



Original Article



Comparison of Pain, Facial Swelling and Mouth Opening of Single Versus Multiple Suture Technique After Third Molar Extraction

Bakhtawar Baloch¹, Kashif Ali Channar¹, Syed Abdul Rauf Shah², Shahzaman Memon³, Saif-Ur-Rehman³, Shuja Hamid⁴ and Salman Shams^{5*}

¹Department of Oral and Maxillofacial Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan

²Department of Dentistry, Bolan University of Medical and Health Sciences, Quetta, Pakistan

³Department of Oral Pathology, Muhammad Dental College, Mirpurkhas, Pakistan

⁴Department of Oral Medicine, Bhattai Dental and Medical College, Mirpurkhas, Pakistan

⁵Department of Oral Medicine, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan

ARTICLE INFO

Keywords:

Extraction, Inflammatory Complications, Suture, Third Molar, Pell-Gregory Classification, Visual Analog Scale

How to Cite:

Baloch, B., Channar, K. A., Shah, S. A. R., Memon, S., Rehman, S. U., Hamid, S., & Shams, S. (2024). Comparison of Pain, Facial Swelling and Mouth Opening of Single Versus Multiple Suture Technique After Third Molar Extraction: Comparison of Single Versus Multiple Suture Technique After Third Molar Extraction. *Pakistan Journal of Health Sciences*, 5(08). <https://doi.org/10.54393/pjhs.v5i08.1727>

***Corresponding Author:**

Salman Shams
 Department of Oral Medicine, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan
salman.shams@lumhs.edu.pk

Received Date: 24th May, 2024

Acceptance Date: 26th August, 2024

Published Date: 31st August, 2024

ABSTRACT

Extraction of the third molar is a common technique. Pain, swelling and trismus are common signs of local inflammation during the postoperative phase. Moreover, opinions are divided when it comes to the mucosal closure phase of impacted mandibular third molar. **Objective:** To compare the pain, facial swelling and mouth opening of single versus multiple suture techniques after third molar extraction. **Methods:** This quasi-experimental study included 54 patients aged 18-35 requiring mesioangular mandibular third molar extraction. Participants were non-randomly assigned to Group A (single suture) or Group B (multiple suture). Exclusions were based on suture allergies, chronic conditions, pregnancy, lactation, or acute infections. Impacted molars were classified using the Pell-Gregory system, and radiographs assessed impaction. Participants were instructed to return on the 1st, 3rd, and 7th postoperative days for assessment of Pain, swelling, and mouth opening, and comparisons between the two groups were made using the Student's t-test. **Results:** Patients in groups A and B had mean and standard deviation pain levels of 6.9 ± 0.9 and 6.4 ± 0.9 post-operatively on Day 1 and 2.0 ± 2.1 and 2.5 ± 2.7 on Day 7. Post-operative facial swelling measured 15.4 ± 2.4 and 17.0 ± 3.4 mm on Day 1, 14.8 ± 2.4 and 4 ± 2.7 mm on Day 7 in groups A and B. Mean and standard deviation of mouth opening in groups A and B were 26.5 ± 3.6 and 23.7 ± 2.8 mm post-operatively at Day 1, 29.6 ± 3.6 and 27.2 ± 3.0 mm at Day 7. **Conclusions:** It was concluded that based on post-operative pain, swelling, mouth opening, and trismus following third molar extraction, single suture approach was somewhat better than multiple suture.

INTRODUCTION

Eruption of wisdom tooth normally occurs around the age of 17-21 years [1]. A tooth that does not erupt into its functional state of occlusion is termed as "impacted tooth" [2]. The removal of third molar is a common and frequently done oral surgical procedure performed in oral and maxillofacial surgery [3]. Based on the location, depth, angulation and density of bone extractions may vary from easy to extremely difficult procedure [4]. Symptoms related to impaction of third molars usually arise from pericoronitis and its sequelae. Some of the patients may

also face these symptoms related to pathological conditions occurring as a result of impaction of the third molar [5]. The third molar extraction's most often reported side effects include trismus, pain, and swelling [6]. During the postoperative phase, an inflammatory response is predicted despite the expert surgeon using a precise surgical procedure [7]. A number of experimental studies have been focusing on different methods to reduce these complications which includes single and multiple suture techniques with or without placement of drains and giving



incision in the mucosa distal to second molar to create a window for inflammatory exudates to let out. Suture less techniques related to third molar surgery are gaining fast worldwide recognition [8]. The variance of opinion concerning wound closure technique after the extraction of the third molar has different beliefs related to the merit and demerit of primary versus secondary wound closure [9]. Primary wound closure is carried out by covering and sealing the socket with the help of an air-tight mucosal flap. The secondary wound closure involves a 5–6 mm thick wedge of mucosa removed from the distal aspect of the second molar and the flap is repositioned. A triangular opening is made distal to the second molar with the help of interrupted sutures to create a passive outlet for inflammatory exudates and avoid the incorporation of drains [10]. In contrast to first-intention healing, second-intention healing results in a better outflow of the inflammatory exudate, which lowers edema [11]. There is a paucity of local studies about the use of single and multiple suture techniques in removing impacted mandibular significantly decreased postoperative inflammatory complications i.e., pain, swelling and trismus. The single suture technique involves using one long, continuous stitch to close the site after removing a third molar. It's quicker and simpler, with even tension along the incision, but if something goes wrong, it's harder to adjust. On the other hand, the multiple suture technique uses several individual stitches, giving the surgeon more control and allowing for precise adjustments if needed. This method can improve the way the tissue heals but takes more time and involves more knots. Generally, the single suture is used for straightforward cases, while the multiple suture technique is preferred for more complex or irregular wounds [12]. Through this study, we can bring out data that which technique is better in controlling inflammatory complications postoperatively. There is limited local research comparing pain, facial swelling, and mouth opening between single and multiple suture techniques after third molar extraction.

This study aimed to provide clinicians with evidence to choose the most effective and convenient suturing method for optimal patient outcomes and to compare the pain, facial swelling and mouth opening of single versus multiple suture techniques after third molar extraction.

METHODS

This quasi-experimental study used a non-probability consecutive sampling method and was conducted from January 2022 to December 2022 at the Department of Oral and Maxillofacial Surgery, Liaquat University of Medical and Health Sciences, Jamshoro. The sample was calculated through open epi at 90% power of the test and 95% confidence level using mean swelling of 1.2 ± 0.113 from the multiple suture group and 1 ± 0.107 from single suture group on Day 1 of the third molar surgery from the previous study

[8]. Patients aged 18–35 years irrespective of any gender and requiring surgical extraction of mesioangular mandibular third molar were included in the study. Patients who were allergic to suture material, medically compromised patients i.e., Chronic Liver Disease (CLD), Diabetes, Pregnant and Lactating Patients and Acute Infection (pericoronitis) were excluded from the study. The study was carried out with permission from the Liaquat University of Medical and Health Sciences' research ethics committee in Jamshoro (LUMHS/REC/- 154). Patients who met the eligibility requirements and those who expressed interest in participating were added to the research, and they were told of its purpose and the benefits of participating. Before study enrolment, a signed permission was obtained in good faith. Each suspected patient was assessed carefully. Complete history and examination were done to preclude any systemic disease. The patient's whole medical history, including name, age, gender, and hospital registration number, as well as any current complaints and any clinical characteristics like pain, swelling, or mouth opening was documented on a proforma. The Pell-Gregory classification was used to assess the third molar that was affected. Every patient had an OPG and periapical radiograph to determine the class of impaction [13]. Following the patient's non-randomized allocation, they were assigned to either Group A (single suture) or Group B (multiple suture). All surgeries were carried out under the supervision of a supervisor and local anesthesia using the conventional nerve block anesthesia technique of the lingual, buccal, and inferior alveolar nerves. Two 1.8 mL cartridges containing 2% xylocaine with epinephrine 1: 100,000 (Medicine; made in Korea) were administered. Using blade number 15, a three-sided mucoperiosteal flap was elevated. The incision was made at the spot where the second molar's middle and posterior thirds converge (approximately 6 mm down the buccal sulcus), and it continued upward to the tooth's distobuccal angle. The incision was expanded laterally and distally along the external oblique ridge after continuing along the gingival sulcus to a location somewhat distal to the third molar. Neither a lingual retractor nor a lingual flap were used. The bone was removed utilizing the buccal guttering method on a rotator hand piece with a fissure bur while being continuously irrigated with regular saline. Following extensive irrigation and debridement, the tooth was raised using an elevator and straight pair. The flaps were then closed by the treatment group. A single 3-0 silk suture was positioned at the distal relieving incision in Group A. Multiple 3-0 silk sutures were positioned at the distal relieving incision and at the interdental papilla, which is the space between the second and third molars, for the Group B patient. Oral antibiotics, analgesics, and instructions to use a warm saline rinse were given to both treatment

groups. We took care to exclude any elements or substances that may have an impact on the research's variables. This includes applying cold packs and using steroids. Post-operative guidelines were given to each patient. Measurements of facial swelling were taken before the procedure as well as on the 1st, 3rd, and 7th Day after the procedure. To quantify facial swelling, three measures were obtained for the gonion angle-lateral canthal of the eye, tragus-commissure of the mouth, and tragus-pogonium. Before the procedure and on the 1st, 3rd, and 7th Day after the procedure, trismus measurements were made using a millimeter ruler (which measures the greatest distance between the maxillary and mandibular central incisor). Mouth opening less than 25 mm was considered trismus. SPSS version 21.0 was used for data analysis. The mean and standard deviation were calculated for the quantitative variables, which included age, pain score, trismus, and swelling. The frequency and percentage of the qualitative variable, such as gender, were calculated. To determine the significance of the differences between the two groups, student t-test was used. $P < 0.05$ was a significant level.

RESULTS

To assess the level of pain, swelling and mouth opening restriction, the patients were instructed to return to the clinic on the 1st, 3rd, and 7th postoperative days. If the patients had any unexpected pain, they were also instructed to visit the clinic on any day. Each patient received a form, on which to enter their visual analog scale (VAS) values for pain assessment [14, 15]. Prior to surgery as well as the 1st, 3rd, and 7th Day after surgery, VAS scores were gathered (Figure 1).



Figure 1: Visual Analogue Scale Rating

The age range of participants in both groups was 23 to 35 years. The mean age for the first single suture group was 31.4 ± 4.6 years, while the mean age for the second single suture group was 31.2 ± 4.3 years. Out of 54 patients, male patients were 12 (44.4%) and 10 (37.0%) and female patients were 15 (55.56%) and 17 (62.96%) in Group A (single suture) and B (multiple suture) respectively (Table 1).

Table 1: Distribution of Age of the Participants in Both Groups (n=54)

Variable	Characteristics	Single Suture (n=27)	Multiple Suture (n=27)
Age (Years)	Range	23-35	23-35
	Mean \pm S.D	31.4 ± 4.6	31.2 ± 4.3
Gender n (%)	Male	10 (37.03%)	12 (44.44%)
	Female	17 (62.96%)	15 (55.56%)

*student t-test

The mean preoperative pain scores were similar between the single suture (7.3 ± 1.2) and multiple suture groups (7.6 ± 1.2), with no significant difference ($p=0.30$). On postoperative Day 1, mean pain scores were slightly higher in the single suture group (6.9 ± 0.9) compared to the multiple suture group (6.4 ± 0.9), but this difference was not statistically significant ($p=0.063$). On Day 3, pain scores had decreased in both groups (single suture mean 5.1 ± 1.4 ; multiple sutures mean 4.9 ± 0.9) with no significant difference ($p=0.48$). On day 7, mean pain scores further decreased (single suture 2.0 ± 2.1 ; multiple sutures 2.5 ± 2.7) with no significant difference between the groups ($p=0.39$) (Table 2).

Table 2: Comparison of Pain Score at Preoperative, and Various Time Points Between Two Interventions (n=54)

Pain	Single Suture Mean \pm S.D (95% CI)	Multiple Suture Mean \pm S.D (95% CI)	P-Value*
Pre-Operative	7.3 ± 1.2 (5.0-10.0)	7.6 ± 1.2 (5.0-9.0)	0.302
Post-Operative			
Day 1	6.9 ± 0.9 (5.0-8.0)	6.4 ± 0.9 (5.0-8.0)	0.063
Day 3	5.1 ± 1.4 (2.0-8.0)	4.9 ± 0.9 (4.0-7.0)	0.482
Day 7	2.0 ± 2.1 (0.0-6.0)	2.5 ± 2.7 (0.0-9.0)	0.399

*student t-test

Preoperative facial swelling was similar between the single suture (14.3 ± 2.4 mm) and multiple suture groups (mean 15.5 ± 3.3 mm), with no significant difference ($p=0.128$). On postoperative Day 1, facial swelling was slightly higher in the multiple suture group (17.0 ± 3.4 mm) compared to the single suture group (15.4 ± 2.4 mm), approaching statistical significance ($p=0.050$). By Day 3, facial swelling remained higher in the multiple suture group (16.8 ± 3.0 mm) compared to the single suture group (15.1 ± 2.7 mm), with a significant difference ($p=0.034$). By Day 7, the trend continued, with the multiple suture group having higher facial swelling (16.4 ± 2.7 mm) compared to the single suture group (14.8 ± 2.4 mm), also showing a significant difference ($p=0.027$) (Table 3).

Table 3: Comparison of Facial Swelling (mm) at Preoperative and Various Time Point Between Two Interventions (n=54)

Facial Swelling	Single Suture Mean \pm S.D (95% CI)	Multiple Suture Mean \pm S.D (95% CI)	P-Value*
Pre-Operative	14.3 ± 2.4 (12.0-21.7)	15.5 ± 3.3 (10.7-21)	0.128
Post-Operative			
Day 1	15.4 ± 2.4 (13.0-23.7)	17.0 ± 3.4 (12.0-23.3)	0.050
Day 3	15.1 ± 2.7 (12.3-24.3)	16.8 ± 3.0 (11.7-22.7)	0.034
Day 7	14.8 ± 2.4 (12.0-23.0)	16.4 ± 2.7 (10.7-21.7)	0.027

*student t-test

Preoperative mouth opening was greater in the single suture group (29.9 ± 3.7 mm) compared to the multiple suture group (26.6 ± 3.9 mm), and this difference was significant ($p=0.002$). On postoperative Day 1, mouth opening remained significantly greater in the single suture group (26.5 ± 3.6 mm) compared to the multiple suture

group (23.7 ± 2.8 mm), with a statistically significant difference ($p=0.002$). By Day 3, mouth opening increased in both groups, but the single suture group (27.4 ± 3.6 mm) still showed significantly greater mouth opening than the multiple suture group (25.3 ± 2.6 mm, $p=0.016$). By Day 7, the single suture group (29.6 ± 3.6 mm) continued to have significantly greater mouth opening compared to the multiple sutures group (27.2 ± 3.0 mm) ($p=0.011$) (Table 4).

Table 4: Comparison of Mouth Opening (mm) at Preoperative, and Various Time Point Between Two Interventions ($n=54$)

Mouth Opening	Single Suture Mean \pm S.D (95% CI)	Multiple Suture Mean \pm S.D (95% CI)	P- Value*
Pre-Operative	14.3 \pm 2.4 (12.0-21.7)	15.5 \pm 3.3 (10.7-21)	0.128
Post-Operative			
Day 1	26.5 \pm 3.6 (21.0-35.0)	23.7 \pm 2.8 (17.0-29.0)	0.002
Day 3	27.4 \pm 3.6 (22.0-36.0)	25.3 \pm 2.6 (18.0-30.0)	0.016
Day 7	29.6 \pm 3.6 (25.0-40.0)	27.2 \pm 3.0 (22.0-33.0)	0.011

*student t-test

DISCUSSION

An impacted lower third molar removal results in pain swelling, and difficulty opening the mouth. Submucosal dexamethasone is an accessible route of steroid administration in patients [14]. The duration of the surgical intervention, the kind of suturing method used, and the type of wound closure all influence the prevalence of such postoperative issues [15, 16]. Our results showed that age and gender were not different statistically between groups. This shows that randomization eliminates these two confounders. Post-operative pain in this study decreased continuously from Day 1, 3, and 7 in both group patients. In the multiple suture group pain level was low on Days 1 and 3 as compared to single suture group whereas pain level on Day 7 was low in single suture group as compared to multiple suture group. According to Osunde OD's research [3], there was a statistically significant difference in pain on postoperative Days 1, 2, and 3 ($P < 0.05$), but no significant changes were seen between the two groups on Days 5 and 7. Since Shuja and Maria effectively removed the inflammatory exudates through their closure techniques, they also reported reduced discomfort [17-19]. In this research post-operative assessment of facial swelling after third molar extraction shows a significant difference in facial swelling on Day 1 (p -value = 0.050) 15.4 ± 2.4 and 17.0 ± 3.4 mm, facial swelling at Day 3 (p -value = 0.034) 15.1 ± 2.7 and 16.8 ± 3.0 mm and facial swelling at Day 7 (p -value = 0.027) 14.8 ± 2.4 and 16.4 ± 2.7 mm in Group A (single suture) and Group B (multiple suture) respectively. Post-operative swelling decreased continuously from Day 1, 3 and 7 in both group patients. In single suture group swelling level was low on Day 1, 3 and 7 as compared to multiple suture group. Similarly, a study carried out by Mahat showed that facial swelling on 7th postoperative day was significantly higher in the multiple suture group [19].

One of the frequent side effects that accompany the extraction of mandibular impacted third molars is trismus. In addition to other factors, low-grade infections and repetitive muscular stimulation are the usual causes of this [20]. Post-operatively, trismus in our study was almost similar from Day 1, 3 and 7 in both group patients. Other studies have shown a reduction in trismus when using a method of closure that allows for the outflow of inflammatory exudates. These outcomes were likewise comparable to those previous investigations [16, 17].

CONCLUSIONS

This study concluded that both single and multiple suture techniques are effective in managing postoperative pain, the single suture technique may offer advantages in terms of reducing postoperative facial swelling and improving mouth opening. These benefits could lead to enhanced patient comfort and faster functional recovery.

Authors Contribution

Conceptualization: KAC

Methodology: BB, SUR

Formal analysis: SM, SH

Writing-review and editing: SARS, SS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

- [1] Rajper WA, Channar KA, Larik MD, Majeedano SA, Soomro AA, Hussain A. Comparison of Postoperative Complications after Impacted Mandibular Third Molar Extraction with Conventional Suturing Versus Tube Drainage. *The Professional Medical Journal*. 2020 Jul; 27(07): 1408-13. doi: 10.29309/TPMJ/2020.27.07.4011.
- [2] Ali R, Shaikh T, Memon M, Shams S. Efficacy of Intra-Masseteric and Submucosal Dexamethasone Injection in Surgical Extraction of Impacted Lower Third Molar. *The Professional Medical Journal*. 2019 Jul; 26(07): 1141-6. doi: 10.29309/TPMJ/2019.26.07.3786.
- [3] Osunde OD, Saheeb BD, Adebola RA. Comparative Study of Effect of Single and Multiple Suture Techniques on Inflammatory Complications after Third Molar Surgery. *Journal of Oral and Maxillofacial Surgery*. 2011 Apr; 69(4): 971-6. doi: 10.1016/j.joms.2010.05.009.

- [4] Ma S, Li X, Zhang A, Liu S, Zhao H, Zhao H. Efficacy of Secondary Closure Technique after Extraction of Third Molars: A Meta-Analysis. *British Journal of Oral and Maxillofacial Surgery*. 2019 Dec; 57(10): 977-84. doi: 10.1016/j.bjoms.2019.08.028.
- [5] Syed KB, AlQahtani FH, Mohammad AH, Abdullah IM, Qahtani HS, Hameed MS. Assessment of Pain, Swelling and Trismus Following Impacted Third Molar Surgery Using Injection Dexamethasone Submucosally: A Prospective, Randomized, Crossover Clinical Study. *Journal of International Oral Health*. 2017 May; 9(3) :116-21. doi: 10.4103/jioh.jioh_65_17.
- [6] Balamurugan R and Zachariah T. Comparison of Primary and Secondary Closure with A Buccal Mucosal-Advancement Flap on Postoperative Course After Mandibular Impacted Third Molar Surgery. *Oral and Maxillofacial Surgery*. 2020 Mar; 24: 37-43. doi: 10.1007/s10006-019-00814-w.
- [7] Rodrigues ÉD, Martins-de-Barros AV, Loureiro AM, Carvalho MD, Vasconcelos B. Comparison of Two Suture Techniques on the Inflammatory Signs After Third Molars Extraction—A Randomized Clinical trial. *Plos One*. 2023 Jun; 18(6): 1-12. doi: 10.1371/journal.pone.0286413.
- [8] Osunde OD, Adebola RA, Saheeb BD. A Comparative Study of the Effect of Suture-less and Multiple Suture Techniques on Inflammatory Complications Following Third Molar Surgery. *International Journal of Oral and Maxillofacial Surgery*. 2012 Oct; 41(10): 1275-9. doi: 10.1016/j.ijom.2012.04.009.
- [9] Kakadia U, Patel K, Kumar KA, Khare G, Patel N. A Comparative Study of Primary Versus Secondary Closure after Removal of Lower Third Molar. *International Journal of Clinical Dental Science*. 2013 May; 4(1): 1-7.
- [10] Waite PD and Cherala S. Surgical Outcomes for Suture-less Surgery in 366 Impacted Third Molar Patients. *Journal of Oral and Maxillofacial Surgery*. 2006 Apr; 64(4): 669-73. doi: 10.1016/j.joms.2005.12.014.
- [11] Koyuncu BÖ, Zeytinoğlu M, Tetik A, Gomel MM. Effect of Tube Drainage Compared with Conventional Suturing on Postoperative Discomfort After Extraction of Impacted Mandibular Third Molars. *British Journal of Oral and Maxillofacial Surgery*. 2015 Jan; 53(1): 63-7. doi: 10.1016/j.bjoms.2014.09.021.
- [12] Alkadi S and Stassen L. Effect of One-Suture and Sutureless Techniques on Postoperative Healing After Third Molar Surgery. *Journal of Oral and Maxillofacial Surgery*. 2019 Apr; 77(4): 703.e1-703.e16. doi: 10.1016/j.joms.2018.12.001.
- [13] Santos KK, Lages FS, Maciel CA, Glória JC, Douglas-de-Oliveira DW. Prevalence of Mandibular Third Molars According to the Pell & Gregory and Winter Classifications. *Journal of Maxillofacial and Oral Surgery*. 2022 Jun; 21: 1-7.
- [14] Lau AA, De Silva RK, Thomson M, De Silva H, Tong D. Third Molar Surgery Outcomes: A Randomized Clinical Trial Comparing Submucosal and Intravenous Dexamethasone. *Journal of Oral and Maxillofacial Surgery*. 2021 Feb; 79(2): 295-304. doi: 10.1016/j.joms.2020.09.020.
- [15] Azab M, Ibrahim S, Li A, Khosravirad A, Carrasco-Labra A, Zeng L *et al.* Efficacy of Secondary Vs Primary Closure Techniques for the Prevention of Postoperative Complications After Impacted Mandibular Third Molar Extractions: A Systematic Review Update and Meta-Analysis. *The Journal of the American Dental Association*. 2022 Oct; 153(10): 943-56. doi: 10.1016/j.adaj.2022.04.007.
- [16] Pachipulusu PK. Comparative Study of Primary and Secondary Closure of the Surgical Wound After Removal of Impacted Mandibular Third Molars. *Oral and Maxillofacial Surgery*. 2018 Sep; 22: 261-66. doi: 10.1007/s10006-018-0696-8.
- [17] Shuja E, Orakzai GS, Khan MN, Siddiqui MO. Comparing Pain and Trismus in “Primary” and “Secondary” Closure of Surgical Wound After Removal of Impacted Mandibular Third Molar. *Journal of Rawalpindi Medical College*. 2020 Mar; 24(1): 8-11. doi: 10.37939/jrmc/vol24.iss1.3.
- [18] Maria A, Malik M, Virang P. Comparison of Primary and Secondary Closure of the Surgical Wound After Removal of Impacted Mandibular Third Molars. *Journal of Maxillofacial and Oral Surgery*. 2012 Sep; 11: 276-283. doi: 10.1007/s12663-011-0287-9.
- [19] Mahat AK, Yadav R, Yadav AK, Acharya P, Dongol A, Sagtani A *et al.* A Comparative Study of the Effect of Sutureless Versus Multiple Sutures Technique on Complications Following Third Molar Surgery in Nepalese Subpopulation. *International Journal of Dentistry*. 2020 Feb; 2020(1): 2-6. doi: 10.1155/2020/9314762.
- [20] Zhang Y, Zhuang P, Jia BO, Xu J, Cui Q, Nie L *et al.* Persistent Trismus Following Mandibular Third Molar Extraction and its Management: A Case Report and Literature Review. *World Academy of Sciences Journal*. 2021 Jan; 3(1): 1. doi: 10.3892/wasj.2020.73.