

Article

A morphometric analysis of shape, size and position of mental foramen in dry human mandibles

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Academic Editor: Ajay Verma

Received: 1 January 2021; Accepted: 25 March 2021; Published: 30 March 2021.

Abstract: **Aim:** To calculate size, shape and position of mental foramen. **Materials & Methods:** 50 dry human mandibles of either gender (20- females, 30- males) were included. The position of mental foramen in horizontally was calculated based on classification proposed by Bokhari. The vertical position was divided into six types using the modified Ngeow and Yuzawati criteria. Size was measured both vertically and horizontally with the help of vernier caliper and expressed as mean. **Results:** Most common horizontal position was II seen in both males (left- 56%, right- 50%) and females (left- 60%, right- 58%). Most common vertical position was 2 seen in males (left- 62%, right- 65%) and females (left- 55%, right- 52%). Most common shape was oval seen in both genders (males- 68% left, 62% right) and (females- 70% left, 72% right). A significant difference was observed ($P < 0.05$). **Conclusion:** Variation in shape, size and position was observed both males and females, however, most common shape found to be oval and position was II horizontally and 2 vertically in both genders.

Keywords: Mental foramen; Shape; Position; Vertical.

1. Introduction

Mental foramen is an opening present on lateral aspect of mandible. These are two in number on right side and one on left side [1]. Here, the mandibular nerve unites with mental nerve and may continue as incisive nerve. It also carries mental vessels [2,3]. The location of mental foramen varies person to person and with different age group. The position of mental foramen both vertically and horizontally has been classified by various authors [4,5]. In children before eruption of teeth, it is normally present near alveolar crest. Similarly, in geriatric population due to continuous bone resorption it is close to the crestal bone [6]. Normally, it is present below premolars, the position may be between first and second premolar, anterior to first premolar, anterior to second premolar or anterior to first molar [7]. Vertically it is classified into 6 positions based on its occurrence within 2 mm of root of first premolar and second premolar. The occurrence of accessory mental foramen is not uncommon, if present, it usually lies below first molar [8].

Mental nerve innervates the lower lip, labial mucoperiosteum of the ipsilateral lower incisors, canine and premolars. The size and shape also vary. It is either oval, irregular or circular shape. Size may vary from 2-4 mm [9]. The thorough knowledge of position, size and shape of mental foramen is of great value as various surgical procedures such as insertion of dental implant, orthognathic surgeries, dental filling are frequently done in mandible [10]. Sometimes, surgical procedure performed on mandible can lead to paraesthesia of lower lip and chin if the position of mental foramen is not taken into consideration. Therefore, in order to prevent such iatrogenic injuries, the knowledge its exact location is of paramount importance [11]. Considering this, we attempted this study on 50 dry human mandibles to calculate size, shape and position of mental foramen.

2. Methodology

This observational study was conducted after consulting and obtaining no objection certificate from ethical and review committee of the institute. A total of 50 dry human mandibles of either gender (20- females, 30- males) were included.

The position of mental foramen in horizontally was calculated based on classification proposed by Bokhari. Position I: mesial to the first premolar; Position II: between the first and second premolars; Position III: distal to the second premolars. The radiographic vertical position was divided into six types using the modified Ngeow and Yuzawati criteria. Position 1: when it is present more than 2 mm inferior to the apex of the first premolar. Position 2: when it is present more than 2 mm inferior to the apex of the second premolar. o Position 3: when it is less than 2 mm inferior or at the apex of the first premolar. o Position 4: when it is 2 mm inferior or at the apex of the second premolar. o Position 5: when it is positioned superior to the apex of the first premolar. o Position 6: when it is present superior to the apex of the second premolar. All these findings were measured following radiographic analysis done on OPG radiograph taken with machine Allengers following all standardized parameters. Size was measured both vertically and horizontally with the help of vernier caliper and expressed as mean. Results of the present study after recording all relevant data were subjected for statistical inferences using chi-square test. The level of significance was significant if p value is below 0.05 and highly significant if it is less than 0.01.

3. Results

Table 1. Size of mental foramen.

Dimension (mean) (mm)	Male		Female		P value
	Left	Right	Left	Right	
Vertical	2.90	2.88	2.82	2.86	Non- significant, >0.05
Horizontal	3.15	3.12	3.20	3.21	Non- significant, >0.05

It was observed that mean vertical dimension of mental foramen in males left side was 2.90 mm and on right side was 2.88 mm and in females left side was 2.82 mm and on right side was 2.86 mm. Horizontal dimension was 3.15 mm in males left side and 3.12 mm on right side and 3.20 mm in females left side and 3.21 mm in right side. A non-significant difference was observed ($P > 0.05$) (Table 1).

Table 2. Position of mental foramen.

Position	Category	Male		Female		P value
		Left	Right	Left	Right	
Horizontal	I	30%	39%	22%	25%	<0.05
	II	56%	50%	60%	58%	>0.05
	III	14%	11%	18%	20%	<0.05
Vertical	1	5%	3%	2%	5%	>0.05
	2	62%	65%	55%	52%	<0.05
	3	3%	4%	14%	11%	<0.05
	4	30%	28%	22%	24%	>0.05
	5	0	0	7%	8%	<0.05
	6	0	0	0	0	-

Most common horizontal position was II seen in both males (left- 56%, right- 50%) and females (left- 60%, right- 58%). Most common vertical position was 2 seen in males (left- 62%, right- 65%) and females (left- 55%, right- 52%). A significant difference was observed ($P < 0.05$) (Table 1, Figure 1).

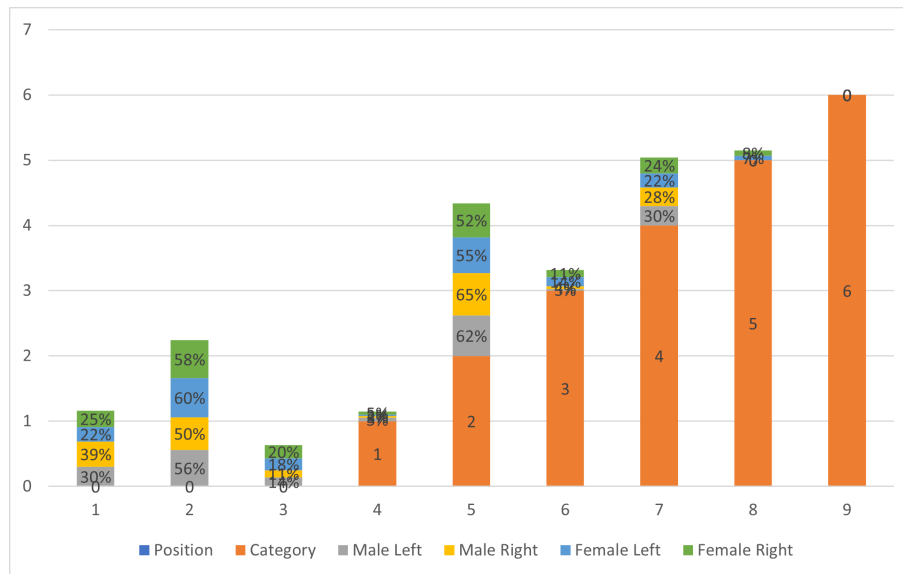


Figure 1. Graphic representation of the effect of ICT Solutions on total anthropogeapainic GHG supply

Table 3. Shape of mental foramen

Shape	Male		Female		P value
	Left	Right	Left	Right	
Circular	12%	20%	14%	13%	>0.05
Oval	68%	62%	70%	72%	<0.05
Irregular	20%	18%	16%	15%	>0.05

Most common shape was oval seen in both genders (males- 68% left, 62% right) and (females- 70% left, 72% right). A significant difference was observed ($P < 0.05$) (Table 3).

4. Discussion

An exact location, position, size and shape of mental foramen is essential to avoid any injury to it [12]. Failure to have thorough knowledge may lead to complication such as loss of sensation of lower lips. In completely edentulous patients, construction of complete denture is one of the treatment options especially in old patients [13]. Even in cases where dental surgeon is planning an implant supported overdenture, the position is important [14]. Excessive pressure of lower arch denture on mental foramen can illicit pain or insertion of dental implant in mental foramen is the causative factor for paraesthesia. All these factors need to be studied carefully. In our study we took 50 dry human mandibles of both genders [15,16]. We compared the size, shape and position in both genders.

Our study found higher vertical dimension in males compared to females. In males on left side was 2.90 mm and on right side was 2.88 mm and in females left side was 2.82 mm and on right side was 2.86 mm. Horizontal dimension was 3.15 mm in males left side and 3.12 mm on right side and 3.20 mm in females left side and 3.21 mm in right side. Bello [17] in their study took 320 orthopantomograms of subjects and observed that most of the foramina analysed were horizontally positioned between the mandibular first and second premolars (65.9%) and vertically positioned greater than 2 mm below the apex of the second mandibular premolars. The average vertical dimension and horizontal dimension of the foramen is 2.87 mm and 3.56 mm respectively with 55.2% of the foramen analysed being ovoid in shape. Asymmetrical mental foramina were seen in 164 subjects (51.3%) while 156 subjects had symmetrical mental foramina (48.7%). A study done on a Turkey population reported the HD to be 2.93 mm on the right side and to be 3.14 mm on the left side; the vertical Diameter (VD) was 2.38 mm on the right side and it was 2.64 mm on the left side.

Our study showed that most common horizontal position was II seen in both males ie. left- 56%, right- 50% and females ie. left- 60%, right- 58%. Most common vertical position was 2 seen in males ie. left- 62%,

right- 65% and females ie. left- 55%, right- 52%. Cabanillas [18] in their study using 180 cone beam CTs analyzed the distance between the upper and lower cortical areas of the mental foramen to the alveolar crest and the mandibular basal bone respectively, as well as the location, shape, size and presence of accessory holes. The mean of the upper cortical area in relation to the alveolar crest was 15.00 mm and the mean of the lower cortical area to the mandibular basal bone was 13.75 mm. The most frequent location was the longitudinal axis of the second premolar (44.4% right side and 47.2% left side). The predominant shape was oval and the size was in the range of 2.00 mm to 2.99 mm. Accessory holes were present in 55.5% of cases.

It was shown in our results that most common shape was oval seen in 68% left and 62% right side in males and 70% left and 72% right in females. Udhaya *et al.*, [19]. conducted a study on 90 adult dry human mandibles to locate position and found that the mental foramen was located at the level of the root of the 2nd premolar, midway between the inferior margin and the alveolar margin of the mandible. Most of the mental foramina were oval in shape. The orientation of the foramen was postero-superior in 83% of the mandibles. The accessory foramina were noted in five mandibles. Our study did not report any occurrence of accessory foramen in either side of genders. Cag Irankaya *et al.*, [20]. reported AMFs below the 1st molar.

5. Conclusion

Variation in shape, size and position was observed both males and females, however, most common shape found to be oval and position was II horizontally and 2 vertically in both genders.

Conflicts of Interest: "The author declares no conflict of interest."

References

- [1] Marzola C. (1989). *Anesthesiologia*. 1st Ed. Sao Paulo, Pancast Editorial.
- [2] Agthong, S., Huanmanop, T., & Chentanez, V. (2005). Anatomical variations of the supraorbital, infraorbital, and mental foramina related to gender and side. *Journal of Oral and Maxillofacial Surgery*, 63(6), 800-804.
- [3] Green, R. M. (1987). The position of the mental foramen: a comparison between the southern (Hong Kong) Chinese and other ethnic and racial groups. *Oral Surgery, Oral Medicine, Oral Pathology*, 63(3), 287-290.
- [4] Santini, A., & Land, M. (1990). A comparison of the position of the mental foramen in Chinese and British mandibles. *Cells Tissues Organs*, 137(3), 208-212.
- [5] Seema, S., Bhavana, D., Kamlesh, T., & Penci, C. A. (2014). Morphometric analysis of mental foramen in human mandibles of Gujarat region. *International Journal of Research in Health Sciences*, 3, 36-7.
- [6] Sawyer, D. R., Kiely, M. L., & Pyle, M. A. (1998). The frequency of accessory mental foramina in four ethnic groups. *Archives of Oral Biology*, 43(5), 417-420.
- [7] Al-Juboori, M. J., Al-Wakeel, H. A., Yun, C. M., & Wen, F. S. (2013). Location of mental foramen among Malaysia populations: retrospective study by using orthopantomogram. *World Journal of Medicine and Medical Science*, 1(5), 85-90.
- [8] Olasoji, H. O., Tahir, A., Ekanem, A. U., & Abubakar, A. A. (2004). Radiographic and anatomic locations of mental foramen in Northern Nigerian adults. *The Nigerian Postgraduate Medical Journal*, 11(3), 230-233.
- [9] Alok, A., Singh, I. D., Panat, S. R., Singh, S., Kishore, M., & Jha, A. (2017). Position and symmetry of mental foramen: A radiographic study in bareilly population. *Journal of Indian Academy of Oral Medicine and Radiology*, 29(1), 16-19.
- [10] Mbajjorgu, E. F., Mawera, G., Asala, S. A., & Zivanovic, S. (1998). Position of the mental foramen in adult black Zimbabwean mandibles: a clinical anatomical study. *The Central African Journal of Medicine*, 44(2), 24-30.
- [11] Budhiraja, V., Rastogi, R., Lalwani, R., Goel, P., & Bose, S. C. (2013). Study of position, shape, and size of mental foramen utilizing various parameters in dry adult human mandibles from north India. *International Scholarly Research Notices*, 2013, Article ID 961429, <https://doi.org/10.5402/2013/961429>.
- [12] Oliveira Junior, E. M., Araújo, A. L. D., Da Silva, C. M. F., Sousa-Rodrigues, C. F., & Lima, F. J. C. (2009). Morphological and morphometric study of the mental foramen on the M-CP-18 Jiachenjiang point. *International Journal of Morphology*, 27(1), 231-238.
- [13] Shah, S., Vaze, S., & Kinhal, K. (2010). A variation in the position of the mental foramen: a case report. *Journal of Maxillofacial and Oral Surgery*, 9(3), 307-309.
- [14] Ōivanovic, S. (1970). Some morphological characters of the East African mandible. *Cells Tissues Organs*, 77(1), 109-119.
- [15] Neiva, R. F., Gapski, R., & Wang, H. L. (2004). Morphometric analysis of implant-related anatomy in Caucasian skulls. *Journal of Periodontology*, 75(8), 1061-1067.

- [16] Bokhari, K., Shahrani, A. A., Mustafa, A. B., Hdban, Y., Saleh, M., & Mofareh, A. (2016). Position of Mental Foramen among Saudi Population: A Radiographic Study. *International Journal of Experimental Dental Science*, 5(2), 109-112.
- [17] Bello, S. A., Adeoye, J. A., Ighile, N., & Ikimi, N. U. (2018). Mental foramen size, position and symmetry in a multi-ethnic, urban black population: Radiographic evidence. *Journal of Oral & Maxillofacial Research*, 9(4), e2.
- [18] Cabanillas Padilla, J., & Quea Cahuana, E. (2014). Morphological and morphometric study of the mental foramen using cone-beam CT in dentate adult patients. *Odontostomatología*, 16(24), 4-12.
- [19] Udhaya, K., Saraladevi, K. V., & Sridhar, J. (2013). The morphometric analysis of the mental foramen in adult dry human mandibles: a study on the South Indian population. *Journal of Clinical and Diagnostic Research*, 7(8), 1547-1551.
- [20] Çagirankaya, L. B., & Kansu, H. (2008). An accessory mental foramen: a case report. *The Journal of Contemporary Dental Practice*, 9(1), 98-104.



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