

# Comparison of Prevalence and Angulation of Impacted Third Molar among Erbil Population with That of Iraq Neighboring Countries: A Descriptive Retrospective Study

Khurshid A. Kheder<sup>(1)</sup>; Hassan A. Barzanji<sup>(2)</sup>; Sarkawt H. Ali<sup>(3)</sup>

**Background and objectives:** the problem of impacted teeth remain actual in all countries. Differences in ethnicity, culture and environment may play a role in its occurrence. The objective is to find the differences in prevalence of this problem between population of Erbil/Iraq and Iraqi neighboring countries.

**Patients and methods:** primary data of Erbil population and secondary data of Iraqi neighboring countries were used. A retrospective analysis done for all orthopantomograms in college of dentistry, then compared to published data of those countries.

**Results:** regarding the age and sex, there is no such significant differences between all included countries; considering dominant type of impaction, Kuwait was different from others by dominance of vertical impaction; Distoangular impaction in Erbil was twice of other countries.

**Conclusion:** there is no significant differences between Erbil population and Iraqi neighboring countries regarding the prevalence and angulation of impaction.

**Key words:** third molar impaction, Erbil, Iraq, middle east impaction prevalence.

---

<sup>(1)</sup> B.D.S., DMFS, Lecturer at the College of Dentistry- Hawler Medical University.

<sup>(2)</sup> B.D.S., M. Sc., Ph.D., Lecturer at the College of Dentistry- Baghdad University.

<sup>(3)</sup> B.D.S., M. Sc., Assistant Lecturer at the College of Dentistry- Hawler Medical University.

## Introduction

Impaction as an abnormality of tooth eruption process, in which the tooth fails to erupt to the normal level and position in the expected period of time<sup>1</sup>, seems to be the most common pathology of tooth eruption in modern communities. Third molars regarded to be the most commonly impacted teeth. Eruption direction and lack of enough space may play role as contributing factors.<sup>2</sup>

There is strong evidence of differences in incidence of such pathology between nations and in different geolocations. Such tendency has been shown by some authors and it ranges between 12% to 68.8%.<sup>3,4</sup> It is clear, such differences, in predominant features, may be the result of changes in genetics and habits. In Nigeria Olosoji HO (2000) compared both rural and urban area to see whether there is any difference. The study concluded that people in urban area are more prone to impaction than rural one.<sup>5</sup> The indigenous citizens of Australia, whose genetics and habits are different from those of non-indigenous, were with minimum amount of impaction (0.2 % and 99.8% respectively).<sup>6</sup> A well-studied theoretical explanation for angulation of impacted teeth still not present. Gregory M. Ness and Larry J. Peterson focused on three theories: root formation, length of arch and tooth maturation. The normal development and eruption

pattern, assuming that there is enough space, are bringing the tooth to its normal vertical position from horizontal and mesioangular respectively.<sup>7</sup> Under development of mesial root or over development of distal root are responsible for horizontal and mesioangular inclinations. The distoangular one may occur when there is over development of mesial and/or under development of distal root, and, vertical by underdevelopment of both roots. For this theory, genetics may play the cardinal role. The theory of inadequate space, for accommodation of developing third molar, as second possible cause of impaction, is much better studied. This theory directly linked to soft diet habit. The third theory-maturation theory claims that it is very important to have root maturation before or at the same time with completion of mandibular growth and bone mineral density.

Newly, bone mineral density was suggested as possible cofactor of impaction. Ethnicity may have role in differences in age at which bone mineral density reaches its peak. A study done on white, black and Hispanic populations showed that such parameter is at <16, 21 and 20 years old respectively.<sup>8</sup>

Determination of the prevalence, predominant site, side and angulation of impaction in Erbil city, in northern of Iraq, where population is a mixture between Kurds, Arabs, Turkman, Assyrians and others (the majority is Kurdish ethnicity) comparing results with that of neighboring countries, serves as the aim of this study.

## Methods

This is a descriptive retrospective study. The data base of the radiological department in college of Dentistry/Hawler medical university was used. All orthopantomogram digital images taken by machine FONAX PAN DG PLUS panoramic digital dental x-ray system manufactured by FONAX Srl Italy, were involved.

The images of all patients from May 2013 to October 2014 was evaluated for the presence or absence of impaction, orientation (Winter's classification), site, side age and sex. Patients below 18 years old were excluded. A case sheet formulated for this reason in Excel office format.

A random search carried out in the internet. For each Iraqi neighboring country, the first found author, with publication newer than 1990, was selected for comparison. In this way for Turkey, Iran, Saudi Arabia, Kuwait and Jordan the work of following authors were selected Topkara A. and Sari Z. (2013), Maryam-Alsada Hashemipour et al (2013), Ali H. Hassan (2010), Dhuha Al Feeli et al (2012), Hattab F.N. et al (1995) respectively.<sup>2, 3, 9-11</sup> At the end, general outline for the condition statistically analyzed to get answers for the main question of the aim. Data analysis carried out using SPSS program.

## Results

Total numbers of cases involved in this study are 740. The mean age was  $33.9 \pm 9.19$ . The age range that contains the majority of cases was 24-33 years old- 403 (54.5%), while the least was the group 54-63 years old - 17 (2.3%). Both sexes have the same portion 370 for each (50%). Out of all included impacted cases 63 (49.7%) were females and 165 (50.3%) male.

Our study showed that out of all included cases, 328 (44.32%) were with impacted teeth (Table 1). Out of which 294 (89.63%) were molars and 34 (10.37%) canines.

The picture of impacted teeth (Table 2) was as follow (from majority to minority): lower right 3<sup>rd</sup> molar 100 (30.5 %), lower left 3<sup>rd</sup> molar 97 (29.6%), upper right 3<sup>rd</sup> molar 49 (14.9%), upper left 3<sup>rd</sup> molar 48 (14.6%), upper right canine 19 (5.8%), upper left canine 12 (3.7%), lower right canine 2 (0.6%) and lower left canine 1 (0.3%). As to whether molars or canines have more prevalence of impaction, the difference between two groups

were significant at  $p < 0.05$ . The right and left side were not significantly different at  $p < 0.05$ .

**Table 1: Frequency of impaction.**

| Impaction | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| No        | 412       | 55.68   | 55.68         | 55.68              |
| Yes       | 328       | 44.32   | 44.32         | 100.0              |
| Total     | 740       | 100.0   | 100.0         |                    |

**Table 2: Picture of impacted teeth.**

|         |                       | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------|-----------------------|-----------|---------|---------------|--------------------|
| Valid   | Impaction of tooth 18 | 49        | 6.6     | 14.9          | 14.9               |
|         | impaction of tooth 28 | 48        | 6.5     | 14.6          | 29.5               |
|         | Impaction of tooth 38 | 97        | 13.1    | 29.6          | 59.1               |
|         | Impaction of tooth 48 | 100       | 13.5    | 30.5          | 89.6               |
|         | Impaction of tooth 13 | 19        | 2.6     | 5.8           | 95.4               |
|         | Impaction of tooth 23 | 12        | 1.6     | 3.7           | 99.1               |
|         | Impaction of tooth 33 | 1         | .1      | .3            | 99.4               |
|         | Impaction of tooth 43 | 2         | .3      | .6            | 100.0              |
|         | Total                 | 328       | 44.3    | 100.0         |                    |
| Missing | System                | 412       | 55.7    |               |                    |
| Total   |                       | 740       | 100.0   |               |                    |

Details of impaction of impacted molars for both genders revealed that the means of two groups are not significantly different at  $p < 0.05$  (male 151(46.17%) and female 142

(43.42%) of impacted teeth. For differences between jaws, regarding molar impaction, the study revealed that the means of impacted molars for both jaws are

significantly different at  $p < 0.05$  (maxilla 97 (33%) and mandible 197 (67%).

While for canine despite the maxilla predominance, the means were not significantly different at  $p < 0.05$ .

The orientation of impacted of lower third molar (Table 3) in our study was as follow: mesioangular – 91 (46.2), vertical 34

(17.25%), distoangular 36 (18.27%), horizontal 35 (17.76%) and transverse (buccolingual) 1(0.5%).

Regarding the picture of impaction in Iraqi neighboring countries, selected publication showed necessary information for interested aspects as it is shown in Tables 4 and 5.

**Table 3: Orientation of impacted teeth.**

|              |              | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------|--------------|-----------|---------|---------------|--------------------|
| Valid        | Mesioangular | 91        | 12.3    | 46.2          | 46.2               |
|              | Distoangular | 36        | 4.85    | 18.28         | 64.48              |
|              | Vertical     | 34        | 4.6     | 17.26         | 81.74              |
|              | Horizontal   | 35        | 4.75    | 17.76         | 99.5               |
|              | Transverse   | 1         | .13     | .5            | 100.0              |
|              | Total        | 197       | 26.63   | 100.0         |                    |
| Others       | System       | 543       | 73.37   |               |                    |
| <b>Total</b> |              | 740       | 100.0   |               |                    |

**Table 4: Jaw, side and gender predominance in Iraq and neighboring countries.**

| Country                                     | Majority: jaw | Majority: side | Gender        |
|---|---------------|----------------|---------------|
| Erbil, Iraq                                 | Mandible      | Right          | No preference |
| Turkey(Topkara A. and Sari Z. 2013)         | Equal         | Equal          | No preference |
| Iran (Maryam-Alsada Hashemipour et al 2013) | Mandible      | Equal          | Female        |
| Jordanian (Hattab F.N. et al 1995)          | Maxilla       | Not found      | Male          |
| Saudi Arabia (Ali H. Hassan 2010)           | Mandible      | Equal          | No preference |
| Kuwait (Dhuha Al Feeli et al 2012)          | Mandible      | Right          | Male          |

**Table 5: Direction of impacted tooth angulation in Iraqi neighboring countries.**

| Angulation   | Erbil, Iraq | Turkey (Topkara A, Sari Z. 2013) | Jordan (Hattab FN 1995) | Saudi Arabia (Hassan Ali H 2010) (Ali H Hassan 2010) | Kuwait (Dhuha Al Feeli 2012) | Iran (Hashemipour MA 2013) |
|--------------|-------------|----------------------------------|-------------------------|--|------------------------------|----------------------------|
| Mesioangular | 46.2        | 65.1                             | Half                    | 33.4   | 2.9                          | 48.3                       |
| Distoangular | 18.27       | 0.6                              | N/A                     | 16.6   | 11.4                         | 6.3                        |
| Vertical     | 17.25       | 6.6                              | 41                      | 20.6   | 39.3                         | 15.5                       |
| Horizontal   | 17.76       | 25.7                             | N/A                     | 27.5   | 27.4                         | 29.3                       |
| Buccolingual | 0.5         | 2.0                              | N/A                     | 1.7  | 0                            | 0                          |
| Inverted     | 0           | 0                                | N/A                     | 0  | 0                            | 0                          |

**Discussion**

Despite the differences in nationality language and may be habits, middle eastern groups have inherited about 4-15% of their gens as mixing of populations dating back roughly 32 generations.<sup>12</sup> Gens as predictors of growth of bones and teeth, may play role even in the path and way of eruption of teeth. Iraqi population as mixture of Arabs, Kurds, Turkmen and Assyrians, they are linked to neighboring countries by genes, cultural habits and even environment. The findings in our study, which were close to that of Iraqi neighboring countries, may show a gross fact of above relations.

The prevalence of impaction (327 cases 44.2%) in our study, is close to that of Saudi Arabia (40.5%), much higher than that of Jordan (1/3 of cases) and it is much less than that of Turkey (54.1%). The higher percentage in Turkey in comparison to other countries may indicate differences in life style.

Our results and those of Iraqi neighboring countries are not so different from that of many authors worldwide. Ananthalakshmi et

al (2012) showed the results of India - 41.2% and ensuring that it is close to that of Colombia and afro-americans. It is very close to that of a meta- analysis for world prevalence where it is 57.58% done by K. Carter<sup>1</sup> and S. Worthington (2016). Abu-Hussein Muhamad and Watted Nezar (2016) in addition to their results for Arab-Israeli – 19.2%, they mentioning least prevalence recorded in Nigeria rural area as 1.9% and the highest in China 80%.<sup>13, 14, 15</sup>

The age range that contains the majority of cases (24-33 years old with mean 33.9 ± 9.19, which had 403, 54.5%) clinically matches the age of clinically appearance of problem and it is close to results of included authors. Lukman (2008) and Katayon and Omed (2010)<sup>16,17</sup> investigating the same problem in Erbil showed 21-25 and 20-40 age ranges respectively as having most cases. According to Kruger et al (2001)<sup>18</sup> considering the 18 and even 20 years old, as the age when surgeons can decide whether the tooth is impacted or not, is not correct. In their study, teeth that were impacted by age 18 years old, 33.7% of

them by age 26 had fully erupted, 31.4% had been extracted, and 13.1% remained unerupted. Finding of 17 cases (2.3%) in age group 54-63 years old in our study, can be considered as a rare finding, because we could not find any data for this age range.

Both sexes had the same participation portion (370 for each 50%), and those who had impaction were 165 (50.3%) male and 63 (49.7%) females. Such result of Erbil population, in male dominance, is matching that of Turkey: 61.3% male, 51.0% female; Saudi Arabia: males 52.6%, females 47.4%; Kuwait: males 13%, females 10.9%; and Jordan: males 17.4%, and females 16.2%. Different from that of Erbil by Katayon and Omed (2010) and Iran by Maryam-Alsada Hashemipour et al (2013) in female dominance, where they showed 58%, 64.9% for female and 42%, 35.1% for male respectively. Different from that of Lukman (2008) that showed equal prevalence by 43.82%. It is hard to explain this finding by current study. There are some factors that supposed to play a role in picture of impaction, by making female dominance significant. Majority of women, in middle east, do not have active life style (house wives), they have smaller body texture and they reach peak of growth at an age, when third molars just starting eruption process, are among them. The results showed the reverse: slight male dominance in many countries (Iraq, Turkey, Kuwait and Jordan). Despite the slight differences in the number and percentage of impacted molars, the differences were not significant at  $p < 0.05$ . The same conclusion was found by Lukman, Topkara and Sari, Ali H. Hassan, Dhuha Alfeely et al, and some others. This result puts the effect of above female factors under question. Such tendency in Middle East may be explained by accessibility of advanced dental services for males more than females.

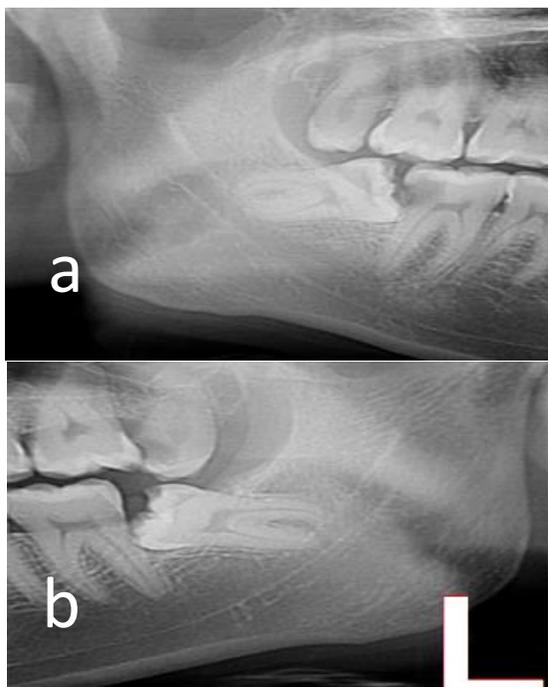
The prevalence of impacted teeth in both arches were the same. Mandible was the most

common site. The means of impacted molars for both jaws are significantly different at  $p < 0.05$  (maxilla 97 (33%) and mandible 197 (67%). Same mandible dominance was observed by Lukman (2008) and Katayon and Omed (2010) in Erbil population. Same tendency was noted in Saudi Arabia, Kuwait and Iran. It is not matching that of Jordan where maxilla was dominant site. In Turkey, there was no significant difference between both jaws (49.3% maxilla and 50.7% mandible).

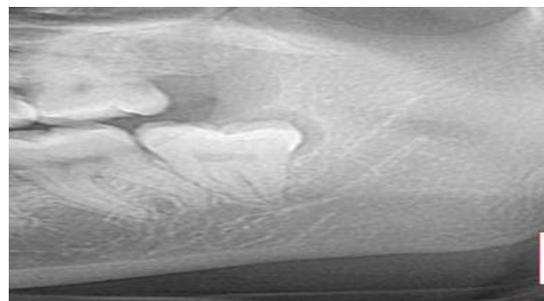
Regarding the side dominance, the study showed that lower right 3<sup>rd</sup> molar was the most frequently occurring impaction with a little difference to that of the same arch but on the left (0.9%). In upper arch the frequency of impaction of third molars on both sides, was half of the lower arch and there was by 0.4% higher incidence in the right side. Frankly, the right side and lower arch has higher tendency for impaction. It is not matching data of Kuwait where left was dominant, with Turkey and Iran where they were equal. We could not find a good logic explanation for this finding. Maybe the fact that the majority of people are right handed and they are using right side much more than left, serves as proposed theory, but it needs further study for confirmation.

Mesiangular orientation of impacted teeth was the most frequent. Same finding was recorded by Katayon and Omed (2010) and in all Iraq neighboring countries. The only exception was Kuwait, where vertical impaction was the most common. The percentage of such impaction among countries was different. Our result was half of that of Turkey (65.1%), much less than that of Iran (48.3%), but higher than that of Saudi Arabia and Kuwait (33.4% and 2.9% respectively). Genetically and habitually, the population of Erbil are much close to Arabic and Persian ethnicity. We think, for dominancy of mesioangular impaction, the sequence of development of roots serves as good explanation. The distal root may start first to

develop that pushes the crown to engage distal surface of the second molar. If the mesial root starts to develop first, then the crown will not be engaged and, even if it is impacted, the direction going to be vertical or distoangular one. (Picture 1, 2, 3, 4) We think curvature of roots may happen if they faced with dense bone layer e.g. inferior alveolar canal. Such hypothesis needs investigation and further study.



Picture 1: a and b OPG showing mesioangular impaction on both sides.



Picture 2: a and b OPG showing distoangular impaction.



Picture 3: OPG showing vertical impaction



Picture 4: OPG showing horizontal impaction

The bone mineral density and the age of its peak may serve as good explanation for impaction. If Middle East population having their peak of bone mineral density at 20 just like Hispanic ethnicity, so, developing roots of lower third molar may not be able to resorb a completed well mineralized cortical layer. The minerals content of water in most Middle East

countries may be similar, but we have no data to prove or refuse this information. We think that geological similarity may play its role. This is especially true for turkey and northern of Iraq.

The data used for those countries was what the accessible one for us. The sample size in some countries was small, and some aspects of the impaction of some countries were not present. Comparison between nations and countries should be further investigated.

To have better and in detail results regarding above concerning points there must be a group, in all these countries, who can work together. They should have the same sample size and sample selection. In addition to above mentioned characteristics of impaction, they should give more concentration on bone mineral density at alveolar process, timing of each root formation, age of eruption of third molar and age of mandibular growth completion.

### Conclusion

The features found in our study comparing with that of Iraq neighboring countries statistically are close to each other and, thus we could not show significant ethnical and /or cultural influence on impaction. Geographical influence like water contents and diet habits may have influence. This fact cannot be so definitely conclusive and need further investigation.

### Acknowledgement

We, all authors of this article, highly appreciate the support of deanery staff of college of dentistry in Hawler medical university, departments of oral and maxillofacial surgery, department of oral medicine and diagnostics, the director of outpatient clinics, and all who helped us even by a word.

Special thanks and appreciation for authors, in Iraqi neighboring countries, the work of whom we used in our study for comparison.

We have no conflict of interest and financial support. All ethical considerations were applied.

### References

1. James R. Hupp Principles of management of impacted teeth. In: Edward Ellis III. James R. Hupp, Myron R. Tucker Contemporary oral and maxillofacial surgery, Riverport Lane, St. Louis, Missouri: Elsevier Mosby; 2014. 6<sup>th</sup> ed., p. 143-167.
2. Topkara A, Sari Z Investigation of third molar impaction in Turkish orthodontic patients: Prevalence, depth and angular positions. *Eur J Dent* 2013;7:94-8. DOI: 10.4103/1305-7456.119084
3. Dhuha Al Feeli , Yasmeen Sebaa., Adel Al-Asfour, Prevalence of impacted teeth in adult patients: A radiographic study of Kuwaiti population. Kuwait University: Health Science Center/ faculty of dentistry. Elective Project Study Course 2012.
4. Quek SL, Tay CK, Tay KH, Toh SL, Lim KC Pattern of third molar impaction in a Singapore Chinese population: a retrospective radiographic survey. *Int J Oral Maxillofac Surg*. 2003 Oct; 32(5):548-52.
5. Olasoji HO, Odusanya SA Comparative study of third molar impaction in rural and urban areas of South-Western Nigeria. *Odontostomatol Trop*. 2000 Jun; 23(90):25-8.
6. Roslind Preethi George, Estie Kruger, Marc Tennant Hospitalisation for the surgical removal of impacted teeth: Has Australia followed international trend? *AMJ* 2011; 4(8): p. 425-430. <http://dx.doi.org/10.4066/AMJ.2011.688>
7. Gregory M Ness, Larry J Peterson, Impacted teeth. In: Michael Miloro, ed. Peterson's principles of oral and maxillofacial surgery. 2nd edit, London: BC Decker Inc, Hamilton; 2004. p. 139-155
8. A. B. Berenson, M. Rahman, G. Wilkinson Racial difference in the correlates of bone mineral content/density and age at peak among reproductive-aged women. *Osteoporos Int* 2009; 20:1439-1449 DOI 10.1007/s00198-008-0817-6
9. Hattab FN, Rawashdeh MA, Fahmy M.S. Impaction status of third molars in Jordanian students. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1995; 79(1):24-9. DOI: [http://dx.doi.org/10.1016/S1079-2104\(05\)80068-X](http://dx.doi.org/10.1016/S1079-2104(05)80068-X)
10. Maryam-Alsadat Hashemipour, Mehrnaz Tahmasbi-Arashlow, Farnaz Fahimi-Hanzaee Incidence of impacted mandibular and maxillary third molars: a radiographic study in a Southeast Iran population. *Med Oral Patol Oral Cir Bucal* 2013; 18(1):140-5:e140-5. doi:10.4317/medoral.18028

11. Ali H. Hassan Pattern of third molar impaction in a Saudi population. *Clin Cosmet Investig Dent* 2010; 2:109-113. DOI: 10.2147/CCIDEN.S12394
12. Priya Moorjani, Nick Patterson, Joel N. Hirschhorn, Alon Keinan, Li Hao, Gil Atzmon, Edward Burns, Harry Ostrer, Alkes L. Price, David Reich. The history of African gene flow into southern Europeans, Levantines, and Jews. *PLoS Genetics* 2011; 7 (4): e1001373 DOI: 10.1371/journal.pgen.1001373
13. Ananthakshmi Ramamurthy, Jeya Pradha, Sathiya Jeeva, Nadeem Jeddy, J Sunitha, Selva Kumar Prevalence of mandibular third molar impaction and agenesis: a radiographic south Indian study. *Journal of Indian Academy of Oral medicine and radiology* 2012; 24(3): 173-176
14. K. Carter, S. Worthington Predictors of Third Molar Impaction: A Systematic Review and Meta-analysis. *Journal of Dental Research* 2016; 95(3): 267–276
15. Abu-Hussein Muhamad and Watted Nezar Prevalence of impacted mandibular third molars in population of Arab Israeli: A retrospective study. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 2016;15(1 Ver. VII): 80-89
16. Lukman Fawzi Omar Prevalence of impacted wisdom teeth among Hawler young people. *MDJ* 2008; 5(1):97-103
17. Katayon N. Kurchid, Omed I. Shihab Prevalence of impacted third molar patients attending the Hawler college of dentistry: retrospective study. *Zanco J. Med. Sci.* 2010; 14(1):1-4
18. Kruger E, Thomson WM, Konthasinghe P Third molar outcomes from age 18 to 26: findings from a population-based New Zealand longitudinal study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2001 Aug; 92(2):150-5.

