYL TRINITRATE SUBLINGUAL TABLETS PREPARED BY DIRECT COMPRESSION', *Journal of pharmaceutical sciences*, 54, pp. 447–451.
- Sandri, G. et al. (2006) 'Differentiating factors between oral fast-dissolving technologies', *American Journal of Drug Delivery*, 4(4), pp. 249–262.
- Seager, H. (1998) 'Drug-delivery products and the Zydus fast-dissolving dosage form', *The Journal of pharmacy and pharmacology*, 50(4), pp. 375–382.
- Zhang, H., Zhang, J. and Streisand, J. B. (2002) 'Oral Mucosal Drug Delivery', *Clinical pharmacokinetics*, 41(9), pp. 661–680.