

Perceptions of Oral and Maxillofacial Radiologists and Non-radiologists: A cross-sectional Survey.

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Abstract:

Background: The role of oral radiology in various aspects of dentistry cannot be overemphasized be it preventive, curative or rehabilitative. Hence, it is essential to know the perception of radiologists and other dental professionals for a better insight into the expected function scope of this branch

Objectives: To determine how oral and maxillofacial radiologists' and non-radiology departments define the scope of oral radiology in India.

Materials and Method: The participants comprised of both oral radiologists and other dental specialists, who were asked to grade/rank six statements on "How best do you define an oral radiologist?" in the form of a questionnaire.

Results: Radiologists and non-radiologists consider Oral and Maxillofacial Radiologists' are knowledgeable about the pathological basis of disease and clinical and radiological correlation of disease" but it was also revealed that they lack the "responsibility for establishing policies regarding radiographic selection criteria, radiation safety/protection, and quality assurance and making decisions regarding the purchase of equipment, the use of films and other aspects of clinical operation.

Conclusions: Although the perception of oral and maxillofacial radiologists and non-radiologists are similar on the scope of radiology, inadequate knowledge of recent advances due to extremely high cost of equipment, lack of operational skills, radiation safety and protection this field suffers from being the most popularly opted field by dental student unlike in case of developed nations where Oral Medicine and Radiology are two separate fields excelling indefinitely but individually.

Keywords: Oral and maxillofacial radiologist; radiation safety; non radiologist; operational skills; scope.

I. Introduction

Oral and maxillofacial radiology is the specialty of dentistry and discipline of radiology concerned with the production and interpretation of images and data produced by all modalities of radiant energy that are used for the diagnosis and management of diseases, disorders and conditions of the oral and maxillofacial region.¹

The field of Oral and Maxillofacial Radiology (OMR) has experienced an explosive growth of knowledge and development of new technology that is unparalleled in dentistry. The diagnosis of disease is the cornerstone of dental practice, and recent advances in imaging science have enabled dentists to provide much better diagnostic services to their patients with a minimum of radiation exposure using modalities that were unknown a generation ago. Digital imaging, plain and computed tomography, magnetic resonance imaging, and other techniques are now part of the armamentarium of the dentist, largely through the work of oral and maxillofacial radiologists.

Oral medicine as a subject in the curriculum of Bachelor of Dental Surgery in India was introduced around 40 years ago. Government Dental College, Bangalore was the first dental college in India to teach oral medicine with help from World Health Organization (WHO). Government Dental College, Bangalore was also the first to introduce the Master in Dental Surgery (MDS) 2-year duration course in oral medicine, diagnosis and radiology 1970.

Dental Radiology was only a minor subject being merged with subjects like conservative dentistry, periodontics and oral surgery. In the year 1959 a 2 year Master's Degree was initiated by Bombay University. In the year 1970 the Bombay University changed MDS course in dental radiology to MDS course in Oral Medicine, diagnosis and radiology.²

In India the curriculum of oral radiology is concomitant with oral medicine whereas in the foreign scenario, these two branches are functioning individually. With no previous literature regarding the perceptions of oral radiologists in India, it is important to know about the existing functioning of this specialty.

Questions like, where is radiology heading in India? Is it excelling individually or parallel with Oral Medicine? Why is it still a minor subject? Will dental radiology succeed as an individual branch in India? still remain unanswered due to lack of studies done in the past.

The present study aims to 1) know the perception of oral radiologists regarding their specialty. 2) To assess how non radiological departments differ in their opinion about oral radiology. 3) To determine the scope of the branch and where it is heading in India.

II. Materials and Methodology

The study was planned to be conducted in two stages. The first stage was a pilot study, in which a letter or e-mail was sent to the post graduates and faculty of SDM Dental College on "Who is a radiologist?" 20 members participated and answered questions regarding: performing advanced radiological procedures, image interpreters, teachers, researchers, improving treatment outcomes, policy makers. Each word was converted into a sentence. These sentences were then labeled as statements and placed into a rank-order survey, which was then distributed in paper form and later in digital form using a survey program to distribute to house surgeons, oral radiologists, oral surgeons, orthodontists, periodontist, general dentistsetc.

Appendix-1:

DEFINING AN ORAL AND MAXILLOFACIAL RADIOLOGIST SURVEY

AGE: _____ SEX: MALE FEMALE LOCATION: _____

OCCUPATION

General Dentist Oral Surgeon Oral Surgery Resident Endodontist Endodontic Resident
 Oral and Maxillofacial Radiologist OMR Resident Orthodontist Orthodontics Resident
 Prosthodontist Prosthodontics Resident Pedodontist Pedodontics Resident Periodontists
 Periodontics Resident Public Health Dentist PHD Resident Dental Student
 Other (please explain) _____

If a dentist,
Year of college you graduated in _____

PLEASE **RANK ORDER** THE FOLLOWING STATEMENTS FROM 1-6 OR 1-7

NOTE: The last statement in the survey may be used if you would like to write your own statement to rank with the others in the survey. If not, then the rank will be from 1-6

EACH NUMBER CAN ONLY BE USED ONCE PER STATEMENT, 1 through 6(7)

1- is the **most important** statement that expresses the definition of Oral and Maxillofacial Radiologist.

6(7) -is the **least important** statement that expresses the definition of Oral and Maxillofacial Radiologist.

Rank from 1-6(7)

Oral and maxillofacial radiologist is highly knowledgeable in all aspects of radiology and has a solid understanding of the pathologic basis of disease and the correlation between clinical and radiographic findings.

It includes a career that centers on teaching in dental or medical schools, conducting research, or providing radiographic services to patients. Responsibilities include didactic and clinical education of dental, and/or graduate dental students.

OMR to integrate instruction in image production with interpretation of disease, thereby combining radiology with oral pathology, diagnosis, and medicine.

OMRs also are responsible for establishing policies regarding radiographic selection criteria, radiation safety, and quality assurance. They make decisions regarding the purchase of equipment, the use of films and film-screen combinations, processing techniques, and other aspects of clinical operation.

A state of art standard intraoral and panoramic radiography, perform TMJ and implant tomography, orthodontic radiographic examinations, special imaging techniques sialography and advanced imaging techniques such as (CBCT) Cone Beam Computerized Tomography, and diagnostic consultations.

The diagnosis/radiodiagnosis given by the an Oral Maxillofacial radiologist help general dentists and other specialists increase successful treatment outcomes with their patients.

Oral and Maxillofacial Radiologists are _____

The second phase consisted of participation of all available respondents (n=200) including oral radiologist, non-radiology specialist, dental post graduates and house surgeons from Hubli-Dharwad who were above the age of 21 were approached through letters/emails/personal communication. Out of which 149 responses were received which gave a response rate of 74.5%. The data were collected from December 2015 through end-January 2016. The reliability of the questionnaire was tested which yielded alpha-chronbach value of 0.78.

In the questionnaire (Appendix-1), respondents were asked to grade/rank order six statements on “How best do you define an oral radiologist?” Demographic data of the respondents included age, sex, occupation, location, and year of graduation. Survey response collection was terminated with the three main cohorts, oral radiologists (n = 32), non-radiology cohort (NRCs) (n = 58), and dental students (n = 52)

Table 1: Demographic variables used

DEMOGRAPHIC DATA	TOTAL	PERCENTAGE (OUT OF 142)
DESIGNATION	n=142	
ORAL RADIOLOGISTS	32	22.55%
NON RADIOLOGISTS	58	40.84%
DENTAL STUDENTS	52	36.61%
PERIOD OF GRADUATION	n=142	
1999-2001	11	7.74%
2001-2010	49	34.52%
2010 ONWARDS	82	57.74%
GENDER	n=142	
FEMALE	85	59.85%
MALE	57	40.14%

III. Data Analyses

In total, 149 responses were received, and the information was compiled from the occupation variables to establish three general cohorts of responders i.e. oral radiologists(including OMR residents/post graduates), non-radiological cohorts (NRCs) (oral surgeons, orthodontists, periodontist, general dentists and their residents), and dental students (house surgeons performing comprehensive cases). Of the 149, there were 6 respondents who had write-in statements that were rank-ordered and missed a statement were not included. The remaining 142 responses were divided into the three cohorts.

Each person was asked to rank order the statements in the survey from 1 through 7. The last statement in the survey could be used if they would like to write their own statement to rank with the others in the survey. If not, then the ranking will be from 1-6.

Each number must be used only once where number 1 was the most important statement that expresses the definition of Oral and Maxillofacial Radiologist (most important function according to the respondent) and rank 6(7) was the least important statement that expresses the definition of Oral and Maxillofacial Radiologist (least important function according to the respondent). Numbers 2,3,4,5 were the order of lesser importance. Grading was to be done in chronology, no number must be repeated.

IV. Results

Of the 149, there were 6 respondents who had write-in statements that were rank-ordered and missed a statement were not included. Based on 142 responses, data was divided into the three cohorts and the result was tabulated using MS Excel. The results were analyzed on certain demographic variables. (Table 1)

The major cohorts were compared using the Chi Square test (analysis of variance) to evaluate whether the rank order was different among the three groups for a specific statement.

Differences based on Designation:(Table 2)

What do Oral Radiologists think of themselves?

The results revealed that 20 out of 35 Oral Radiologists (OMRs) feel that Statement 1(“Oral and maxillofacial radiologist is highly knowledgeable in all aspects of radiology and has a solid understanding of the pathologic basis of disease and the correlation between clinical and radiographic finding”) of the survey is the most essential function of their branch and 14 out of 35 Statement 4(“OMRs also are responsible for establishing policies regarding radiographic selection criteria, radiation safety/protection, and quality assurance. They make decisions regarding the purchase of equipment, the use of films and film-screen combinations, processing techniques, and other aspects of clinical operation.”)is the least looked after function by them.

Oral Radiologists compared to Non Radiology Cohort

A similar result was obtained from the Non Radiology Cohort (NRCs). 31 out of 58 NRCs believed that Statement 1 best defines an OMR and Statement 4 being the least important.

Oral Radiologists compared to Dental Student Cohort

However, dental student differ and feel Statement 6 (“The diagnosis/radio diagnosis given by the Oral Maxillofacial radiologist help general dentists and other specialists increase successful treatment outcomes with their patients.”) is the most apt description of an Oral Radiologist although Statement 4 remains the least favorite even for the student cohort.

Table 2: Responses based on different designations for the three cohorts

GROUPS: Based on Designation	Knowledgeable about the pathological basis of disease and clinical and radiological correlation of disease. (STATEMENT 1)		Help general dentist and other fields in increasing their treatment outcomes by giving an accurate radio diagnosis. (STATEMENT 6)		Establishing policies regarding selection criteria and purchase of equipment is something which is not taken care by the radiologists (STATEMENT 4)	
NON RADIOLOGISTS	31/58	53.4%	-	-	16/58	27.58%
RADIOLOGISTS	20/35	57.1%	-	-	14/35	40%
STUDENTS	-	-	14/52	26.9%	18/52	36.4%

Differences based on Year of Graduation (Table 3)

In the graduation year from 1991-200 (n=11), 6/11 respondents believe that statement 1 should be ranked first and 3/11 say statement 4 is ranked the last.

In the graduation period from 2001-2010 (n=49) 26/49 respondents believe that statement 1 should be ranked first and 18/49 say statement 4 should be ranked the last.

In the graduation period from 2011 onwards (n=82) 32/82 respondents believe that statement 6 should be ranked first and 30/82 say statement 4 should be ranked the last.

When compared between these groups, results were not significantly ($P > 0.05$) different in rank and can be correlated to occupation based results.

Table 3: Responses based on graduation period for the three cohorts.

GROUPS Based on Graduation Period	Knowledgeable about the pathological basis of disease and clinical and radiological correlation of disease. (STATEMENT 1)		Help general dentist and other fields in increasing their treatment outcomes by giving an accurate radio diagnosis. (STATEMENT 6)		Establishing policies regarding selection criteria and purchase of equipment is something which is not taken care by the radiologists (STATEMENT 4)	
1991-2000	6/11	54.5%	-	-	3/11	27.2%
2001-2010	26/49	50.06%	-	-	18/49	36.63%
2010 ONWARDS	-	-	32/82	39.02%	30/82	36.58%

Differences based on Gender: (Table 4)

Out of 85 female replies, 41/85 female respondents believe that statement 1 should be ranked first and 32/85 say Statement 4 should be ranked the last.

Out of 57 male replies, 23/57 male respondents believe that statement 1 should be ranked first and 19/57 say Statement 4 should be ranked the last.

When compared between these two groups, results were not significantly ($P > 0.05$) different in rank and can be correlated to occupation based results.

Table 4: Responses based on graduation period for the three cohorts.

GROUPS Based on Gender	Knowledgeable about the pathological basis of disease and clinical and radiological correlation of disease. (STATEMENT 1)		Establishing policies regarding selection criteria and purchase of equipment is something which is not taken care by the radiologists (STATEMENT 4)	
Females	41/85	48.23%	32/85	37.64%
Males	23/57	47.36%	19/57	33.33%

V. Discussion

Oral and maxillofacial radiologists have the ability to link clinical and pathological aspects of disease with the basis of radiological background. This not only facilitates in accurate diagnosis but also aids in follow up and determining the prognosis of any condition.

The present questionnaire based survey analysis is based on 142 responses obtained, the statement of choice when asked "How do you best define an Oral and Maxillofacial radiologist?" both radiologist (57.1%) and non-radiology cohorts (53.4%) selected statement 1 of the questionnaire. This was based on similar findings of a study, which compared Impact of clinical history on radiographic detection of fracture between radiologists and orthopedists.³ It was evident from this study that, the accuracy of fracture detection by orthopedic surgeons and radiologists was directly influenced by the knowledge of localizing clinical signs. And also the orthopedists depend on the clinical history information much more than do radiologists. This implies that radiologists are far superior in their specialty and make prompt diagnosis compared to other specialists.

In a study conducted by Eng J et al⁴ in United Kingdom, revealed that radiologists were more superior in image interpretation and diagnosis compared to the medical physicians. Due to lack of literature on the current topic of interest in India, reference has been quoted from the foreign scenario. Even though oral radiologists are known to excel in image interpretation, they may fall short in a few areas of expertise. This aspect is reflected in the present study (Statement 4 i.e. OMRs also are responsible for establishing policies

regarding radiographic selection criteria, radiation safety/protection, and quality assurance. They make decisions regarding the purchase of equipment, the use of films and film-screen combinations, processing techniques, and other aspects of clinical operation'), was chosen as the least efficient function of OMRs by 40% Radiologists, 27.58% non-radiologists and 34.6% student cohort. This lacunae in the expected function of OMRs had been a matter of concern globally.

As per the safety code for diagnostic x-ray equipment and installations⁵ norms have been included for beam filtration, dose, dosimetry, collimation, room layout dark room, radiation leakage, quality assurance and radiation safety for the workers under the radiation protection rules (RPR, 1971). As per the protocol, all installations having more than two X-ray units, or even a single X-ray unit with fluoroscopy facility must have a radiologist with a graduate degree (M.B.B.S./B.D.S) from a recognized university or an equivalent qualification or post-graduate degree/diploma in radiodiagnosis from a recognised university. (*Guidelines Laid by Atomic Energy Regulatory Board (AERB), constituted under the Atomic Energy Act, 1962 by the Government of India*)

For oral radiologists who are aware of the set guidelines, do they still do fall short in the areas of radiation protection and safety?

Radiation protection has been a cause of concern in the country as seen in various studies conducted at a national and international level. In 2013, a study was conducted on all private dental practitioners in Mangalore to assess the knowledge, attitudes, and practices towards safety in radiation protection.⁶ Although the knowledge and practices of respondents were poor, they had a positive attitude and were willing to improve their knowledge.

A recent study conducted in 2016 to assess the Compliance of Indian dentists with oral radiology safety measures revealed that for minimizing any unnecessary radiation, attempts should be made to improve dentists' knowledge about radiation dose reduction techniques.⁷ A questionnaire study based in United Kingdom also revealed knowledge of radiation exposure from radiological investigations and the associated risks was poor.⁸

The advances in image Measures have been taken to reduce the exposure of the radiation doses to the patient. Digital imaging and communications in medicine (DICOM) is the International Organization for Standardization (ISO)-referenced standard for communication of diagnostic images and associated data. It is the internationally accepted format in which radiologic images are sent from scanners and digital X-ray devices, as well as the protocol used to send, archive, and retrieve them. To protect the oral and maxillofacial radiologists' investment in equipment and the patient's investment of time, money, and radiation exposure, it is desirable to use a standard oral filmless system of image exchange and interpretation. In 2013, a questionnaire based study conducted all over India to assess the adoptability of DICOM by the Indian Oral Maxillofacial radiologist yielded that there is still much work to be done to ensure optimal use of DICOM by Indian OMRs.⁹

The student cohort's selection of Statement 6 i.e. "The diagnosis/radio diagnosis given by an Oral Maxillofacial radiologist help general dentists and other specialists increase successful treatment outcomes with their patients as the most efficient function of oral radiologists can be justified by saying that Dental students are confined in an institution based study design depend on Intra Oral Periapical films and OPGs to make diagnosis to further assist treatment."¹⁰ Thus, it is fair to say that dental students will depend on a radiology department to assist them to perform any treatment.

VI. Scope

A survey that was designed and conducted by an international panel of oral medicine experts to assess the current state of oral medicine & radiology practice internationally revealed India has the largest expansion of oral medicine and radiology services as due increasing numbers of clinicians within the specialty as compared with other countries.¹¹ With the expansion of the specialty comes a massive expansion in the knowledge requirements for graduates from radiology residency. As the specialty continues to grow, the training will evolve to help residents cope with the large amount of knowledge and training required. Future options may be to subdivide radiology residency early on into subspecialties as they do in internal medicine.¹² A survey conducted in the United States also revealed that there is a strong need for oral radiology specialist services.¹³

Despite such finding, the lack of support and understanding of the benefits of advanced imaging procedures and rigid curriculum based clinical practice, the brighter side of the specialty has been neglected and gone unnoticed. In today's scenario oral medicine and radiology is opted as the last resort to fill in the vacancy of available private and government post graduate seats found in a study titled "Oral Medicine and Radiology- An Indian Scenario", 2013.^{2,10} A study done in 2011 titled "Dental Students motivation and perception of dental professional career in India" reveals Oral medicine and radiology being one of the least favourite branches for post-graduation.¹⁰

The present study is one of its kind to be conducted in the field of radiology regarding the perceptions of oral maxillofacial radiologists. This study not only helps to evaluate the already existing intraspecialty structure but also suggests to develop strong interdisciplinary skills for further research and development of the

specialty and profession but also helps to bring out a certain degree of objectivity by the departments not specializing in the field of radiology. The oral and maxillofacial radiologist (OMR) will realize the lacuna of activity based on a third person's point of view. This not only helps the OMRs to realize their strengths and weaknesses but also helps them to improvise their current pace of practice for better functioning in future.

The limitations of this study include the sample size confined to the local dentists of one city. Studies involving multicentre design including a larger population of dentists' will help to gain insight into this speciality. Also, the interpretation of each statement is related to individual perceptions, which is influenced by training and experience. Since opinions are subject to personal likes and dislikes, this study cannot be generalized for the OMRs or non-radiology departments across the different parts of the country.

VII. Conclusion

The oral and maxillofacial radiologists defined their scope of practice by stating that they are "Knowledgeable about the pathological basis of disease and clinical and radiological correlation of disease". The non-radiological cohorts also perceived the scope of an OMR in a similarly.

However, dental students perceive the scope of OMRs differently and feel that the OMRs "Help general dentist and other fields in increasing their treatment outcomes by giving an accurate radio diagnosis". These perceptions were based on the differences in designation.

This study also highlighted the lacunae of the speciality regarding radiation exposure, protection and safety. The inadequate knowledge of recent advances due to extremely high cost of equipment, lack of operational skills, radiation safety and protection this field suffers from being the most popularly opted field by dental students unlike in case of developed nations where Oral Medicine and Radiology are two separate fields excelling indefinitely but individually. Due to lack of generalizability of this study, it is difficult to comment on the separation of two fields in India to improve the functioning as seen other various nations. However the differences of three cohorts and the inputs received here should help OMRs to better serve patients and enhance the future of their speciality.

Conflict of Interest:

None

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Format of the report:

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