
Retrospective Study on Amount of Local Anaesthesia Used in Extraction of Mandibular Third Molar Impaction Based on Winters Classification

ASHFAQ AHMED. M¹, PRADEEP D^{2*}, S.P. SARAVANA DINESH³

¹Department of oral and maxillofacial surgery, Saveetha Dental college and Hospital, Saveetha institute of Medical and Technical Sciences, Saveetha university, Chennai 600077, Tamil Nadu, India

²Associate professor, Department of oral and maxillofacial surgery, Saveetha Dental college and Hospital, Saveetha institute of Medical and Technical Sciences, Saveetha university, Chennai 600077, Tamil Nadu, India

³Professor and Head of the Department, Department of orthodontics and Dentofacial Orthopedics, Saveetha Dental college and Hospital, Saveetha institute of Medical and Technical Sciences, Saveetha University, Chennai 600077, Tamil Nadu, India

*Corresponding Author

Email ID: 151501059.sdc@saveetha.com¹, pradeep@saveetha.com², saravanadinesh@saveetha.com³

Abstract: Local anaesthesia are most commonly used drugs in dentistry. The required dose of local anaesthesia is based on factors like age, weight, systemic illness etc. Failure to administer the right amount may lead to adverse effects. Mandibular third molar is a common tooth to get impacted and due to which discomfort, pain and also caries in adjacent teeth occurs. Thus the aim of the study is to determine the amount of local anaesthesia used in extraction of mandibular third molar. Evaluation of 634 patients reported to saveetha dental college for extraction of mandibular third molar. Data was collected from dental archiving software and the results were statistically analysed. From the results obtained, we can observe that impactions which use 0-2ml of local anaesthesia are mesioangular(28.01%), Distoangular impaction (8.79%), Horizontal impaction(21.01%), vertical impaction (6.35%), and impactions which use 3-5 ml are mesioangular(12.87%), Distoangular impaction (5.37%), Horizontal impaction(12.21%), vertical impaction (3.58%) and impactions which use 6-10 ml are mesioangular(1.30%), vertical impaction (0.33%) and the type of impaction which uses more amount of local anaesthesia was found to be mesioangular impaction but the results obtained are found to be statistically not significant($p>0.05$). According to the age distribution, patients who use 0-2 ml of local anaesthesia belong to the age group of 17-25 years (23.78%), 26-35 years(28.50%), 36-45 years(8.41%), 45-65 years(3.75%) and patients who use 3-5ml of local anaesthesia belong to the age group of 17-25 years (12.87%), 26-35 years(15.64%), 36-45 years(4.56%), 45-65 years(0.98%) and the patients of age group 17-25 years use maximum dose of local anaesthesia but the results obtained are statistically insignificant ($p>0.05$). Within the limits of the study, we can conclude that mesioangular impaction is the common impaction that uses a maximum dose of 6-10 ml and age groups of 26-35 years use more LA upto 5ml and ages 17-25 years use a maximum of 6-10 ml.

Keywords: defense Impaction, Innovation technique, Local anaesthesia, Mesioangular, Third molar, Winter's classification.

INTRODUCTION

Local anaesthetics are the most commonly used drugs in dentistry. Although they are considered effective and safe in controlling pain during dental procedures, complications related to their use appear inevitable (Ayoub and Coleman, 1992). The use of such drugs aims to inhibit nerve conduction during a variety of dental procedures. These drugs are classified as ester or amide type with short, intermediate or long acting action. In addition to the local anesthetic agent in the local anesthetic cartridge other constituents, such as vasoconstrictors are of great importance during the administration of local anesthetic (Wahl and Brown, 2010). During their routine work most dentists who use such drugs often ignore important aspects of drug administration, notably the maximum dose and the dose calculation which relate to the use of local anaesthetics. Most dentists memorize the maximum number of cartridges and the total contents in milligrams of local anesthetic per cartridges (Becker and Reed, 2012). The required dose of local anesthetic is based on many factors including age and weight, and medically compromised patients and children require special consideration when calculating the maximum dose of a local anesthetic or a vaso-constrictor (Nakai et al., 2000). Dental professionals are at a greater risk for acquiring cross-infection while treating patients. This is evident from the fact that most of the human

pathogens have been isolated from oral secretions. Dental hospitals use instruments and materials that are directly exposed to blood and saliva and are therefore potential sources of infection (Mp and Rahman, 2017). Failure to administer the correct dose of local anaesthesia may cause serious adverse effects such as restricted jaw opening, paralysis of the lingual nerve, paresthesia, dysesthesia, and, in rare cases, ophthalmologic complications. Although toxic reactions are more commonly encountered during the use of nerve block techniques than infiltrations, it is recommended to perform 2 negative aspirations (Blanton and Jeske, 2002) .

Mandibular third molar impaction is the most common tooth to be impacted due to a variety of factors. Winter's classification of impacted third molar is based on its orientation to an imaginary line passing through the occlusal surfaces of first and second molars to the retromolar areas as seen on a periapical radiograph (or an orthopantomograph)(Juodzbalys and Daugela, 2013) . Many orthognathic surgeries done in mandible are in relation to the third molar(Jain et al., 2019). The impactions are classified into horizontal, mesioangular, vertical, distoangular, buccolingual and ectopic (Albert et al., 2006). Some of these impactions require more amount of local anesthesia in order to provide effective anesthetic activity.

Patients with third molar extractions developed alveolar osteitis on the seventh postoperative day (Jesudasan et al., 2015). Tranexamic acid can be used as a means of treating excessive blood loss due to surgery and it can also be used for conditions like angioedema (Christabel et al., 2016). Among the various signaling systems that control cell proliferation, cell death, motility, migration, and stemness, the Wnt pathway is identified as one of the master developmental pathways that contributes to cancer initiation and development in immunocompromised patients(Marimuthu et al., 2018). Trauma of the excretory duct of the salivary gland situated in the submandibular or sublingual space can occur when the instrument slips towards the floor of the oral cavity (Packiri et al., 2017). Our department is passionate about research we have published numerous high quality articles in this domain over the past years (Kavitha et al., 2014) , (Praveen et al., 2001),(Devi and Gnanavel, 2014), (Putchala et al., 2013), (Vijayakumar et al., 2010), (Lekha et al., 2014a, 2014b) (Danda, 2010) (Danda, 2010) (Parthasarathy et al., 2016) (Gopalakannan et al., 2012), (Rajendran et al., 2019), (Govindaraju et al., 2017), (P. Neelakantan et al., 2015), (PradeepKumar et al., 2016), (Sajan et al., 2011), (Lekha et al., 2014a), (Neelakantan et al., 2013), (Patil et al., 2017), (Jeevanandan and Govindaraju, 2018), (Abdul Wahab et al., 2017), (Eapen et al., 2017), (Menon et al., 2018), (Wahab et al., 2018), (Vishnu Prasad et al., 2018), (Uthrakumar et al., 2010), (Ashok et al., 2017), (Prasanna Neelakantan et al., 2015). Thus the aim of the study is to analyse the amount of local anaesthesia used in extraction of mandibular third molar impaction based on winters classification.

MATERIALS AND METHODS

The details of 634 patients were obtained from dental information archiving software that is formulated by saveetha dental college and hospitals for the purpose of preservation and efficient analysis of patients details that contains data including pictures of oral cavity and treatments being done which is maintained in a confidential manner. This serves as proofs and records for the conduction of retrospective studies. The study was followed after the ethical approval of retrospective analysis by the Institutional scientific review board. The ethical approval number is SDC/SIHEC/2020/DIASDATA/0619-0320. Cross verification was done with the help of photographs and radiographs. To minimize sampling bias all data were included. The exclusion criteria was patients with systemic illness, caries due to improper oral hygiene, Allergy to local anaesthesia etc. Data was downloaded from DIAS and imported to excel sheet. All the unnecessary data were excluded and excel tabulation was done. The excel sheet was imported to spss software 23 and Data analysis was done using descriptive statistics and the results were obtained in the form of graphs and tables using the chi square test.

RESULTS AND DISCUSSION

Out of 634 cases third molar extractions were performed, we can observe that impactions which use 0-2ml are mesioangular(28.01%), Distoangular impaction (8.79%), Horizontal impaction(21.01%), vertical impaction (6.35%), and impactions which use 3-5 ml are mesioangular(12.87%), Distoangular impaction (5.37%), Horizontal impaction(12.21%), vertical impaction (3.58%) and impactions which use 6-10 ml are mesioangular(1.30%), Disto angular impaction(0.16%), Horizontal impaction (0.33%) and the type of impaction which uses more amount of local anaesthesia was found to be mesioangular impaction but the results obtained are found to be statistically insignificant($p>0.05$)(Graph 1).

According to the age distribution, patients who use 0-2 ml of local anaesthesia belong to the age group of 17-25 years (23.78%), 26-35 years(28.50%), 36-45 years(8.41%), 45-65 years(3.75%) and patients who use 3-5ml of local anaesthesia belong to the age group of 17-25 years (12.87%), 26-35 years(15.64%), 36-45 years(4.56%), 45-65 years(0.98%) and patients who use 6-10ml of local anaesthesia belong to the age group of 17-25 years (0.81%), 26-35 years(0.81%), 36-45 years(0.16%), and the patients of age group 26-35 years use maximum dose of local anaesthesia but the results obtained are statistically insignificant ($p>0.05$)(Graph 2).

A study conducted by Hesham khalil et al on consecutive patients with impacted mandibular third molar teeth. All the third molars were classified according to Winter's classification. Surgical extraction was performed on all the patients under local anaesthesia. It was found that the age group of 26-35 years (69%) used the maximum dose of local anaesthesia and 35% acquired complications during administration especially in distoangular and horizontal impactions (Khalil, 2014).

Another study conducted by Bello SA et al says that distoangular and horizontal impaction used the maximum dose of LA and it also says older patients need more LA than younger patients (Bello et al., 2011). Brown et al say in his study that 2 ml of LA may be used as a safety margin to avoid complications and for an effective result (Brown et al., 2002). Dental extractions are the commonly performed procedures in dental clinics. An ideal tooth extraction is defined as painless removal of the whole tooth or tooth root with minimal trauma to the investing tissues so that the wound heals uneventfully and no postoperative prosthetic problem is created (Mp, 2017a). Trismus is a challenging surgical problem that can occur after the administration of local anaesthesia into the pterygomandibular space (Patil et al., 2017). The pain of tooth extraction varies among individuals, and each extraction of an individual may be quite different. Management of post-extraction pain and suffering, leads to earlier mobilization, shortened hospital stay, reduced hospital costs and increased patient satisfaction (Rao and Kumar, 2018). The mandible is more prone to injury than the zygomatic complex due to its mobility and lesser bony support compared with the maxilla (Rajendra Prabhu Abhinav et al., 2019). Surgical dental procedures are common and risk for cardiac diseases is on the rise, use of antibiotic prophylaxis before the start of the treatment in susceptible patients is highly recommended (Kumar and Sneha, 2016). BTX is increasingly being used in medicine and dentistry and is associated with a few reversible adverse effects (Mp, 2017b).

Local anesthesia forms the backbone of pain control techniques in dentistry and local anesthetics are the safest and most effective drugs in all of medicine for the prevention and management of pain (R. P. Abhinav et al., 2019). An accidental intravascular injection of local anaesthetics may occur following any injection procedures. - A number of complications can arise from the incorrect administration of local anaesthetic injections, some of which are permanent and can damage patients or even be life threatening (Vijayalakshmi and Kumar, 2015). Only recently many innovations have been added to the traditional methods of drug delivery systems. These include computer controlled local anesthetic delivery systems, jet injectors, intraosseous systems, vibrotactile devices, safety dental syringes and denti-patch (Kumar, 2015). Some of the limitations of the above study is that it is a uncentered study with minimal sample size with predominant south indian population. Further study can help to understand the accurate dose to administer a safe amount of local anaesthesia and prevent further complications. Basic dental procedures must be explained to the patients in their own terms for better understanding and also encourage them to undergo procedures for their safety concerns (Patturaja and Pradeep, 2016).

CONCLUSION

Within the limits of the study, we can conclude that mesioangular impaction is the common impaction that uses maximum dose of 6-10 ml and age group 17-25 years use maximum of 6-10 ml during the extraction of impacted mandibular third molar. Therefore, it is important that the right amount of local anesthesia be administered during the surgical removal of the impacted mandibular third molar to avoid serious adverse effects such as trismus, paraesthesia and systemic complications due to overdose. The dentists should also be aware about the medical history of allergy to local anaesthesia to avoid life threatening situations.

Author Contributions

Author 1 (Ashfaq Ahmed. M) carried out the retrospective study by collecting the data and prepared the draft of the manuscript after performing the required statistical analysis. Author 2 (Pradeep D) helped in the conception of the topic, and contributed in the study design, statistical analysis and aided in the drafting of the manuscript. Author 3 (Saravana Dinesh.S.P) contributed in developing and formatting the manuscript. All the above mentioned authors have discussed among themselves and have contributed to the study.

Conflict of Interest

The authors would like to declare that there is no conflict of interests.

REFERENCE

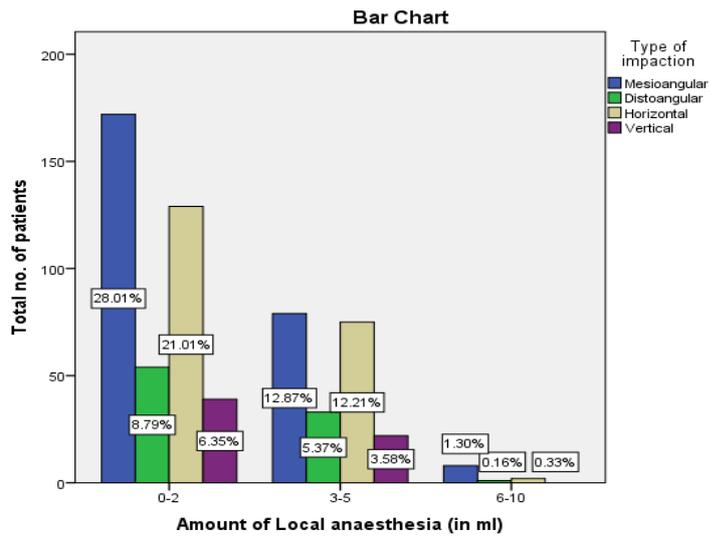
1. Abdul Wahab PU, Senthil Nathan P, Madhulaxmi M, et al. (2017) Risk Factors for Post-operative Infection Following Single Piece Osteotomy. *Journal of maxillofacial and oral surgery* 16(3): 328–332.
2. Abhinav R. P., Sweta VR and Ramesh A (2019) Role of virtual reality in pain perception of patients following the administration of local anesthesia. *Annals of Maxillofacial Surgery*. DOI: 10.4103/ams.ams_263_18.
3. Abhinav Rajendra Prabhu, Selvarasu K, Maheswari GU, et al. (2019) The Patterns and Etiology of

- Maxillofacial Trauma in South India. *Annals of maxillofacial surgery* 9(1): 114–117.
4. Albert DG de M, de Melo Albert DG, Gomes ACA, et al. (2006) Comparison of Orthopantomographs and Conventional Tomography Images for Assessing the Relationship Between Impacted Lower Third Molars and the Mandibular Canal. *Journal of Oral and Maxillofacial Surgery*. DOI: 10.1016/j.joms.2006.03.020.
 5. Ashok BS, Ajith TA and Sivanesan S (2017) Hypoxia-inducible factors as neuroprotective agent in Alzheimer's disease. *Clinical and experimental pharmacology & physiology* 44(3): 327–334.
 6. Ayoub ST and Coleman AE (1992) A review of local anesthetics. *General dentistry* 40(4): 285–7, 289–90.
 7. Becker DE and Reed KL (2012) Local anesthetics: review of pharmacological considerations. *Anesthesia progress* 59(2): 90–101; quiz 102–3.
 8. Bello SA, Adeyemo WL, Bamgbose BO, et al. (2011) Effect of age, impaction types and operative time on inflammatory tissue reactions following lower third molar surgery. *Head & face medicine* 7: 8.
 9. Blanton PL and Jeske AH (2002) Misconceptions involving dental local anesthesia. Part 1: Anatomy. *Texas dental journal* 119(4): 296–300, 302–4, 306–7.
 10. Brown RS, Paluvoi S, Choksi S, et al. (2002) Evaluating a dental patient for local anesthesia allergy. *The Compendium of continuing education in dentistry* 23(2): 125–8, 131–2, 134 passim; quiz 140.
 11. Christabel A, Anantanarayanan P, Subash P, et al. (2016) Comparison of pterygomaxillary dysjunction with tuberosity separation in isolated Le Fort I osteotomies: a prospective, multi-centre, triple-blind, randomized controlled trial. *International journal of oral and maxillofacial surgery* 45(2): 180–185.
 12. Danda AK (2010) Comparison of a single noncompression miniplate versus 2 noncompression miniplates in the treatment of mandibular angle fractures: a prospective, randomized clinical trial. *Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons* 68(7): 1565–1567.
 13. Devi VS and Gnanavel BK (2014) Properties of Concrete Manufactured Using Steel Slag. *Procedia Engineering* 97: 95–104.
 14. Eapen BV, Baig MF and Avinash S (2017) An Assessment of the Incidence of Prolonged Postoperative Bleeding After Dental Extraction Among Patients on Uninterrupted Low Dose Aspirin Therapy and to Evaluate the Need to Stop Such Medication Prior to Dental Extractions. *Journal of maxillofacial and oral surgery* 16(1): 48–52.
 15. Gopalakannan S, Senthilvelan T and Ranganathan S (2012) Modeling and Optimization of EDM Process Parameters on Machining of Al 7075-B4C MMC Using RSM. *Procedia Engineering* 38: 685–690.
 16. Govindaraju L, Neelakantan P and Gutmann JL (2017) Effect of root canal irrigating solutions on the compressive strength of tricalcium silicate cements. *Clinical oral investigations* 21(2): 567–571.
 17. Jain SV, Muthusekhar MR and Baig MF (2019) Evaluation of three-dimensional changes in pharyngeal airway following isolated lefort one osteotomy for the correction of vertical maxillary excess: a prospective *Journal of maxillofacial*. Springer. Available at: <https://link.springer.com/article/10.1007/s12663-018-1113-4>.
 18. Jeevanandan G and Govindaraju L (2018) Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial. *European Archives of Paediatric Dentistry*. DOI: 10.1007/s40368-018-0356-6.
 19. Jesudasan JS, Wahab PUA and Sekhar MRM (2015) Effectiveness of 0.2% chlorhexidine gel and a eugenol-based paste on postoperative alveolar osteitis in patients having third molars extracted: a randomised controlled clinical trial. *The British journal of oral & maxillofacial surgery* 53(9): 826–830.
 20. Juodzbalys G and Daugela P (2013) Mandibular third molar impaction: review of literature and a proposal of a classification. *Journal of oral & maxillofacial research* 4(2): e1.
 21. Kavitha M, Subramanian R, Narayanan R, et al. (2014) Solution combustion synthesis and characterization of strontium substituted hydroxyapatite nanocrystals. *Powder Technology* 253: 129–137.
 22. Khalil H (2014) Local anesthetics dosage still a problem for most dentists: A survey of current knowledge and awareness. *The Saudi Journal for Dental Research* 5(1): 49–53.
 23. Kumar S (2015) Newer delivery systems for local anesthesia in dentistry. *J Pharm Sci Res* 7: 252–255.
 24. Kumar S and Sneha S (2016) KNOWLEDGE AND AWARENESS REGARDING ANTIBIOTIC PROPHYLAXIS FOR INFECTIVE ENDOCARDITIS AMONG UNDERGRADUATE DENTAL STUDENTS. *Asian Journal of Pharmaceutical and Clinical Research*. DOI: 10.22159/ajpcr.2016.v9s2.13405.
 25. Lekha L, Kanmani Raja K, Rajagopal G, et al. (2014a) Schiff base complexes of rare earth metal ions: Synthesis, characterization and catalytic activity for the oxidation of aniline and substituted anilines. *Journal of organometallic chemistry* 753: 72–80.
 26. Lekha L, Kanmani Raja K, Rajagopal G, et al. (2014b) Synthesis, spectroscopic characterization and antibacterial studies of lanthanide(III) Schiff base complexes containing N, O donor atoms. *Journal of Molecular Structure*. DOI: 10.1016/j.molstruc.2013.10.014.
 27. Marimuthu M, Andiappan M, Wahab A, et al. (2018) Canonical Wnt pathway gene expression and their

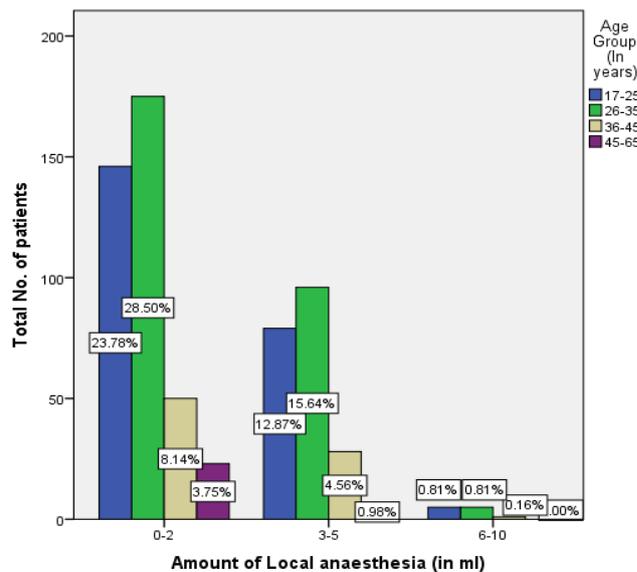
- clinical correlation in oral squamous cell carcinoma. *Indian journal of dental research: official publication of Indian Society for Dental Research* 29(3): 291–297.
28. Menon S, Ks SD, R S, et al. (2018) Selenium nanoparticles: A potent chemotherapeutic agent and an elucidation of its mechanism. *Colloids and surfaces. B, Biointerfaces* 170: 280–292.
 29. Mp SK (2017a) Relationship between dental anxiety and pain experience during dental extractions. *Asian J Pharm Clin Res.* [pdfs.semanticscholar.org.](https://pdfs.semanticscholar.org/f024/7b95077e4a0bb861eb9b8b815893f19758d6.pdf) Available at: <https://pdfs.semanticscholar.org/f024/7b95077e4a0bb861eb9b8b815893f19758d6.pdf>.
 30. Mp SK (2017b) The emerging role of botulinum toxin in the treatment of orofacial disorders: Literature update. *Asian J Pharm Clin Res.* [innovareacademics.org.](https://innovareacademics.org/journals/index.php/ajpcr/article/download/16914/12228) Available at: <https://innovareacademics.org/journals/index.php/ajpcr/article/download/16914/12228>.
 31. Mp SK and Rahman R (2017) Knowledge, awareness, and practices regarding biomedical waste management among undergraduate dental students. *Asian J Pharm Clin Res.* [innovareacademics.org.](https://innovareacademics.org/journals/index.php/ajpcr/article/download/19101/12066) Available at: <https://innovareacademics.org/journals/index.php/ajpcr/article/download/19101/12066>.
 32. Nakai Y, Milgrom P, Mancl L, et al. (2000) EFFECTIVENESS OF LOCAL ANESTHESIA IN PEDIATRIC DENTAL PRACTICE. *The Journal of the American Dental Association.* DOI: 10.14219/jada.archive.2000.0115.
 33. Neelakantan P, Grotra D and Sharma S (2013) Retreatability of 2 mineral trioxide aggregate-based root canal sealers: a cone-beam computed tomography analysis. *Journal of endodontia* 39(7): 893–896.
 34. Neelakantan P., Cheng CQ, Mohanraj R, et al. (2015) Antibiofilm activity of three irrigation protocols activated by ultrasonic, diode laser or Er:YAG laser in vitro. *International endodontic journal* 48(6): 602–610.
 35. Neelakantan Prasanna, Sharma S, Shemesh H, et al. (2015) Influence of Irrigation Sequence on the Adhesion of Root Canal Sealers to Dentin: A Fourier Transform Infrared Spectroscopy and Push-out Bond Strength Analysis. *Journal of endodontia* 41(7): 1108–1111.
 36. Packiri S, Gurunathan D and Selvarasu K (2017) Management of Paediatric Oral Ranula: A Systematic Review. *Journal of clinical and diagnostic research: JCDR* 11(9): ZE06–ZE09.
 37. Parthasarathy M, Isaac Joshua Ramesh Lalvani J, Dhinesh B, et al. (2016) Effect of hydrogen on ethanol-biodiesel blend on performance and emission characteristics of a direct injection diesel engine. *Ecotoxicology and environmental safety* 134(Pt 2): 433–439.
 38. Patil SB, Durairaj D, Suresh Kumar G, et al. (2017) Comparison of Extended Nasolabial Flap Versus Buccal Fat Pad Graft in the Surgical Management of Oral Submucous Fibrosis: A Prospective Pilot Study. *Journal of maxillofacial and oral surgery* 16(3): 312–321.
 39. Patturaja K and Pradeep D (2016) Awareness of Basic Dental Procedure among General Population. *Journal of pharmacy research.* [indianjournals.com.](http://www.indianjournals.com/ijor.aspx?target=ijor:rjpt&volume=9&issue=9&article=010) Available at: <http://www.indianjournals.com/ijor.aspx?target=ijor:rjpt&volume=9&issue=9&article=010>.
 40. PradeepKumar AR, Shemesh H, Jothilatha S, et al. (2016) Diagnosis of Vertical Root Fractures in Restored Endodontically Treated Teeth: A Time-dependent Retrospective Cohort Study. *Journal of endodontia* 42(8): 1175–1180.
 41. Praveen K, Narayanan V, Muthusekhar MR, et al. (2001) Hypotensive anaesthesia and blood loss in orthognathic surgery: a clinical study. *The British journal of oral & maxillofacial surgery* 39(2): 138–140.
 42. Putchala MC, Ramani P, Herald J. Sherlin, et al. (2013) Ascorbic acid and its pro-oxidant activity as a therapy for tumours of oral cavity – A systematic review. *Archives of Oral Biology.* DOI: 10.1016/j.archoralbio.2013.01.016.
 43. Rajendran R, Kunjusankaran RN, Sandhya R, et al. (2019) Comparative Evaluation of Remineralizing Potential of a Paste Containing Bioactive Glass and a Topical Cream Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study. *Pesquisa Brasileira em Odontopediatria e Clínica Integrada.* DOI: 10.4034/pboci.2019.191.61.
 44. Rao TD and Kumar MP (2018) Analgesic Efficacy of Paracetamol Vs Ketorolac after Dental Extractions. *Research Journal of Pharmacy and Technology* 11(8). A & V Publications: 3375–3379.
 45. Sajjan D, Udaya Lakshmi K, Erdogdu Y, et al. (2011) Molecular structure and vibrational spectra of 2,6-bis(benzylidene)cyclohexanone: a density functional theoretical study. *Spectrochimica acta. Part A, Molecular and biomolecular spectroscopy* 78(1): 113–121.
 46. Uthrakumar R, Vesta C, Raj CJ, et al. (2010) Bulk crystal growth and characterization of non-linear optical bithiourea zinc chloride single crystal by unidirectional growth method. *Current applied physics: the official journal of the Korean Physical Society* 10(2): 548–552.
 47. Vijayakumar GNS, Devashankar S, Rathnakumari M, et al. (2010) Synthesis of electrospun ZnO/CuO nanocomposite fibers and their dielectric and non-linear optic studies. *Journal of alloys and compounds* 507(1): 225–229.
 48. Vijayalakshmi B and Kumar MPS (2015) Knowledge of students about Local anaesthetics used during oral surgical procedures. *Journal of Pharmaceutical.* [search.proquest.com.](http://search.proquest.com) Available at:

<http://search.proquest.com/openview/48cb9b4321987f331ca65487b6ace4b9/1?pq-origsite=gscholar&cbl=54977>.

49. Vishnu Prasad S, Kumar M, Ramakrishnan M, et al. (2018) Report on oral health status and treatment needs of 5-15 years old children with sensory deficits in Chennai, India. *Special care in dentistry: official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry* 38(1): 58–59.
50. Wahab PUA, Madhulaxmi M, Senthilnathan P, et al. (2018) Scalpel Versus Diathermy in Wound Healing After Mucosal Incisions: A Split-Mouth Study. *Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons* 76(6): 1160–1164.
51. Wahl MJ and Brown RS (2010) Dentistry’s wonder drugs: local anesthetics and vasoconstrictors. *General dentistry* 58(2): 114–23; quiz 124–5.



Graph 1: Bar graph represents amount of local anaesthesia administered based on winter’s classification of extraction. X-axis represents the amount of local anaesthesia (in ml) and Y-axis represents Total number of patients. The type of impaction which uses more amount of local anaesthesia was found to be mesioangular impaction. There was no association between the amount of local anaesthesia used and impaction. Pearson chi square value: 6.574, df: 6, p-value: 0.362 ($p > 0.05$) statistically insignificant.



Graph 2 : Bar graph represents the association between the amount of local anaesthesia administered and age group. X-axis represents the amount of local anaesthesia and Y-axis represents the total number of patients. The patients of age group 26-35 years use maximum dose

Ashfaq Ahmed. M et al / Retrospective Study on Amount of Local Anaesthesia Used in Extraction of Mandibular Third Molar Impaction Based on Winters Classification

of local anaesthesia. There was no association between the amount of local anaesthesia and age group. Pearson chi square value: 3.533, df: 6, p-value: 0.740 ($p>0.05$) statistically not significant.