

UDK 37

ISSN 2545 - 4439  
ISSN 1857 - 923X

# INTERNATIONAL JOURNAL

Institute of Knowledge Management

# KNOWLEDGE



**Scientific Papers**

Vol. 31. 4.

**MEDICAL SCIENCES AND HEALTH**



**KIJ**

**Vol. 31**

**No. 4**

**pp. 811 - 1198**

**Skopje 2019**

Global Impact & Quality Factor 1.822 (2107) <http://globalimpactfactor.com/knowledge-international-journal/>



KNOWLEDGE – International Journal  
Vol.31.4  
June, 2019

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**KNOWLEDGE**



**INTERNATIONAL JOURNAL**

**SCIENTIFIC PAPERS  
VOL. 31.4**

*Promoted in Budva, Montenegro  
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**Print:** GRAFOPROM – Bitola

**Editor:** IKM – Skopje

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**KNOWLEDGE - International Journal Scientific Papers Vol. 31.4**

**ISSN 1857-923X** (for e-version)

**ISSN 2545 – 4439** (for printed version)



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**CONTENTS**

ETIOLOGY OF CIRCULAR CARIES .....	829
Olga Kokoceva-Ivanovska .....	829
Efka Zabokova-Bilbilovska .....	829
Mijoska Aneta .....	829
BIOCOMPATIBILITY AND REACTION OF DENTAL POLYMERS IN ORAL ENVIRONMENT .	835
Natasha Stavreva .....	835
Biljana Kapusevska .....	835
STUDY OF THE SIZE OF THE ANGLE OF THE MANDIBLE .....	841
Svetlana Jovevska .....	841
Mihajlo Petrovski .....	841
DENTAL SCANNERS IN PROSTHODONTICS .....	845
Blagoja Dashtevski .....	845
Aneta Mijoska .....	845
Marjan Petkov .....	845
Vanco Spirov .....	845
Oliver Dimitrovski .....	845
TEETH EXTRACTION WITH ROOT DELACERATION ON THE ORTHODONTIC INDICATIONS	
.....	853
Pavel Stanimirov .....	853
Greta Yordanova .....	853
DIFFERENCE IN CRANIOFACIAL CHARACTERISTICS IN ATTRACTIVE MALE AND FEMALE	
FACES .....	859
Sofija Carceva Shalja .....	859
Sandra Atanasova .....	859
Mihajlo Petrovski .....	859
ORAL TISSUE CONDITION IN PROSTHODONTIC GERIATRIC PATIENTS .....	865
Aneta Mijoska .....	865
Gordana Kovacevska .....	865
Georgi Tomov .....	865
INTRODUCTION TO ORTHODONTIC EDUCATION IN BULGARIA OF DIGITAL	
TECHNOLOGIES AND 3D ARCHIVING .....	869
Greta Yordanova .....	869
Martin Mladenov .....	869
INDICATIONS FOR MOLAR EXTRACTION DURING ORTHODONTIC TREATMENT .....	873
Sandra Atanasova .....	873
Sofija Carceva Salja .....	873
Ljubica Prosheva .....	873
COMPOSITE RESTORATIONS IN DENTISTRY .....	879
Aleksandar Andreevski .....	879
INFLUENCE OF GROWTH IN TREATED CLASS III GROWING PATIENTS WITH FACE MASK	
THERAPY AND UNTREATED PATIENTS .....	883
Sofija Carceva Shalja .....	883
Sandra Atanasova .....	883
POSITION OF THE MENTAL FORAMEN IN CORELATION WITH THE LOWER PREMOLARS: A	
PANORAMIC RADIOGRAPHIC STUDY .....	889
Mihajlo Petrovski .....	889
Svetlana Jovevska .....	889
Olivera Terzieva-Petrovska .....	889

PREVALENCE OF DENTAL CARIES IN CORRELATION WITH ORAL HYGIENE .....	895
Ivona Kovacevska.....	895
Natasha Longurova.....	895
Katerina Zlatanovska.....	895
THE SIGNIFICANCE OF TRAINING AND EDUCATION IN ACCURATE EVALUATION OF NATURAL TOOTH COLOR .....	901
Julija Zarkova .....	901
Ivan Nacevski .....	901
Vesna Korunovska Stefkovska .....	901
FUNCTIONAL RECOVERY OF VOICE FUNCTION IN PATIENTS WITH LARYNGEAL DYSFUNCTION: OBSERVATIONAL STUDY .....	905
Galina Mratskova .....	905
Damyam Petrov .....	905
THE INFLUENCE OF HYPERPROLACTINEMIA ON THE LEVEL OF FSH AND LH IN WOMEN .....	911
Mire Spasov.....	911
Verica Spasova .....	911
ACREDITED MOLECULAR METHODS FOR DETECTION OF INFECTIONS CAUSED BY HIV, HEPATITIS B VIRUS AND HEPATITIS C VIRUS .....	917
Belinda Gelmanovska.....	917
Vaso Taleski .....	917
FLUORESCENT IN SITU HYBRIDIZATION AND IMMUNOHISTOCHEMISTRY FOR SUBTYPING “NON-CLASSIFIABLE” RENAL CELL CARCINOMAS .....	921
Atanas Ivanov .....	921
Vili Stoyanova .....	921
JEJUNAL ADENOCARCINOMA: A CASE REPORT .....	925
Gordana Bozhinovska Beaka.....	925
Biljana Prgova Veljanovska .....	925
Milka Zdravkovska.....	925
Irena Eftimovska Rogac .....	925
Nadica Bozhinovska .....	925
THE ROLE OF TUMOR MARKERS CA 125, CA 72-4 AND CA 19-9 IN DETECTION AND MONITORING OF THE COURSE OF DISEASE OF OVARIAN CARCINOMA AND CARCINOMA OF THE UTERINE BODY .....	931
Kristina Petkova .....	931
Venci Chalkov .....	931
SPLenic ABSCESS IN PATIENT WITH CHRONIC PANCREATITIS: A CASE REPORT .....	937
Gordana Bozhinovska Beaka.....	937
Biljana Noveska-Petrovska.....	937
Biljana Prgova Veljanovska .....	937
Nadica Bozhinovska .....	937
ROLE OF GOUT IN ATRIAL FIBRILLATION.....	943
Antoniya Kisheva .....	943
DEVELOPMENT ROLE AND IMPORTANCE OF FETAL AUTOPSY SCIENTIFIC PURPOSES - REVIEW OF THE LITERATURE.....	947
Tanya Kitova .....	947
BARRIERS TO THE EFFECTIVENESS OF DISEASE MANAGEMENT IN PEOPLE WITH DIABETES MELLITUS .....	953
Boryana Levterova .....	953

DYABETTE CONTROL PROGRAM AND PREVENTION OF THEIR CONDITIONS - PROPOSALS AND GUIDELINES .....	959
Varvara Pancheva.....	959
Valentin Vassilev.....	959
ALGORITHM OF COMPLEX PROGRAM FOR TREATMENT AND REHABILITATION IN DEGENERATIVE DISEASES OF THE VERTEBRAL COLUMN IN THE CERVICAL AREA. PREVENTION OF CERVICAL ARTHROPATHY.....	963
Petya Kasnakova.....	963
THE DIAGNOSIS OF DAUCUS CAROTA AS ALERGOGEN ON THE IMMUNE SYSTEM IN WHITE LABORATORY RAT .....	969
Mire Spasov.....	969
Icko Gjorgoski .....	969
THE DIAGNOSIS OF PHLEUM PRATENSE AS ALERGOGEN ON THE IMMUNE SYSTEM IN WHITE LABORATORY RAT .....	975
Hristijan Spasov.....	975
Mire Spasov.....	975
Icko Gjorgoski .....	975
Majlinda Ademi.....	975
INCREASED MEASLES MORBIDITY AND PUBLIC AWARENESS OF THE RISKS OF REFUSING IMMUNIZATION FOR THIS DISEASE .....	981
Ivelina Dobрева .....	981
Pavlina Teneva .....	981
Tsvetana Bojkova .....	981
PERSPECTIVES IN HEALTH CARE FOR CHILDREN WITH SPECIAL NEEDS IN CHILDREN'S AND SCHOOL HEALTH.....	985
Monika Obreykova.....	985
Galina Terzieva.....	985
MYOPIA IN PRE-SCHOOL CHILDREN AND MOBILE PHONES .....	991
Aleksandar Dodevski.....	991
Strahil Gazepov .....	991
Biljana Dodevska.....	991
Alen Georgijev .....	991
VISUAL SCREENING OF SCHOOL CHILDREN IN THE MUNICIPALITY OF SAPAREVA BANYA IN SOUTHWESTERN BULGARIA.....	995
Slavena Stoykova .....	995
Ekaterina Petrova.....	995
WETTABILITY – ANOTHER PARAMETER FOR GOOD FITTING OF A SILICONE-HYDROGEL DAILY DISPOSABLE CONTACT LENS .....	1001
Nikola Peev .....	1001
SUCCESSFUL COGNITIVE AGING - COGNITIVE RESERVE AND NEUROPLASTICITY .....	1005
Antonia Yaneva .....	1005
Kristina Kilova .....	1005
Teodora Dimcheva .....	1005
THE ROLE OF ACUPUNCTURE IN THE REHABILITATION OF PARALYSIS OF N.FACIALIS .....	1009
Lence Nikolovska .....	1009
Stefanija Gjorgieva.....	1009
Mire Spasov .....	1009

NEED FOR TRAINING OF HEALTHCARE PROFESSIONALS FROM OUTPATIENT CARE FOR BURNS INJURIES .....	1013
Anushka Dimitrova.....	1013
CARE AND TREATMENT IN PATIENTS WITH HEPATITIS B IN THE MUNICIPALITY OF PRILEP .....	1019
Panova Gordana.....	1019
Boshevska Viktorija .....	1019
Liljana Simonovska .....	1019
Iva Paneva .....	1019
Lenche Nikolovska .....	1019
Mire Spasov .....	1019
Gjorgji Shumanov.....	1019
ACUTE VENLAFAXINE OVERDOSE WITH POSITIVE URINE IMMUNOASSAY FOR TRAMADOL – CLINICAL AND DIAGNOSTIC OVERLAP - CASE REPORT AND LITERATURE OVERVIEW .....	1027
Pereska Zanina.....	1027
Janicevic-Ivanovska Danijela .....	1027
Bekjarovski Niko.....	1027
Simonovska Natasha.....	1027
Babulovska Aleksandra .....	1027
DRUG-INDUCED NEUTRALIZING ANTIBODIES TO TNF- $\alpha$ BLOCKES IN PATIENTS WITH INFLAMMATORY JOINT DISEASES FOLLOWED BY 24-MONTHS.....	1033
Krassimir Kraev.....	1033
Mariela Geneva-Popova .....	1033
Velichka Popova.....	1033
Stanislava Popova.....	1033
INFORMATION AND KNOWLEDGE OF THE ANTIBIOTICS AND THE ANTIBIOTIC RESIDENCE OF THE POPULATION FROM THE SOUTHEAST REGION OF REPUBLIC OF NORTH MACEDONIA .....	1039
Milka Zdravkovska.....	1039
Marija Darkovska-Serafimovska .....	1039
Gordana Bozinovska-Beaka .....	1039
Svetlana Zivkova .....	1039
SIMPLE LIQUID CHROMATOGRAPHY METHOD WITH UV DETECTION FOR DETERMINATION OF BROMAZEPAM IN SOLID PHARMACEUTICAL DOSAGE FORMS .....	1045
Irena Brcina .....	1045
Marija Darkovska Serafimovska .....	1045
Tijana Serafimovska .....	1045
Trajan Balkanov .....	1045
Biljana Gjorgjeska.....	1045
CONSUMPTION ANALYSIS OF MOST PRESCRIBED ANTIBIOTICS FINANCED BY THE HEALTH INSURANCE FUND IN REPUBLIC OF NORTH MACEDONIA .....	1051
Elena Drakalska.....	1051
Bistra Angelovska.....	1051
Veneta Zdravkova.....	1051
MICROBIOLOGICAL DIAGNOSIS AND IMPORTANCE OF INFECTIONS CAUSED BY INFLENZAE – A VIRUS.....	1057
Zivadinka Cvetanovska .....	1057
Vaso Taleski .....	1057



POISONOUS SNAKES OF BULGARIA: CLINICAL AND EPIDEMIOLOGICAL ANALYSIS .....	1063
Olimpiada Atmazhova .....	1063
Evgenia Barzashka .....	1063
Iskra Petkova .....	1063
BODY FAT DISTRIBUTION AND LIPID PROFILE CHANGES AFTER WEIGHT LOSS – A CASE REPORT .....	1071
Slavica Shubeska Stratrova .....	1071
Danijela Janicevic Ivanovska .....	1071
FACTORS FOR OBESITY IN STUDENTS FROM THE SCHOOLS .....	1077
Antoaneta Grozeva .....	1077
INFLUENCE OF SUNSHINE ON THE SERUM LEVELS OF VITAMIN D .....	1081
Ivelina Dobрева .....	1081
Pavlina Teneva .....	1081
Valya Trencheva.....	1081
GEOMEDICAL TOURISM – OUTDOOR HEALTH CARE FACILITIES ANTI-GEOPATHIC STRESS TREATMENT .....	1087
Krasimira Staneva.....	1087
APPLICATION OF BLASTWARE SOFTWARE FOR MEASURING MICROCOLIMIC CONDITIONS .....	1093
Naim Baftiu .....	1093
Raif Bytyqi .....	1093
Overall, the number of measurements .....	1096
Percentage .....	1096
APPLICATION OF BIOPRINTING IN CONTEMPORARY MEDICINE (REVIEW).....	1099
Desislava Bakova .....	1099
Kristina Kilova .....	1099
Maria Semerdjieva.....	1099
CBRN EVENT - DO WE NEED MEDICAL INTELLIGENCE .....	1103
Elena Valkanova.....	1103
Rostislav Kostadinov.....	1103
ACUTE PANCREATITIS .....	1107
Redzep Emurlai .....	1107
PALLIATIVE CARE AND EUTHANASIA – CONVERGENCE POINTS AND PUBLIC ATTITUDES .....	1113
Nikola Sabev.....	1113
SOCIOECONOMIC CHARACTERISTICS OF PATIENTS WITH TENSION HEADACHE IN MUNICIPALITY OF VELES .....	1119
Elena Manchevska.....	1119
Toshe Krstev.....	1119
Gordana Panova.....	1119
SEASONALITY IN THE APPEARANCE OF INTRA HOSPITAL INFECTIONS .....	1127
Emilija Chapevska.....	1127
PEDAGOGICAL COMPETENCE OF MENTORS DURING THE PRE-GRADUATION TRAINEESHIP OF FUTURE NURSES .....	1131
Snezhana Dragusheva.....	1131
Penka Petleshkova.....	1131
Tanya Paskaleva .....	1131

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THE ROLE OF THE PATRONAGE NURSE IN THE PREVENTION AND EARLY DETECTION OF DISEASES IN CHILDREN UP TO 12 MONTHS OF AGE .....	1135
Donka Kostadinova .....	1135
Gordana Panova.....	1135
STANDARDIZATION AS AN APPROACH TO IMPROVING THE QUALITY OF CLINICAL AND LABORATORY WORK .....	1143
Denitsa Trancheva .....	1143
CONCEPTS FOR RESEARCH OF PATIENTS SATISFACTION .....	1149
Alexander Alexandrov.....	1149
STUDY ON ACCESSIBILITY TO MEDICAL CARE IN BULGARIA – PATIENT’S OPINION....	1153
Darina Mineva .....	1153
LEVEL OF CONFLICT IN PUBLIC HOSPITALS .....	1157
Ekaterina Raykova.....	1157
Maria Semerdjieva.....	1157
EXTRA RESOURCES POOL - A PREREQUISITE FOR HOSPITAL DISASTER RESILIENCE....	1163
Mariya Georgieva .....	1163
Rostislav Kostadinov .....	1163
STRATEGIC PLANNING OF UNIVERSITY SCIENTIFIC PUBLISHING HOUSE TO THE MEDICAL UNIVERSITY - PLOVDIV .....	1167
Kristina Kilova .....	1167
Todor Stoev .....	1167
STUDENT SATISFACTION BY QUALITY OF TRAINING IN SUBJECT “HEALTHCARE MANAGEMENT” .....	1175
Kamelia Bogdanova .....	1175
TRENDS IN THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE FIELD OF HEALTHCARE - A LITERARY REVIEW .....	1181
Kristina Kilova .....	1181
Denis Milkov .....	1181
Tanya Kitova .....	1181
Nonka Mateva.....	1181
THE ACADEMIC FORMATION OF NEW LOGOPEDIANS IN ALBANIAN MEDICAL FACULTIES .....	1189
Aurela Basha.....	1189
Lidra Ballhysa.....	1189
CHARACTERISTICS OF THE HEALTH CARE SYSTEM .....	1195
Wioletta Świeboda.....	1195

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**POSITION OF THE MENTAL FORAMEN IN CORELATION WITH THE LOWER PREMOLARS: A PANORAMIC RADIOGRAPHIC STUDY**

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**Mihajlo Petrovski**Faculty of medical sciences, University “Goce Delcev” Stip, Republic of North Macedonia,  
mihajlo.petrovski@ugd.edu.mk**Svetlana Jovevska**Faculty of medical sciences, University “Goce Delcev” Stip, Republic of North Macedonia,  
svetlana.jovevska@ugd.edu.mk**Olivera Terzieva-Petrovska**Faculty of medical sciences, University “Goce Delcev” Stip, Republic of North Macedonia,  
oliveraterzieva@yahoo.com

**Abstract:** Background: Evaluation of the position of foramen mentale has great significance and it is very important aids in endodontic, oral-surgical, periodontal interventions, as well as diagnostic procedures. Thus, in view of this, the present study was conducted among the population in North Macedonia, to determine the most common location of the mental foramen and to estimate difference in position of foramen mentale in correlation with the second lower premolar teeth. The mental foramen is an opening located on the external surface of the mandible in the region of the mandibular premolars. Radiographically the foramen mentale can be as an oval or round radiolucent zone in the inferior part of corpus mandible on lateral sides, on the left and right side. Panoramic radiographs are the most commonly used extra-oral radiographic aids in dentistry since they provide a rapid and wide picture of mandible and the maxilla in the same time. This technique allows the adequate localization of foramen mentale. The main aim of study is to evaluate the position of the mental foramen and its relationship with mandibular premolars among the population in Republic of North Macedonia

Material and method: A total number of 250 panoramic radiographs were evaluated for the positioning of the mental foramen. When assessing the position of the mental foramen, its position is determined in relation with the mandibular premolars and the mandibular median line. All radiographic images in which can not be localized and confirmed the presence of the mental aperture was also excluded from the examination. The examination was performed on a negatoscope if it is classical panoramic x-ray or adequate software used for digital panoramic x-rays. If necessary, magnification was used for magnification of the images. The relationship of foramen mentale with the lower premolars was given according to the following classification: (1) if the position of foramen mentale is distally from the line that passes between the second premolar and the first molar in the lower jaw-first class; (2) if the position of foramen mentale is between the vertical central axis of the second premolar and the passing line between the second premolar and the first molar in the lower jaw- second class; (3) if the position of the foramen mentale is between the vertical axis of the second premolar and the line passing between the first and second premolars in the lower jaw- third class; (4) if the position of foramen mentale is between the line that passes between the first and second premolars in the lower jaw and the vertical central axis of the first premolar-fourth class and if the position of foramen mentale is mesially from the vertical center axis of the first premolar- fifth class. Results: On the basis of the data from our research, it is noted that in near 60%, foramen mentale is positioned between the roots of the first and second lower premolars. The most common position for foramen mentale is the third class (which means that foramen mentale is between the vertical axis of the second premolar and the line passing between the first and second premolars in the lower jaw).

Conclusion: In conclusion, the present results showed variations in position of foramen mentale. So it must be noted that local differences in foramen mentale position may occur in a population. This variability should alert the oral surgeons while performing oral surgical and periodontal interventions. If the studies related to variations in the position of foramen mentale are carried out in larger numbers, this data will be reliable for dental medicine clinicians, and with this type of information the possibility of complications will be minimized.

**Keywords:** foramen mentale, mental foramen, Ortodontomogram, panoramic x-ray

**INTRODUCTION**

Evaluation of the position of foramen mentale has great significance and it is very important aids in endodontic, oral-surgical, periodontal interventions, as well as diagnostic procedures. Thus, in view of this, the present study was conducted among the population in North Macedonia, to determine the most common localization of the

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mental foramen and to estimate difference in position of foramen mentale in correlation with the second lower premolar.

The mental foramen is an opening located on the external surface of the mandible in the region of the mandibular premolars. The inferior alveolar blood vessels and nerve after being conveyed through the mandibular canal exit as the mental blood vessels and nerve. This nerve is responsible for innervating the lower lip, labial mucoperiosteum of the lower incisors, canine and premolars as well as the mental region.

The position of the foramen is of significant importance in procedures of local anesthesia of the terminal branches of the inferior alveolar nerve together with the mental nerve. In clinical practice, anaesthesia of these nerves could be effectively obtained just if the mental foramen is adequately located by the clinician and the anesthetic solution dropped within it.[1] It is also a very important structure for evaluation of the maturity of the lower jaw, placement of dental implants, remodeling activity of the bone.[2]

Normally, mental foramen is located below the interval between the lower premolars. However, variations in the location of the foramen have been reported. It most common lie between the apices of lower premolars or below the apex of second premolar.[3]

According to Bello et al.,[4] most of the analyzed foramina were horizontally positioned between the mandibular first and second premolars (65.9%) and vertically positioned higher than 2 mm below the apex of the second mandibular premolars. Srinivas et al in their research noted that the most common position of the foramen mentale was along the long axis of the second premolar in the north Indian population and in southern Indian populations it was found to be between the first and second premolar.[5] According to Cartes et al.[6] foramen mentale is usually located between the apices of the first and second premolars in younger individuals and immediately below the apex of the inferior second premolar in older individuals. Similar to previously presented data, Curie et al.[7] showed that the most common position for foramen mental is between the first and second premolar teeth when using both premolar crowns (51%) and apices (76%) as reference points.

Radiographically the foramen mentale can be seen as an oval or round radiolucent zone in the inferior part of corpus mandible on lateral sides, on the left and right side. Panoramic radiographs are the most commonly used extraoral radiographic aids in dentistry since they provide a rapid and wide picture of mandible and the maxilla in the same time. This technique allows the adequate localization of foramen mentale. This easy determination of foramen mentale is most often used. The retroalveolar x-rays can not serve for determination of foramen mentale position. That is due to the oblique path of the mental canal and it is difficult to identify foramen mentale consistently on intra oral radiography.

The main aim of study is to evaluate the position of the foramen mentale and its relationship with mandibular premolars among the population in Republic of North Macedonia.

## **MATERIAL AND METHOD**

A total number of 250 panoramic radiographs were evaluated for the positioning assessment of the foramen mentale. The number of male and female examinees was equal. Evaluation of the positioning of the foramen mentale will not be performed in completely toothless individuals. This investigation was including digital and classical panoramic x-rays of both jaws.

For complete and correct evaluation, the following conditions must be fulfilled by the panoramic x-ray to be included in this investigation:

- High quality and contrast
- Absence of artefacts in the area of foramen mentale
- Appropriate angulation of the x-rays
- The presence of teeth from the left first to the right first molar (to avoid the possibility of dental migration)
- Absence of periapical changes of teeth in the premolar region (which can be wrongly interpreted as foramen mentale)
- Presence of premolars in the upper jaw to avoid elongation of the premolars from the lower jaw
- Patients should not be under orthodontic treatment

All radiographic images in which can not be localized and confirmed the presence of the mental aperture was also excluded from the examination.

The examination will be performed on a negatoscope if it is classical panoramic x-ray or adequate software used for digital panoramic x-rays. If necessary, magnification was used for magnification of the images.

Assessment of the presence of foramen mentale and its relation with the adjacent structures and the mandibular canal will be made of three independent examiners, including the main examiner. During the research were include different profiles of researchers, doctors of general medicine and doctors of dental medicine.

When assessing the position of the mental channel, its position is determined in relation with the mandibular premolars and the mandibular median line.

The relationship of foramen mentale with the lower premolars will be given according to the following classification:

- The position of foramen mentale is distally from the line that passes between the second premolar and the first molar in the lower jaw-first class
- The position of foramen mentale is between the vertical central axis of the second premolar and the passing line between the second premolar and the first molar in the lower jaw- second class
- Position of the foramen mentale is between the vertical axis of the second premolar and the line passing between the first and second premolars in the lower jaw- third class
- The position of foramen mentale is between the line that passes between the first and second premolars in the lower jaw and the vertical central axis of the first premolar-fourth class
- Positional position of foramen mentale is mesially from the vertical center axis of the first premolar- fifth class

In these cases foramen mentale can be localized above or in line with the apex of the premolars from the lower jaw or between the apexes of both premolars.

## RESULTS

In the section that follows through tables analyzed data from the survey are presented. Table number 1 presents the data referring to the positioning of foramen mentale in relation to the two lower premolars, if it is under the first or under the second premolar or the openings is located between these two teeth.

Under first premolar	Between two premolars	Under second premolar
14.8 %	58.4 %	26.8 %

**Tab. No. 1. Position of foramen mentale in correlation with the mandibular premolars**

The table below (Table No. 2) presents the data referring to the position of the mandibular canal according to the previously presented mandibular channel positioning classes (in material and method).

	Total
First class	3.22 %
Second class	16.13 %
Third class	43.55 %
Fourth class	25.81 %
Fifth class	11.23 %

**Tab. No. 2. Position of foramen mentale in correlation with the mandibular premolars according to the different classes of positioning**

Based on the presented results, it can be noted that the most common localization of foramen mentale is between the two lower premolars, while the remaining positions are rare.

Also, after statistic processing, no significant difference was observed of the different positions of foramen mentale in the male and female subjects (for  $p < 0.005$ ).

## DISSCUSSION

The primary aim of this study was to determine the position of the foramen mentale in relation with the two lower premolars, using dental panoramic radiographs. In order to compare the results of this study with existing data, the position of foramen mentale was also determined according to the five different classes of positioning of foramen mentale, explained earlier in the text.

The knowledge of the various possible localizations of mental foramen is important and it is helpful to avoid damage to the mental nerve in different oral surgical procedures, aids in interpreting anatomical landmarks in oral pathology and radiology and it is important for dental implant planning and placing. Understanding the position of these foramina will also assist the clinician in performing local anesthetic blocks while some oral or periodontal surgical techniques are performing.

According to this, adequate determination of the radiographic position and features of the foramen mentale in particular is much needed in order to corroborate anatomic descriptions that were made in past times and also to reduce or eliminate the possibility of complications during the interventions.

On the basis of the data from our research, it is noted that in near 60%, foramen mentale is positioned between the roots of the first and second lower premolars. Similar results were published by Bokhari et al.[8] after analyzing of 900 panoramic radiographs in Saudi Arabia where 72% of the left mental foramen and 52% of the right mental foramen were positioned between the mandibular premolars. In a study performed with Chilean individuals, Fuentes et al.[9] found that foramen mentale is located on the longitudinal axis of the second premolar on the right side and between longitudinal axes of the first and second premolars on the left side, which shows similar results to our research. This positioning of foramen mentale has been confirmed and described in numerous textbooks and books in the field of anatomy and various dental disciplines.

Also, results from our research suggest that the most common position for foramen mentale is the third class (which means that foramen mentale is between the vertical axis of the second premolar and the line passing between the first and second premolars in the lower jaw). A similar common positioning of foramen mentale projected at the mesial half of the lower second premolar is presented in one research from 2016 published by [Thakare et al.\[10\]](#) In one series of 377 panoramic radiographs, analyzed by Chkoura and El Wady the most common position for the mental foramen was in line with the second premolar in 62.7%, followed by between the first and second premolars in 30%; thus these two positions accounted for 92.7% of the cases.[11]

This study does present some limitations, primarily because no patient information available to assess participant ethnicity and previous dental treatment. Also the sample size was small and magnification of the panoramic x-rays was not always used.

## CONCLUSION

In conclusion, the present results showed variations in position of foramen mentale. So it must be noted that local differences in foramen mentale position may occur in a population. This variability should alert the oral surgeons while performing oral surgical and periodontal interventions. If the studies related to variations in the position of foramen mentale are carried out in larger numbers, this data will be reliable for dental medicine clinicians, and with this type of information the possibility of complications will be minimized.

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