

## General Information

### About The Journal

International Journal of Scientific Study (IJSS) is a monthly journal publishing research articles after full peer review and aims to publish scientifically sound research articles in across all science like Medicine, Dentistry, Genetics, Pharmacy, etc.

Each article submitted to us would be undergoing review in three stages: Initial Review, Peer Review & Final Review.

All rights are reserved with journal owner. Without the prior permission from Editor, no part of the publication can be reproduced, stored or transmitted in any form or by any means.

### Abstracting & Indexing Information

Index Copernicus, DOAJ, Google Scholar, World Cat, Genamics Journal Seek, Ulrichsweb Serials Solutions, ICJME, GFMER, Socolar, BASE, Research Bible, Academic Journals Database, J-Gate, ScienceGate, Jour Informatics, Academic Keys, International Society of Universal Research in Sciences(EyeSource), Rock your Paper, NTHRYS, Directory of Research Journal Indexing(DRJI), Scientific Indexing Services (SIS), Rubriq-Beta, SHERPA RoMEO.

### Information for Authors

The authors should follow "Instructions to Authors" which is available on website <http://www.ijss-sn.com/instructions-to-authors.html>. Authors should fill the Copyright Transfer form & Conflict of Interest form. Manuscripts should be submitted directly to: [editor@ijss-msai.com](mailto:editor@ijss-msai.com).

### Publication Charges

International Journal of Scientific Study aims to encourage research among all the students,

professionals, etc. But due to costs towards article processing, maintenance of paper in secured data storage system, databases and other financial constraints, authors are required to pay. However discount will be provided for the non-funding quality research work upon request. Details about publication charges are mentioned on journal website at: <http://www.ijss-sn.com/submit-article.html>.

### Advertising Policy

The journal accepts display and classified advertising. Frequency discounts and special positions are available. Inquiries about advertising should be sent to [editor@ijss-msai.com](mailto:editor@ijss-msai.com).

### Publishing Details

**Publisher Name:** Smile Nation - Lets Smile Together

**Registered Office:** International Journal of Scientific Study, 9/2, Satyalok Building, Gadital, Hadapsar, Pune, Maharashtra, India – 411028.

**Designed by:** Tulyasys Technologies ([www.tulyasys.com](http://www.tulyasys.com))

### Disclaimer

The views and opinions published in International Journal of Scientific Study (IJSS) are those of authors and do not necessarily reflect the policy or position of publisher, editors or members of editorial board. Though the every care has been taken to ensure the accuracy and authenticity of Information, IJSS is however not responsible for damages caused by misinterpretation of information expressed and implied within the pages of this issue. No part of this publication may be reproduced without the express written permission of the publisher.



## Editorial Board

### Founder & Editor In Chief

Dr. Swapnil S. Bumb  
*India*

### Editor

Dhairya Lakhani  
*India*

### Co-Editors

#### Academics

Dr. João Malta Barbosa  
*United States of America*

Anastasia M. Ledyaeva  
*Russia*

#### Reviews

Dr. Mohammad Akheel  
*India*

Asfandyar Sheikh  
*India*

### Editorial Coordinator

Dr. Safalya Kadtane  
*India*

### Section Editors

Dorcas Naa Dedei Aryeetey,  
*Ghana*

Animasahun Victor Jide,  
*Nigeria*

Hingi Marko C,  
*Tanzania*

Tade Soji Emmanuel,  
*Nigeria*

Dr. Manu Batra,  
*India*

Mallika Kishore,  
*India*

## Contents

### EDITORIAL

Understanding Health Care Delivery System in India

*Dr. Swapnil S. Bumb*

1

### ORIGINAL ARTICLES

Study of Minimal Invasive Surgical Procedure of Liver Abscesses in Western Uttar Pradesh - A Hospital Based Study

*S C Sharma, Sameer Jain, S P Sinha, S K Jain, Akanksha Singh*

2

Dental Rubber Dam as a Barrier Membrane in the Treatment of Infrabony Defects

*Rita Singh, Shyam Padmanabhan, C D Dwarakanath*

6

Dental CT versus Radiography in the Detection of Vertical Root Fractures

*Shruti Chandak, Shalini Saraswat, Omprakash, Vijai Pratap*

14

Knowledge and Attitude of School Teachers Towards Tooth Avulsion in Rural and Urban Areas

*Manjeet Kaur, Kanika Gupta, Ruchika Goyal, Navdha Chaudhary*

17

Efficacy of Azithromycin Pulse Therapy in Acne Vulgaris Treatment: A Hospital Based Study

*Sanjeev Sharma, Priyank Kumar, Sanjay Banjare, S K Jain*

21

Relationships between Serum 25-Hydroxy Vitamin D Levels and Plasma Glucose and Lipid Levels in Pediatric Patients in a Rural Hospital

*N C Shivaprakash, Ranjit Baby Joseph*

24

Sonographic Evaluation of Salivary Gland Tumors – A Hospital Based Study

*Vijai Pratap, S K Jain*

32

Relationship Between Depression and Vitamin C Status: A Study on Rural Patients From Western Uttar Pradesh in India

*Prerana Gupta, Sanchit Tiwari, Jigar Haria*

37

The Burden of Anaemia amongst Antenatal Women in the Rural Population of Northern India

*M Shams Khan, Anupama Srivastav, Anil K Dixit*

40

|  |    |
|--|----|
| Hepatitis B Seropositivity and Vaccination Coverage among Health Care Workers in a Tertiary Care Hospital in Moradabad, UP, India<br><i>Sumit Kumar, Rehana Begum, Umar Farooq, Pallavi Kumari</i> | 43 |
|--|----|

|   |    |
|---|----|
| Electric Burns Injuries of Head and Neck Region: A Retrospective Study<br><i>Sameer Jain, S C Sharma, S P Sinha, S K Jain</i> | 47 |
|---|----|

|  |    |
|--|----|
| Sonomammographic Evaluation & Characterization of Breast Lumps<br><i>Shalini Saraswat, Shruti Chandak, Omprakash, Vijai Pratap, Amit Kumar</i> | 50 |
|--|----|

|  |    |
|--|----|
| Psychiatric Morbidity Associated with Hip Fractures – A Hospital Based Study<br><i>Prerana Gupta, Julfiqar, S K Jain</i> | 54 |
|--|----|

## REVIEW ARTICLE

|   |    |
|---|----|
| Cariogram – A Multi-factorial Risk Assessment Software for Risk Prediction of Dental Caries<br><i>Anup N, Preeti Vishnani</i> | 58 |
|---|----|

## CASE REPORT

|   |    |
|---|----|
| Adenomatoid Odontogenic Tumour: Report of a Case and Review of Literature<br><i>Vikas Singh, D J Bhaskar, R Chandan Agali, Mallika Kishore, Safalya S Kadtane, Harender Singh</i> | 63 |
|---|----|

## CLINICAL STUDY

|   |    |
|---|----|
| Post-operative Analgesic Effect of Intrathecal Clonidine versus Fentanyl Added to Bupivacaine in Patients Undergoing Cesarean Section: A Prospective Comparative Study<br><i>Gaurav Dwivedi</i> | 67 |
|---|----|



## ***From the Desk of Editor-in-Chief***

# **Understanding Health Care Delivery System in India**

**Dr. Swapnil S. Bumb**

*Post Graduate Student, Department of Public Health Dentistry, Teerthanker Mahaveer Dental College & Research Centre, Moradabad, Uttar Pradesh, India.  
E-mail: swapnil\_bumb@yahoo.com*

Health is a fundamental human right. Health care is a public right. Hence it implies that the state authority has a responsibility for the health of its people. Also we are aware that social, economic, political, environmental factors have impact on the health care delivery system of any country because it influences growth and development of that particular country. National governments of all countries around the globe are striving to improve and expand their health care delivery services. Nearly all governments of the world have recognized these principles. The current drawbacks and criticism against health care services is that they are: Urban oriented, curative in nature and it is accessible only to a limited population.

In both developed and developing countries currently the aim is not only to reach the whole population with sufficient & adequate health care services, but also to secure an acceptable level of health for all through the application of primary health care programmes.

In country like India, health care is completely a governmental affair. Since independence, India has created a vast public health infrastructure comprising of several Sub-centres, Public Health Centres (PHCs) and Community Health Centres (CHCs). It is estimated

that this vast infrastructure is only benefitted by 20% of the population, while 80% of healthcare needs are still being provided by the private sector. Poor access to health leads to avoidable incidence of morbidity, mortality and out-of-pocket expenses, often leading to indebtedness. In rural areas especially, there are pockets of under-served populations where the vicious circle of poverty, malnutrition and poor health reinforce each other. Moreover WHO has identified inequalities in access for health care will be one of the future's major public health problems. Hence health care delivery system should be organized in such a manner that it can meet the needs of entire population. Primary health care is best way to provide health services to the community. Public health infrastructure should be strengthened to address the systemic issues in the Health Sector, so as to ensure that the Outlays earmarked for Health Sector are efficiently utilized, and can be translated into outcomes, which can stand public scrutiny. Hence all the possible necessary actions and attempts should be made to improve quality of life of the entire population by improving education, research sectors and also implementing and promoting health related policy and in order to improve a system within a country, it is utmost important to acquire knowledge of various policies, health projects running internationally.

# Study of Minimal Invasive Surgical Procedure of Liver Abscesses in Western Uttar Pradesh - A Hospital Based Study

S C Sharma,  
Sameer Jain<sup>1</sup>,  
S P Sinha<sup>2</sup>, S K Jain<sup>3</sup>,  
Akanksha Singh<sup>4</sup>

(MS General Surgery) Assistant Prof. Dept of Surgery, TMMC&RC, Moradabad, <sup>1</sup>(MS General Surgery) Assistant Prof. Dept of Surgery, TMMC&RC, Moradabad, <sup>2</sup>(MS General Surgery) Prof & Head Dept of Surgery, TMMC&RC, Moradabad, <sup>3</sup>(MS Anatomy) Professor Anatomy, Dept of Anatomy TMMC&RC, Moradabad, <sup>4</sup>Intern Dept of Surgery. TMMC&RC, Moradabad

**Corresponding Author:** Dr. S K Jain (MS Anatomy) Professor Anatomy, Dept of Anatomy, TMMC&RC, Moradabad +91-9997168754. E-mail: drskjain2005@rediffmail.com

## Abstract

**Introduction:** Liver is a vital organ of the body, anatomically situated mostly in right hypochondrium with small extension into left hypochondrium also. Liver is the organ subjected to systemic infections by various microorganisms. Pyogenic and amebic liver abscess are the two common types of hepatic abscess. Pyogenic liver abscess are less common than amebic liver abscess. Right lobe of the liver is most commonly involved in both types of abscesses. Radio-imaging techniques like US and CT are the modalities of choice for investigation purposes. Treatment modalities of these abscesses, first emphasizes on medical treatment, but if it is unsuccessful then only the surgical intervention should be taken up.

**Aims & Objectives:** The aim of this study is to use that modality of treatment for hepatic abscesses which are successful, economical and reduces the hospital stay of patients.

**Methods:** 62 patients belonging to different socio-economic status, age range from (18-70 yrs) were included in this study. All routine investigations like haemogram, culture/sensitivity, pathological tests were done. Later on diagnosis was confirmed by US and CT scan. Patients were treated keeping them under treatment of three groups (vide infra).

**Results:** Based on the size of cyst and type of abscess different modalities of treatment were applied. Hospital stay of patients varied from single day to three to four days or even more for 10 days in which laprotomy was tried for management.

**Conclusion:** We concluded the study with the fact, that draining the abscess under US guidance is the best minimal invasive method of treatment, which on one hand is economical to patients and also reduces the hospital stay, so that proper medical care to other admitted patients is imparted.

**Keywords:** Laprotomy, Minimal Invasive, Hepatomegaly, Abscess

## INTRODUCTION

The two most common hepatic abscesses are pyogenic and amebic liver abscesses. Amebic abscesses are more common in developing countries like India, whereas pyogenic is more common in western countries.<sup>1</sup> Pyogenic liver abscess can be single or multiple. The right lobe is more than two times effected as compared to left while in 5% cases both lobes of liver are involved.<sup>2</sup> Amoebic liver abscess occurs in population where *Entamoeba histolytica* is endemic<sup>3</sup> and it affects right lobe in 80% of cases. Hepatic abscesses develop insidiously with fever, sweats, weight loss and no local signs other than painless or slightly tender hepatomegaly. In other

patients it presents with abrupt onset of fever, nausea, vomiting, severe abdominal pain and polymorphonucleosis. Whereas pyogenic liver abscess does not show gender difference, amebic abscess is approximately 10 times more common in male sex as compared to females. Computed tomography (CT), and ultrasound are the imaging studies of choice. After medical treatment fails like metronidazole, Cephalosporin in pyogenic liver abscess and Diloxanide furoate in amoebic liver abscess we should go surgical intervention. Ultrasonographic guided drainage and percutaneous aspiration can be tried in small abscesses, but catheter drainage should also be taken into consideration. In case of abscess rupture open surgery is indicated. Most

patients with pyogenic liver abscess and those with very large amoebic abscesses, may not recover with antibiotics alone and need drainage guided by ultrasonography or CT. Percutaneous aspiration can be carried out for small abscesses although catheter drainage has become the standard of care. Larger abscesses may also need catheter drainage which is also CT- or ultrasound-guided. Drainage should also be carried out if there is impending rupture.

## MATERIAL AND METHODS

Out of all patients admitted in the department of Surgery TMMC&RC and associated Hospital from (September 2012 to October 2013), 62 patients were found to have liver abscess in a period of 12 months. Age of patients ranged between 18 to 70 years and out of that 32% were in 25-36 years age group and 68% were above that age group. Males were 74%. Three patients had previous history of abdominal surgery. Routine investigations were done including haemogram, liver function tests, blood sugar, HIV, hepatitis B, X-ray chest and abdomen. Diagnosis was confirmed by ultrasonographic scanning and computerized tomography.

Patients not responding to the medical treatment were put on surgical intervention as soon as possible and study was conducted in three groups.

Group 1: Included in this group the patients in whom aspiration of liver abscesses was done under ultrasound guidance and in these patients about 50cc of pus was aspirated.

Group 2: In this group we included those patients in whom moderate to large amount of pus filled abscesses were found and a minimal invasive surgery was done under ultrasound guidance.

Group 3: In this group were included those patients who had large pus filled cavities and were drained by laparotomy through right subcostal incision. Pus evacuated in all patients was sent for bacteriological examination and for culture and sensitivity.

Post operative antibiotics and IV fluids were given in all groups of patients.

Treatment modalities used

Group 1: Analgesics, Antibiotic Metronidazole

Group 2: P/C Aspiration, Analgesics, Antibiotic, Metronidazole

Group 3: Irrigation with Saline with Metronidazole, Analgesics Antibiotic

Group 4: Laparotomy.

## RESULTS

**Table 1: Treatment modality of patients ranging 18-25 yrs**

|                           |   |   |  |
|---------------------------|---|---|--|
| <b>Age group</b>          | 18-25 yrs   |   |  |
| <b>Number of patients</b> | 14  |   |  |
| <b>Size of cavity</b>     | CS<2 cm 5 pt  | CS>2 cm 8 pt  | CS>5cm 1 pt  |
| <b>Treatment Group-1</b>  | Treated by group-1  |   |  |
| <b>Treatment Group-2</b>  |   | Treated by group-2  |  |
| <b>Treatment Group-3</b>  |   |   |  |
| <b>Treatment Group-4</b>  |   |   | Treated by group-4                                     |
| <b>Result</b>             | 4 pts treated by group-1 with one day hospital stay and 1 pt didn't respond to group-1 treatment and treated by group-2 treatment with hospital stay 3 days | 6 pts treated by group-2 with hospital stay 3 days. 2 pts didn't respond group-2, treated by group 3 with hospital stay 4 days. | Successful t/t by laprotomy with hospital stay 10 days |

**Table 2: Treatment modality of patients ranging 25-35 yrs**

|                           |  |  |  |
|---------------------------|--|--|--|
| <b>Age group</b>          | 25-35 yrs  |  |  |
| <b>Number of patients</b> | 37   |  |  |
| <b>Size of cavity</b>     | CS<2cm 11pts   | CS>2cm 14pts   | CS>5cm 12pts   |
| <b>Treatment Group-1</b>  | Treated by group-1   |  |  |
| <b>Treatment Group-2</b>  | Treated by group-2   | Treated by group-2   |  |
| <b>Treatment Group-3</b>  |  | Treated by group-3   | Treated by group-3   |
| <b>Treatment Group-4</b>  |  |  | Treated by group-4   |
| <b>Result</b>             | 8 pts t/t by group-1 with hospital stay 1 day. 3 pts had no response by group-1 t/t. Treated by group-2. | 11 pts successful t/t by group-2 with hospital stay 3 days. 3 pts unsuccessful t/t by group-2 treated by group-3. Hospital stay 4 days | 8 pts respond to t/t by group-3 t/t with hospital stay 4 days. 4 pts didn't respond by group-3 t/t by group-4 with hospital stay 10 days |

**Table 3: Treatment modality of patients ranging 35-70 yrs**

|                           |   |   |  |
|---------------------------|---|---|--|
| <b>Age group</b>          | 35-70 yrs   |   |  |
| <b>Number of patients</b> | 11  |   |  |
| <b>Size of cavity</b>     | CS<2cm 3pts   | CS>2cm4pts  | CS>5cm 4pts  |
| <b>Treatment Group-1</b>  | Treated by group-1  |   |  |
| <b>Treatment Group-2</b>  | Treated by group-2  | Treated by group-2  |  |
| <b>Treatment Group-3</b>  |   | Treated by group-3  | Treated by group-3   |
| <b>Treatment Group-4</b>  |   |   | Treated by group-4   |
| <b>Result</b>             | No pt responded to group-1 t/t with hospital stay of one day while 2 pts t/t by group-2 with hospital stay for 3 days | 1 pt responded to group-2 with hospital stay of 3 days, while 3 pts did not respond to t/t by group-2 and treated by group-3 with hospital stay of 4 days | 2 pts respond by group-3 with hospital stay of 4 days, while 2 pts did not respond to group-3 t/t and treated by group-4 t/t (surgical t/t- Laprotomy) with hospital stay of 10 days |

The average recovery period was very short in Group I, where as in moderate to large abscesses it was two to four days. Patients with simple aspiration were discharged from the hospital on next day in satisfactory condition, while in others with pig tail drainage maximum of four days was the stay. Recovery period in contrast to the patients who underwent laparotomy for drainage, was about 10 days.

Overall result is shown in table-4.

**Table 4: Patient response to different treatment modalities**

| <b>Age group</b> | <b>t/t by Group I</b> | <b>t/t by group II</b> | <b>t/t by group III/IV</b> |
|------------------|-----------------------|------------------------|----------------------------|
| 18-25 years      | 04                    | 09                     | 01                         |
| 25-35 years      | 08                    | 25                     | 04                         |
| 35-70 years      | 00                    | 08                     | 03                         |
| Total no of pts  | 12                    | 42                     | 08                         |

## DISCUSSION

Liver abscesses are life-threatening with mortality rate as high as 80 to 90% if left untreated.<sup>4</sup>

In earlier times when antibiotics were not available open surgical drainage was the treatment of choice.<sup>5</sup>

Treatment by aspiration followed by antibiotics was described by<sup>6</sup> and recently in last few years percutaneous drainage under US has largely replaced surgical drainage.<sup>7,8</sup>

## PYOGENIC LIVER ABSCESS

In half of the cases no identifiable cause of pyogenic liver abscess cannot be ascertained.<sup>9-11</sup> With US initially the abscess is hyperechoic but with maturation it becomes hypoechoic. Computed tomography is more specific and sensitive than US.<sup>12</sup> Staphylococcus and Streptococcus being the commonest but abscesses originating from intra-abdominal infection, however, usually contain aerobic gram negative rods especially *E. coli*. Treatment of PLA should individualize. The choice of antibiotic should cover most of common microorganisms cultured from liver abscess. This therapy should consist of a combination of aminoglycosides either with metronidazol or clindamycin or beta -lactam antibiotic. Antibiotic therapy should alone be reserved only for patients in good clinical condition and those who have solitary abscess lesser than 2 cm in diameter, patients must receive antibiotic for 4-6 weeks. "Source control" is essential in surgical treatment of PLA. In recent series Bertel et al, (1996)<sup>13</sup> have reported an overall 87% and Herman et al (1997)<sup>14</sup> 91.5% success rate in percutaneous surgical drainage.<sup>3,8</sup>

Although there are various reports comparing these modalities in the treatment of liver abscess, there are no prospective randomized studies comparing different treatment modalities.

Gerzof et al, 1985<sup>15</sup> compared the medical treatment. percutaneous and surgical drainage in the retrospective study reporting better result with surgical drainage in total of 26 patients.

## AMEBIC LIVER ABSCESS

US findings are good for radiological evaluation of amebic liver abscess which shows peripheral rim with homogeneity.<sup>16,17</sup>

The first line of treatment in Amoebic liver abscesses is Metronidazole. The size of abscesses is important factor in determining the response of drug. PCD and Catheter drainage offer other modities of treatment as in Pyogenic abscesses. Metranidazol is given 750 mg 3 times a day for 7-10 days.

Surgical open drainage is indicated only in those patients with complicated Amoebic abscesses e.g. secondary infection or peritonitis with large Pyogenic and Amoebic Liver abscesses.

## CONCLUSION

This study revealed that draining the abscesses under ultrasound guidance either by simple aspiration or with pig tail drainage or with any other drainage tube is best surgical minimally invasive method of treatment. It not only reduces the sufferings of patients, hospital stay but also is economical to poor patients as compared to laparotomy or any other major surgical procedure. Thus authors recommends ultrasonic guided aspiration of liver abscesses as far as possible in expert hands of surgeon and ultrasonologist.

## REFERENCES

1. Kurland JE, Brann OS. Pyogenic and amebic liver abscesses. *Curr Gastroenterol Rep* 2004;6(4):273-9.
2. Peralta R. Liver Abscess, *eMedicine*, Sep 2009.
3. Krige JE, Beckingham JJ. ABC of diseases of liver, pancreas, and biliary system. *BMJ* 2001; 3:322(7285):537-40.
4. Wong KP. Percutaneous drainage of pyogenic liver abscesses. *World J Surg* 1990; 14: 492-497.
5. Ochsner A, DeBakey M, Murray S. Pyogenic abscess of the liver. II: An analysis of forty-seven cases with review of the literature. *Am J Surg* 1938; 40: 292-319.
6. McFadzean AJS, Chang KPS, Wong CC. Solitary pyogenic abscess of the liver treated by closed aspiration and antibiotics: a report of 14 consecutive cases with recovery. *Br J Surg* 1953; 41:141-152.
7. Rintoul R, O'Riordain MG, Laurenson IF, Crosbie JL, Allan PL, Garden OJ. Changing management of pyogenic liver abscess. *Br J Surg* 1996; 83: 1215-1218.
8. Huang CJ, Pitt HA, Lipsett PA, Osterman FA Jr, Lillemoe KD, Cameron JL, Zuidema GD. Pyogenic hepatic abscess. Changing trends over 42 years. *Ann Surg* 1996; 223: 600-607.
9. Huang C, et al. Pyogenic hepatic abscess: changing trends over 42 years. *Ann Surg* 1996; 223:600-9.
10. Chu KM, et al. Pyogenic liver abscess: an audit of experience over the last decade. *Arch Surg* 1996; 131:148-52.
11. Chou FF, et al. Single and multiple pyogenic liver abscesses: clinical course, etiology and results of treatment. *World J Surg* 1997; 21:384-9.
12. Saini S. Imaging of the hepatobiliary tract. *N Engl J Med* 1997; 336:1889-94.
13. Bertel C K, van Heerden J A, Sheedy P F. Treatment of pyogenic hepatic abscesses: Surgical vs percutaneous drainage. *Arch Surg.* (1986);121:554-558.
14. Herman P, Pugliese V, Montagnini A L. et al. Pyogenic liver abscess: The role of surgical treatment. *Int Surg.* (1997);82:98-101.
15. Gerzof S G, Johnson W C, Robbins A H, Nabseth D C. Intrahepatic pyogenic abscesses: Treatment by percutaneous drainage. *Amer J Surg.* (1985);149:487-494.
16. Donovan A J, Yellin A E, Ralls P W. Hepatic abscess. *World J Surg.* (1991);15:162-169.
17. Pitt H A. Surgical management of hepatic abscesses. *World J Surg.* (1990);14:498-504.

**How to cite this article:** S C Sharma, S K Jain, Sameer Jain, S P Sinha, Akanksha Singh. "Study of Minimal Invasive Surgical Procedure of Liver Abscesses in Western Uttar Pradesh - A Hospital Based Study". *International Journal of Scientific Study*. 2014;1(4):2-5.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Dental Rubber Dam as a Barrier Membrane in the Treatment of Infrabony Defects

Rita Singh,  
Shyam Padmanabhan<sup>1</sup>,  
C D Dwarkanath<sup>2</sup>

Associate Professor, Kathmandu Medical College, Dental Department, Kathmandu, Nepal, <sup>1</sup>Professor, Vyedhi Institute of Dental Sciences and Research Centre, Bangalore, India, <sup>2</sup>Professor, Vishnu Dental College and Hospital, Andhra Pradesh, India

**Corresponding Author:** Dr. Rita Singh, 114, SamaMarg, Kamalpokhari, Kathmandu, Nepal.  
Phone - 009 77 9851033492. E-mail: s.rita2000@gmail.com

## Abstract

**Background:** The ideal goal of periodontal therapy has been the regeneration of the periodontium, resulting in the complete restoration of lost periodontal tissues. This study was taken up so as to evaluate the efficacy the Dental Rubber Dam as a barrier membrane in the treatment of infrabony defects.

**Methods:** Fifteen patients who were diagnosed to have mild to moderate periodontitis having at least one angular defect was taken up for the study. After the routine basic periodontal therapy these sites were treated with dental rubber dam as a barrier in accordance with the principle of guided tissue regeneration. All membranes were removed after 4 weeks of membrane placement.

**Results:** The results showed a significant improvement in all clinical parameters including reduction in periodontal probing depth and gain in clinical attachment level after six-nine months post-operatively. Radiographic measurements also showed a mean reduction in osseous defect depth of 0.94 mm. The sites however, showed an increase in gingival recession amounting to a mean of 1.46 mm.

**Conclusion:** It can be concluded that dental Rubber dam is a barrier membrane with great potential in treatment of periodontal osseous defects provided the limitations brought to light in this study are addressed in the future. At present it can only be recommended for the treatment of osseous defects in the posterior teeth aesthetics is not a prime concern.

**Keywords:** Barrier membranes, Rubber dam, Periodontal regeneration, Infrabony defect

## INTRODUCTION

Barrier membrane helps in periodontal regeneration by preventing the migration of epithelial cells and cells from the gingival connective tissue onto the root surface. There are different types of membranes that can be used to regenerate periodontal tissues. Most of the commercially available regenerative materials are very expensive and not within the reach of the common man especially in developing countries. Investigations have still to be undertaken to find more materials that are cost effective and possess all the required characteristics, as stated above, of an ideal barrier membrane.

The ideal goal of periodontal therapy has been the regeneration of the periodontium, resulting in the complete restoration of lost periodontal tissues.<sup>1</sup> Periodontal regeneration is the regeneration of the tooth's supporting tissues including cementum periodontal ligament and bone.<sup>2</sup>

The methods currently employed to obtain periodontal regeneration are the use of osseous grafts (including autografts, allografts and alloplasts),<sup>3-5</sup> chemical mediators (citric acid, tetracycline, polypeptide growth and differential factors and enamel matrix proteins), interdental denudation,<sup>6</sup> coronally positioned flaps and the use of tissue guiding membranes. Combination of one or more of the above had been tried and tested with favorable results.

While reports of successful periodontal regeneration can be found throughout the periodontal literature there can be little doubt that traditional surgical or non-surgical approaches to periodontitis do not generally lead to regeneration.<sup>7-10</sup>

Guided tissue regeneration (GTR) is based on principles of wound healing as espoused by Melcher.<sup>11</sup> He hypothesized that the cells that repopulate the periodontal wound determine the nature of attachment at the tooth-soft tissue

interface. Melcher originally felt that the progenitor cells to produce the regenerated cementum, periodontal ligament and bone are derived from periodontal ligament cells.

Besides the use of the common commercially available membranes, unusual regenerative materials have been used as a barrier in guided tissue regeneration technique in both animals and humans. Studies using silicon rubber, periosteum, connective tissue membranes as well as dura-mater allografts<sup>12,13</sup> have also been reported. More recently studies have presented the successful use of dental rubber dam in the treatment of periodontal infrabony defects.<sup>14-16</sup>

The ideal requirements of any material to be employed as a barrier membrane include biocompatibility, the ability to retard epithelial migration, manageability, adequate rigidity for space maintenance and the ability to allow tissue integration.<sup>17</sup> In addition to the necessary membrane characteristics listed above, an important pre-requisite for successful periodontal GTR therapy is proper membrane placement.

The use of dental rubber dam (DRD) as a barrier membrane has been suggested due to its good manageability, close adaptation to the root shape, particularly in the presence of root surface interproximal concavities, the possibility of simultaneously treating multiple adjacent periodontal defects, the ability to seal off the coagulum from bacterial contamination and negligible economic cost.

Most of the commercially available regenerative materials are very expensive and not within the reach of the common man especially in developing countries. Investigations have still to be undertaken to find more materials that are cost effective and possess all the required characteristics, as stated above, of an ideal barrier membrane.

In a five case-report presented by Cortellini and Pini Prato<sup>14</sup> to assess the efficacy of dental rubber dam (DRD) as a prospective barrier membrane, all patients presenting with at least one inter-proximal infrabony defect of 3 mm or more with no furcation involvement were taken. A 1-year CAL gain ranging from 3 to 5 mm was observed along with a marked reduction in the probing pocket depth (PPD). The residual PPD at 1-year ranged from 2 to 3 mm. The bone gain ranged from 3 to 5 mm. A slight 1-mm resorption of the inter-proximal crest of the bone was observed in two sites.

Later next year, Salama *et al.*<sup>16</sup> treated ten patients who presented themselves with at least four sites in a quadrant exhibiting probing depths of 7 mm or greater and the presence of existing multiple osseous defects for which regenerative treatment utilizing the principles of GTR

would require the placement of more than commercially available membrane. They found that all membranes became exposed inter-proximally by the second weekly visit. Attachment gain among sites ranged between 1 and 8 mm. The range among patients was 2 to 5 mm of new clinical attachment. The mean gain of probing attachment for all sites in all patients was 3.84 mm. The range of osseous regeneration (measured by open probing) was 2.4 to 7.5 mm. The mean osseous fill for all sites was 4.25 mm. Three of the patients exhibited supra-crestal osseous regeneration. The remaining patients had defect fill that ranged from 80% to 95%.

More recently Michele Paolantonio *et al.*<sup>15</sup> (1998) carried out a clinical study to confirm the validity of dental rubber dam as a suitable material in regenerative procedures. They also compared the effectiveness of dental rubber dam-made membranes and ePTFE barrier membranes in the treatment of periodontal intra-bony defects. They found that in both test and control site, a statistically significant improvement of clinical and intra-surgical parameters occurred at the end of the study; however, a significantly greater improvement was observed in control sites for probing attachment level (+4.0 mm versus +3.0 mm;  $p < 0.01$ ) and vertical bone gain (3.9 mm versus 2.9 mm;  $p < 0.05$ ) although at the time of membrane removal, newly formed tissue from the base of the defect was similar between the experimental sites (test: 5.8 mm; control: 5.6 mm;  $p > 0.05$ ). Conversely, test sites exhibited a statistically significant greater increase in gingival recession (+1.9 mm versus +1.2 mm;  $p < 0.05$ ) and alveolar crest resorption (-1.1 mm versus -0.3 mm;  $p < 0.01$ ) in comparison to controls.

Keeping the above factors in view an attempt has been made to evaluate the efficacy of dental rubber dam as a barrier membrane in the treatment of infrabony defects through clinical and radiological assessment and also to assess the advantages and disadvantages of the material as a prospective occlusive membrane. Clinical parameters include the measurements such as reduction in probing pocket depth, gain in clinical attachment level, change in level of gingival margin and mobility for the group of teeth selected for the study and indices to measure the gingival status and plaque percentage of the subjects. Radiographic assessment includes reduction from baseline osseous defect depth parameters and amount of bone fill as assessed six-months post-operatively.

## MATERIALS AND METHODS

### Patient Selection and Pre-Surgical Procedure

Fifteen patients (eight males and seven females) aged 20-50 years diagnosed as having moderate to severe

periodontitis presented themselves to the Department of periodontology, M.R.Ambedkar Dental College and Hospital. All subjects had a minimum of one infrabony defect as diagnosed clinically and confirmed radiographically. All patients were briefed of the surgical procedure, including the material to be used and a requirement of two surgical sittings, and an informed consent was obtained.

A special Performa was used consisting of a detailed case history, clinical examination and recordings of clinical parameters at baseline, three-month and six-month interval. The clinical parameters included plaque index (Silness and Loe),<sup>2</sup> gingival index (Loe and Silness),<sup>18</sup> periodontal probing depth (PPD), clinical attachment level, gingival recession and tooth mobility.

Radiographic measurements consisted of Intra-oral peri-apical (IOPA) radiographs utilizing the long cone extension methodology.<sup>19</sup> Radiographic assessment was made by scanning the radiographs utilizing a transmissive scanner at 1200 dpi resolution. Measurement was being made using Adobe PhotoShop 5.5™ software.

Pre-surgical periodontal treatment consisting of infection control (mechanical and chemical), supra-gingival and sub-gingival scaling, elimination of plaque retentive factors, occlusal control, elimination of caries and endodontic treatment was performed.

### Inclusion Criteria

1. Subjects with moderate to advanced periodontitis as assessed by clinical and radiographic findings.
2. Subjects presenting with two-walled or three-walled infrabony defect or combination defects were included.

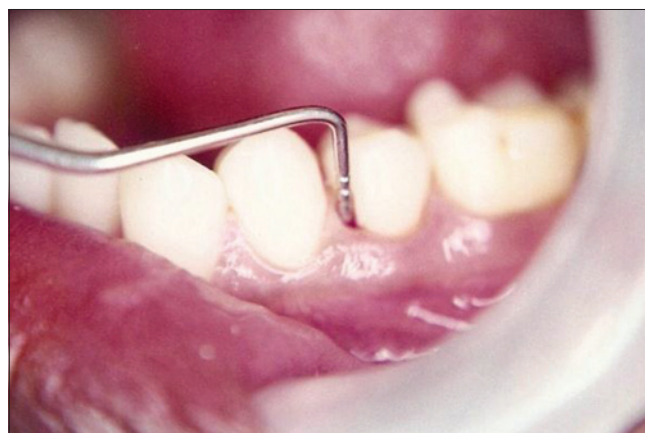
### Exclusion Criteria

1. Subjects with known history of systemic disease/s, allergies or drug usage that would alter the healing response of the oral tissues were excluded.
2. Subjects who had undergone periodontal treatment within six months prior to the present study were excluded.
3. Sites presenting with clinical/radiographic evidence of pulpal pathosis were excluded. One defect adjacent to an endodontically treated tooth was however included.
4. Furcation involved teeth were excluded.
5. One-wall defects and narrow three-walled defects were excluded from the study.

The study sites comprised of ten posterior and five anterior teeth and all cases showed a plaque percentage lesser than 10% at the time of surgery. Amongst the patients recalled, three patients did not return for revaluation.

## SURGICAL PROCEDURE

Following anesthesia, Facial and palatal/lingual full thickness envelope flaps were raised utilizing intra-sulcular incisions to maintain the maximum amount of gingival tissue for membrane coverage. The flaps were extended one tooth mesial and one tooth distal to the defect site. Alveolar bone was exposed for at least 3 mm apical to the base of the defect and periosteal fenestration was made to assure complete membrane coverage at the time of suturing. The defects were thoroughly debrided and the roots were carefully planed with ultrasonic and hand instruments.



**Pre Operative measurement in relation to 34 35**



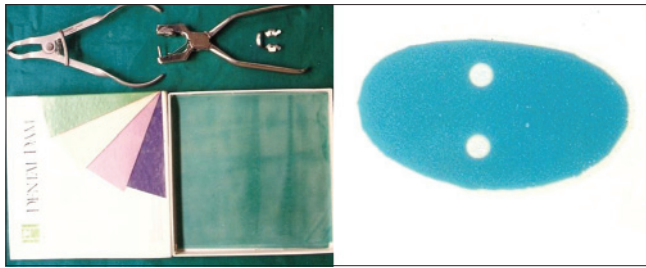
**Angular bony defect seen after flap reflection and debridement on buccal and lingual aspect**

The rubber dam material (cispolisoprene)<sup>1\*</sup> was cut into small pieces depending on the defect area. The dental rubber dam (DRD) was previously disinfected by carefully washing with distilled water and autoclaved at 120°C. Following which it was submerged in 0.2% chlorhexidine for 12 hours, and rinsed with saline solution before use.

The dental rubber dam was positioned as the same way as when teeth are isolated for restorative procedures. One hole was punched in the dam for each tooth adjacent to the defect utilizing a rubber dam punch. The dam was then stretched over the teeth, to place it as a poncho over the denuded bone.

\*Hygenic™ latex dental rubber dam-medium thickness (0.008 inch/0.2 mm)



**Dental Rubber Dam**

It was then adapted and reshaped once in place to eliminate the excess peripheral portions including all sharp edges. The flaps were sutured to cover the rubber dam at the maximal possible extent, avoiding any compression of the area where the infrabony defect was located. Vertical mattress sutures were placed using a non-absorbable black braided silk suture at the defect site and simple interrupted sutures were placed wherever necessary.

**Placement of Rubber Dam on the buccal and lingual aspect extending 2-3 mm apical to alveolar crest****Sutures placed**

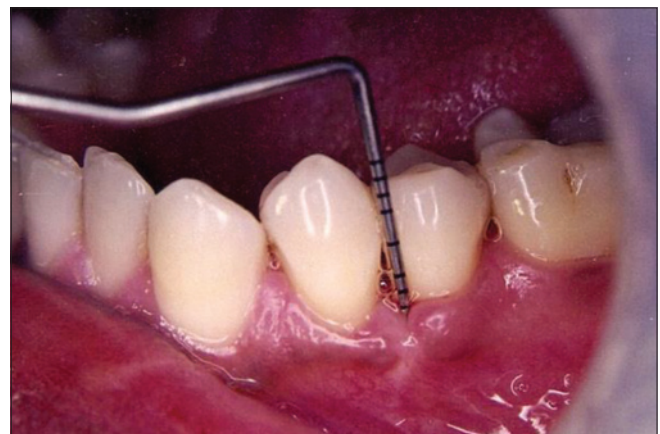
A periodontal dressing (Coe-Pak™) was placed and the patients were dismissed with a prescription of 1 g of tetracycline hydrochloride per day during the first post-operative week and instructed to rinse twice daily with 0.2% chlorhexidine (Hexidine™). Professional tooth cleaning was performed weekly once while the membrane was in place and monthly once following membrane removal.

Four weeks after placement, the DRD was removed after elevation of a partial thickness flap. Following de-epithelialization of the inner walls of the flaps, it was positioned and sutured to obtain the best possible coverage of the newly formed tissue. Periodontal dressing was applied and the patients were re-instructed to rinse twice daily with 0.2% chlorhexidine.

The dressing and sutures were removed after 1 week and patients were instructed to resume tooth brushing in the area and discontinue the chlorhexidine mouthwash.

**Experimental site at 4 weeks postoperatively**

(Prior to membrane removal)

**Surgical site after DRD removal****Six month post-operative**

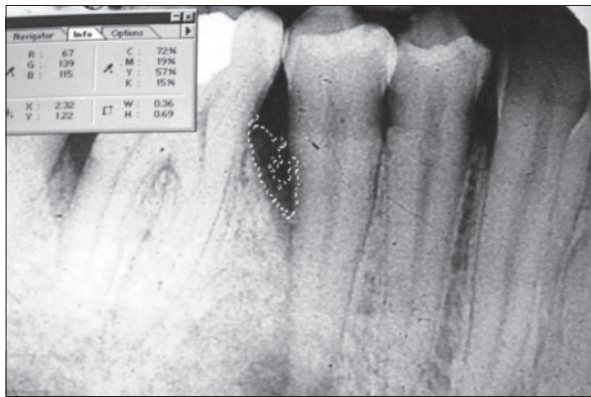
## CLINICAL AND RADIOGRAPHICAL MEASUREMENTS

### Clinical Measurements

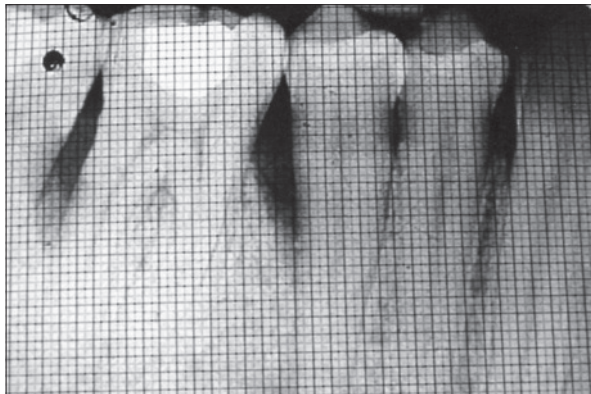
- Probing depth (PD)
- Attachment level (AL)
- Recession

### Radiographic Measurements

A unique method was employed to radiographically determine the amount of hard tissue changes. This was assessed by initially scanning the pre- and post-operative Radiographs at 1200 dpi resolution using a Hewlett Packard transmissive scanner. These images were then imported into a graphic programming software, Adobe PhotoShop 7.0™. The images were then sharpened and the contrast adjusted so-as to clearly de-mark the anatomical landmarks consisting of cemento enamel junctions, alveolar crest and base of the defect. These landmarks were then marked using a colored “pen” tool.

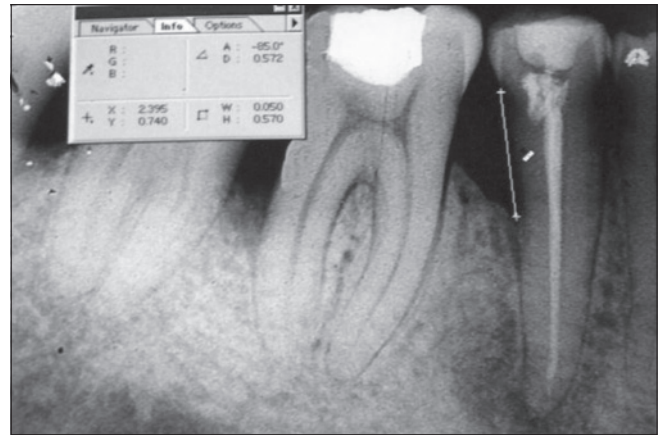


Use of ‘magic wand’ tool to detect areas of similar contrast



Radiograph with grid lines for alternative

Following this, the “scale” tool was utilized to measure the distance from the respective points. The scale determined the distance to an accuracy of 0.01 cm. To further aid in measurements an alternative of grid lines was also utilized.



“Scale” tool used to measure the distance between landmarks in mm

The measurements made include:

- CEJ to Base of the defect (BOD)
- CEJ to Alveolar crest (AC)
- Alveolar crest to base of the defect

It should be noted here that the CEJ of the tooth that is closest was considered, i.e. the CEJ considered to measure the distance to the BOD or AC is never the same.

The percentage of bone fill was calculated using the formula:

$$\frac{\text{CEJ} - \text{BOD (pre-op)} - \text{CEJ} - \text{BOD (post-op)}}{\text{AC} - \text{BOD (pre-op)}} \times 100$$

All the data obtained in this study were evaluated statistically by using student’s paired t-test.

## RESULTS

Fourteen patients with presence of at least one vertical osseous defect as verified by clinical and radiographic evaluation were selected for this study. Four to six weeks after basic therapy, periodontal flap operations were carried out with placement of dental rubber dam in 15 experimental sites. All membranes were removed in the fourth week. The patients were recalled at regular intervals and were followed in the range of six-nine months. All the patients participated for the entire study period. All measurements were analyzed statistically using student’s paired “t” test. Baseline and six-month complete plaque and gingival scores were less than 10% in all of the patients. The level of gingival inflammation around the membrane ranged from mild to moderate.

### General Findings

There were no post-operative complications of any kind in any of the patients. The rubber dam did not cause any objectively recorded adverse effects and none of



the patients reported any sort of discomfort during the period in which it was in place. No allergic reaction to the material, neither any swelling nor suppuration was noted. It was noted that all membranes became exposed interproximally by the second weekly visit. In three patients there was small perforation in the facial gingival resulting in membrane exposure, however, no signs of inflammation were seen in these areas.

### Clinical Assessment

#### *Probing Pocket Depth and Attachment Gain*

A significant reduction was observed in the probing pocket depth. The mean probing depth before surgery was  $6.8 \pm 1.26$  mm and six-month post-operative measurement was  $2.4 \pm 0.90$  mm. This was found to be statistically highly significant ( $p < 0.001$ ).

A highly significant gain in attachment level was also recorded ( $p < 0.001$ ). The mean attachment loss prior to surgery was  $6.8 \pm 1.26$  mm and six-month post-operative measurements showed an attachment loss of  $3.93 \pm 1.03$  mm.

#### *Gingival Recession*

Twelve of the fifteen subjects showed a significant shrinkage in the gingival margin, which was the most important and undesirable finding. While none of the sites showed recession pre-operatively, a mean average recession encountered at the end of the study period was  $1.53 \pm 0.12$  mm.

### Radiographic Assessment

#### *Bone-Fill*

The sites that were treated with the barrier membrane showed a significant amount of bone fill. The mean distance from cemento-enamel junction to base of defect prior to study was  $10.49 \pm 2.72$  mm and at six months there was a reduction to  $9.33 \pm 2.72$  mm. This was statistically significant. Some amount of resorption of alveolar crest was recorded at the end of study. A mean of  $4.54 \pm 1.36$  mm resolved to a height of  $4.75 \pm 1.54$  mm. The overall percentage of bone fill was 16 %, which was statistically significant.

## DISCUSSION

Ever since Melcher<sup>11</sup> formulated the hypothesis suggesting that selected cell population residing in the periodontium can produce new cementum, alveolar bone and periodontal ligament provided that these population are given an opportunity to occupy a periodontal wound a number of devices have been used to achieve this concept of GTR. Starting from a Millipore filter different types of barrier membranes both non-absorbable and absorbable have

been used in periodontal therapy with different degree of success.

For a device to be effective it has to meet certain criteria based on organ and tissue properties and specific goals. These include bio-compatibility, cell exclusion, space maintenance, tissue interaction, ease of use and biological availability. Further, such a device must be cost effective.

Considering the above requisites many unusual materials have been tried as barrier membranes. One of which is dental rubber dam (DRD). The spectacular success reported in a couple of studies prompted its use in this study.

The results from this study shows that DRD used as a barrier membrane in guided tissue regeneration produces a significant reduction in probing depth, gain in clinical attachment level (CAL), and bone fill. In the present study a mean attachment gain of +2.9 mm and an average bone gain of +0.94 mm was recorded.

However, spectacular changes in the radiographs were probably not seen because of duration of short post-operative observation. More perceptible radiographic changes would perhaps become evident if these cases are observed for a longer duration of time.

Notwithstanding the significant gains in reduction of periodontal probing depth (PPD), gain in CAL and other clinical features, the use of DRD in this study resulted in changes, which could seriously limit the use of this material.

12 out of 15 defects treated developed post-operative gingival recession. Although many previous studies using ePTFE have reported gingival recession (GR) following the use of barrier membrane, this is nevertheless unwelcome sequelae. Some of the clinicians have tried coronal repositioning of the flap but some degree of GR always occurred.

Secondly, the exposure of the DRD starting from the second post-operative week despite maximum effort to approximate the flaps with sound suturing technique is of concern to the clinician. In every study using DRD as a barrier membrane, interproximal exposure of the dam has been reported including the present study. Although, this did not result in any infection, what effect such as exposure of the material had on the final outcome of the treatment is difficult to assess.<sup>10,20,21</sup>

Perforation of the tissue with subsequent exposure of the dam seen in two cases of the study is an avoidable complication. This might have been probably because of sharp edges and folding of the DRD and might have

been prevented if the edges of the dam was sutured to the periosteum.

Because of GR seen at the time of removal of DRD there was always a chance of incomplete coverage of the newly formed granulation tissue, which is very vital for ensuring periodontal regeneration. In one study efforts were made to re-suture the flaps in order to protect the newly formed granulation tissue. All these procedures might place additional stress on the patient.

The lack of connective tissue integration into the membrane because of the smooth and non-porous nature of the DRD resulted in inadequate stabilization of the membrane and consequently made maintenance more demanding as it resulted in not only earlier exposure of the membrane but also enhanced epithelium migration down the inner aspect of the mucogingival flap compared with the other materials.

The limitation cited above notwithstanding the DRD as a barrier membrane demonstrated important desirable characteristics. Its tight fitting and adherence to the root circumference along with its ability to be placed at a more coronal level compared to other ePTFE membrane could result in greater amount of newly formed tissue. Further, its ability to adapt to complex root morphology such as concavities is a distinct advantage.

Bacterial aggregation on the membranes has been mentioned as a major disadvantage in many studies prompting some clinicians resorting to use the use of local drug delivery systems to combat the same. However, this problem may not be seen in DRD as little bacterial aggregation can occur on the DRD due to its non-porous surface. Also, the dam protected the regenerative space from infiltration by epithelial cells as well as influences of saliva and bacterial and their byproducts.

The ability of the DRD to treat multiple adjacent infrabony defects simultaneously is a distinct advantage over other materials.

That there was no tissue reaction whatsoever in any of the cases shows the excellent bio-compatibility of the material which is a major advantage.

Most of the commercially available barrier membranes for guided tissue regeneration therapy in India are very expensive and therefore beyond the reach of most of the patients. The low price of DRD is certainly a major positive and desirable factor in the periodontal treatment of patients belonging to the economically poorer section of the society.

Many of the previous studies have used re-entry at the end of one year to assess the clinical outcome. However, since the patients had already undergone two surgical procedures during the duration of this study, a third surgery in the form of re-entry was not considered, instead a new innovative radiographic method of estimation to evaluate the changes in the bone was employed. However, variations in the degree of exposure, developing and fixing of the radiographs might have contributed to variations in the interpretation of the results.

Microbiological assessments also need to be looked into in future studies. Further follow up over a long period of time will throw more light on the efficacy and maintainability of these procedures.

One of the problems encountered with DRD is its lack of rigidity. If the same material can be reinforced to make it a little more rigid, possible collapse of the membrane into the defects could be prevented. Further, if the cervical portion is made tissue adherent this might result in better tissue adaptation and also might prevent recession. Further studies can look into these factors.

## CONCLUSION

It can be concluded that dental Rubber dam is a barrier membrane with great potential in treatment of periodontal osseous defects provided the limitations brought to light in this study are addressed in the future. At present it can only be recommended for the treatment of osseous defects in the posterior teeth aesthetics is not a prime concern.

## REFERENCES

1. The American Academy of Periodontology Goal of Therapy. Consensus report discussion. Section II. In: Proceedings of the World Workshop in Clinical Periodontics. Chicago; 1989. II-13.
2. The American Academy of periodontology. Glossary of Periodontal Terms. 3<sup>rd</sup> ed. Chicago: The American Academy of Periodontology; 1992.
3. Hiatt WH, Schallhorn RE. Intra-oral transplants of cancellous bone and marrow in periodontal lesions. J Periodontol 1973; (44): 194-208.
4. Mellonig JT, Bowers GM, Cotton WR. Comparison of bone graft materials. J Periodontol 1981; (52): 297-301.
5. The American Academy of Periodontology. Position paper. The Potential Role of Growth and Differentiation Factors in Periodontal Regeneration. J Periodontol 1996;(67): 545-553.
6. Prichard JF. Present state of the Interdental Denudation Procedure. J Periodontol 1977: 566-569.
7. Bowers GM, Chadroff B, Carnevale R. Histologic evaluation of new attachment apparatus formation in humans. Part I. J Periodontol 1989; (60): 664-674.
8. Caton J, Nyman S, Zander H. Histometric evaluation of periodontal surgery. II. Connective attachment levels after four regenerative procedures. J Clin Periodontol 1980; (7): 224-231.
9. Fowler C, Garrett S, Crigger M, Egelberg J. Histologic probe position in treated and untreated human periodontal tissues. J Clin Periodontol. 1982;(9): 373-385.

10. Silness L, Loe H. Periodontal disease in pregnancy. *Acta Odontol Scand* 1964; (22): 121.
11. Melcher AH. On the repair potential of periodontal tissues. A Review *J Periodontol*. 1976; 47(5): 256-60.
12. Lekovic VM, Kenney EB, Dimitrijevic BB, Carranza FA Jr. Histometric and stereometric evaluation of new attachment formation following controlled tissue regeneration using four different membranes. *J Periodontol* 1991; (62): 85.
13. Zander DJ, Yukna RA, Malinin TI Human freeze-dried dura mater allografts as a periodontal biologic bandage. *J Periodontol* 1989; (60): 617-623.
14. Cortellini P, Pini Prato G. Guided tissue regeneration with a Rubber Dam: A five case report. *Int J Periodont Rest Dent* 1994;(14): 9-15.
15. Paolantonio M, D'Archivio D, Di Placido, G Tumini V, Di Peppe et al. Expanded polytetrafluoroethylene and dental Rubber Dam barrier membrane in the treatment of periodontal intrabony defects. A comparative clinical trial. *J Clin Periodontol* 1998; (25): 920-928.
16. Salama H, Rigotti F, Gianserra R, Seibert J. The utilization of rubber dam as a barrier membrane for the simultaneous treatment of multiple periodontal defects by the biologic principle of guided tissue regeneration: Case reports. *Int J Periodont Rest Dent* 1994; (14): 17-33.
17. Schallhorn RG, McClain PK. Clinical and radiographic healing pattern observations with combined regenerative techniques. *Int J Perio Rest Dent* 1994; (14): 391-403.
18. Loe H, Silness L. Periodontal disease in pregnancy. *Acta Odontol Scand* 1963; (21): 533.
19. Updegrave WJ. The paralleling extension cone technique in intraoral dental radiography. *Oral Surg Oral Med Oral Pathol* 1951; (4): 1250-1261.
20. Nygaard-Ostby P, Tellefsen G, Sigurdsson TJ, Zimmerman GJ, Wikesjo UM. Periodontal healing following reconstructive surgery: effect of guided tissue regeneration. *J Clin Periodontol* 1996; 23(12): 1073-9.
21. Selvig KA, Kersten BG, Chamberlain AD, Wikesjo UM, Nilveus RE. Regenerative surgery of intrabony periodontal defects using ePTFE barrier membranes: scanning electron microscopic evaluation of retrieved membranes versus clinical healing. *J Periodontol* 1992; 63(12): 974-8.

**How to cite this article:** Rita Singh, Shyam Padmanabhan, C D Dwarakanath. "Dental Rubber Dam as a Barrier Membrane in the Treatment of Infrabony Defects". *International Journal of Scientific Study*. 2014;1(4):6-13.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Dental CT versus Radiography in the Detection of Vertical Root Fractures

Shruti Chandak, Shalini Saraswat<sup>1</sup>, Omprakash<sup>2</sup>, Vijai Pratap<sup>3</sup>

M.D., Assistant Professor, Department of Radiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, <sup>1</sup>D.N.B., Assistant Professor, Department of Radiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, <sup>2</sup>Professor & Head of Department, Department of Radiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, <sup>3</sup>M.D., Associate Professor, Department of Radiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad

**Corresponding Author:** Dr. Shruti Chandak, M.D., Assistant Professor, Department of Radiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad. E-mail: chandakshruti@yahoo.com

## Abstract

**Aims & Objectives:** To compare the findings of Radiography and Computed Tomography (CT) in the diagnosis of vertical root fractures and to correlate our findings post operatively.

**Material and Methods:** We evaluated 22 cases of clinically suspected vertical root fractures those who were referred to us for Dental CT and compared findings of Radiography and CT. Radiography was carried out in the Oral Radiology department and Dental CT was carried out using Philips Brilliance multislice CT scanner. The findings of Radiography and CT were then compared by two experienced radiologists independently. All patients were confirmed intraoperatively.

**Results:** The sensitivity of Radiography for detection of vertical root fracture was 27% for reviewer I and 25% for Reviewer II. The specificity of Radiography for detection of vertical root fracture was 100% for both the reviewers. The sensitivity of CT for detection of vertical root fracture was 93% for reviewer I and 95% for Reviewer II. The specificity of CT for detection of vertical root fracture was 94% for Reviewer I and 100% for Reviewer II.

**Conclusion:** In conclusion, CT is an indispensable tool for the detection of vertical root fractures and scores far better over Radiography.

**Keywords:** Vertical root fractures, Dental CT, Dentscan

## INTRODUCTION

Vertical root fractures are longitudinally oriented fractures of the root which usually involve endodontically treated teeth. They extend from the root canal to the periodontium. The fracture can involve the entire length of the root or only a part of it. It may affect only one or both sides of the root. Their diagnosis is very challenging since they have very diverse clinical features and they are often missed on Radiography.<sup>1</sup> There are a number of radiological features like separation of root fragments, visualization of a lucent fracture line, clear space near a root filling or post, bone loss or dislodgement of filling material. Since a vertical root fracture necessitates extraction of the tooth, it would be better to find a more efficient and reliable means of establishing the diagnosis preoperatively so that prosthetic rehabilitation may be initiated and the cost and effort of an ineffective apical root resection may be avoided.<sup>2</sup> Dental CT

has proved time and again to be an indispensable tool in the diagnosis of vertical root fractures. The basic purpose of this study was to compare Radiography with Dental CT for diagnosis of vertical root fractures.

## MATERIAL AND METHOD

We evaluated 22 cases of clinically suspected vertical root fractures those who were referred to us for Dental CT and compared findings of Radiography and CT. Informed consent was obtained from all the patients. Radiography was carried out in the Oral Radiology department and Dental CT was carried out using Philips Brilliance multislice CT scanner. Reconstructions were performed using the Dentscan software at the Extended workstation. We first drew a planning line along the arch of the jaw and then panoramic and cross sectional reconstructions were

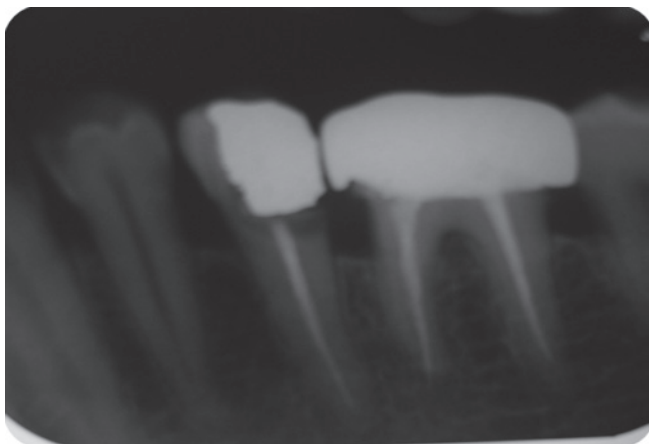


done. All the images were then evaluated including axial, coronal, sagittal, panoramic and cross sectional views. The findings of Radiography and CT were then compared by two experienced radiologists independently. All patients were confirmed intraoperatively. The signs of fracture on Radiography were separation of root fragments, visualization of a lucent fracture line, clear space near a root filling or post, bone loss or dislodgement of filling material. CT findings of a root fracture were characterized by a separation of the adjacent root segments or the demonstration of a hypodense fracture line.

## OBSERVATIONS AND RESULTS

15 out of the 22 clinically suspected were found intraoperatively to have a fracture. Two experienced radiologists evaluated the images independently for vertical root fracture. On Radiography evidence of a fracture was indicated by direct visualization of a radiolucent line, separation of root fragments, clear space near a root filling or post, bone loss or dislodgement of filling material. CT findings of a root fracture were a linear hypodense line traversing the root of the tooth vertically or separation of adjacent root segments. The sensitivity and specificity of dental radiography and CT were then determined separately for each reviewer.

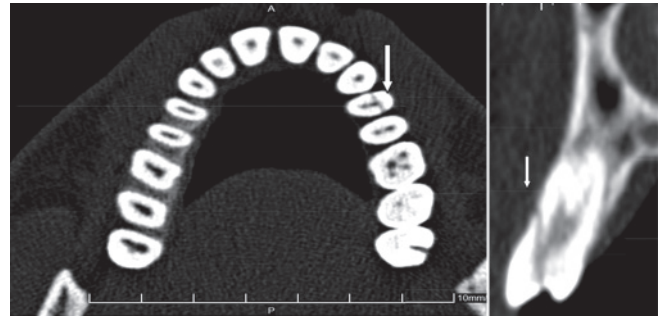
On Radiography, Reviewer I correctly diagnosed fracture in 4 of the 15 teeth. Diagnoses were false negative in 11 cases. All 7 cases without fracture were diagnosed correctly hence there were no false-positive results. The sensitivity was 27% and the specificity was 100%. The sensitivity and specificity for Reviewer II was 25% and 100%.



**Figure 1a: Case with clinical suspicion of vertical root fracture. Fracture line not visualized in IOPA view**

On Dental CT Reviewer I diagnosed 14 of the 15 fractures correctly. There was 1 false-negative case. There were 6 correct negative diagnoses and no false-positive results. The sensitivity and specificity of reviewer I was 93%

and 100%, respectively. The sensitivity and specificity for Reviewer II was 95% and 100%. The average sensitivity and specificity of Dental CT were 94% and 100%, respectively (Figure 1a & 1b).



**Figure 1b: Cross sectional and axial CT sections clearly show the fracture line**

## DISCUSSION

Patients present with pain, tenderness and local swelling after endodontic treatment. There are only a limited number of reports in the radiology literature that deal with the problem of dental vertical root fractures. These fractures are clinically very challenging.<sup>3,4</sup> Horizontal root fractures are typically of traumatic origin and are relatively simple to diagnose. Vertical root fractures are usually iatrogenic and often follow endodontic treatment.<sup>5</sup> They occur in vital teeth with an intact pulp as a result of conservative restorations (filling restoration such as amalgam filling) or in endodontically treated teeth (pulp-extracted teeth with root fillings that are consequently not vital) as a result of excessive pressure used during endodontic treatment. They can also be caused during dental filling or placement of a post. Detection of a vertical root fracture is of clinical importance since it necessitates extraction of the tooth. Clinical signs of the fracture develop slowly and are usually not apparent until 1 or 2 years after injury.

In our study, the sensitivity of Radiography for detection of vertical root fracture was 27% for reviewer I and 25% for Reviewer II. The specificity of Radiography for detection of vertical root fracture was 100% for both the reviewers.

The sensitivity of CT for detection of vertical root fracture was 93% for reviewer I and 95% for Reviewer II. The specificity of CT for detection of vertical root fracture was 94% for Reviewer I and 100% for Reviewer II.

In a study conducted by Soraya Youssefzadeh et al<sup>1</sup> who studied 42 teeth showed CT was 100% sensitive and specific for diagnosing vertical root fracture.

Radiographic signs are usually absent as the orientation of X- ray beam may not be parallel to the plane of fracture. Superimposition also limits its sensitivity for detection of longitudinal fracture.

## CONCLUSION

In conclusion, vertical root fractures are a very difficult diagnostic challenge because the clinical signs and symptoms are highly variable and Radiography is also very unreliable. There is no single pathognomonic clinical or radiographic feature. However, though CT is an indispensable tool for the detection of vertical root fractures and scores far better over Radiography, it would

only be indicated in difficult where Radiography is negative despite clinical suspicion due to the high radiation dose as compared to Radiography.

## REFERENCES

1. Soraya Youssefzadeh, Andre' Gahleitner, Roland Dorfner, Thomas Bernhart, Franz M. Kainberger: Dental Vertical Root Fractures: Value of CT in Detection. Radiology 1999; 210:545–549.
2. Pitts DL, Natkin E. Diagnosis and treatment of vertical root fractures. J Endod 1983; 9:338–346.
3. Haverling M, Ramström G. Dental root fracture diagnosed by polytomography. Acta Radiol Diagn Stockh 1974; 15:558–560.
4. Barkhordar RA, Radke R, Abbasi J. Effect of metal collars on resistance of endodontically treated teeth to root fracture. J Prosthet Dent 1989; 61:676–678.
5. Tamse A. Iatrogenic vertical root fractures in endodontically treated teeth. Endod Dent Traumatol 1988; 4:190–196.

**How to cite this article:** Shruti Chandak, Shalini Saraswat, Omprakash, Vijai Pratap. "Dental CT versus Radiography in the Detection of Vertical Root Fractures". International Journal of Scientific Study. 2014;1(4):14-16.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Knowledge and Attitude of School Teachers Towards Tooth Avulsion in Rural and Urban Areas

Manjeet Kaur, Kanika Gupta<sup>1</sup>, Ruchika Goyal<sup>2</sup>, Navdha Chaudhary<sup>3</sup>

Manjeet Kaur, Professor and Head, Department of Paedodontics and Preventive dentistry, B.R.S. Dental College and Hospital, Panchkula. <sup>1</sup> Kanika Gupta, 2<sup>nd</sup> Year P.G Student, Department of Paedodontics and Preventive Dentistry, B.R.S. Dental College and Hospital, Panchkula. <sup>2</sup> Ruchika Goyal, 2<sup>nd</sup> Year P.G Student, Department of Paedodontics and Preventive Dentistry, B.R.S. Dental College and Hospital, Panchkula. <sup>3</sup> Navdha Chaudhary, 3<sup>rd</sup> Year P.G Student, Department of Paedodontics and Preventive Dentistry, B.R.S. Dental College and Hospital, Panchkula

**Corresponding Author:** Manjeet Kaur, Professor and Head, Department of Paedodontics and Preventive Dentistry, B.R.S. Dental College and Hospital, Panchkula. Mobile - 9888287838. E-mail: mnjtdocgl@yahoo.co.in

## Abstract

**Introduction:** School teachers are most likely to be in the vicinity of the child at the time of the injury in the school. Thus they should be well prepared to intervene when such dental emergencies arise.

**Purpose:** The purpose of this study was to assess the knowledge and attitude regarding tooth avulsion and dental first aid among school teachers in Chandigarh (urban area) and Barwala (rural area).

**Material & Methods:** The study was performed by administering a self-designed questionnaire on a sample of 50 school teachers of Chandigarh and 50 school teachers of Barwala.

**Results:** Results showed poor knowledge in the management of avulsed teeth among the school teachers of both Chandigarh and Barwala.

**Conclusion:** School teachers, being one of the child managers, need to have the basic knowledge to recognize and manage oral emergencies avulsed teeth to prevent its consequences in the child's development.

**Keywords:** Child managers, Dental emergencies, Knowledge, School teachers, Tooth avulsion

## INTRODUCTION

Dental trauma involves injuries to the tooth, periodontium and supporting alveolar bone.<sup>1,2</sup> Traumatic dental injuries can have a significant impact on the life of children, affecting them both emotionally and physically.<sup>3</sup> Dental injuries may cause intrusion, extrusion, avulsion, luxation and subluxation of the tooth.<sup>4</sup> Every year a large number of dental injuries are reported especially among children belonging to 7-15 year age group.<sup>5</sup> Studies show that males are injured twice as often as females.<sup>6</sup> The most commonly traumatised tooth is the maxillary central incisor.<sup>7</sup>

In children, sports were found to be responsible for 13% of overall oral traumas.<sup>8</sup> Tooth avulsion is a result of trauma in which a tooth comes out of the socket. It comprises 0.5 to 16% of all traumatic dental injuries.<sup>5</sup> Tooth avulsion leads to disintegration of pulp and periodontal ligament. This

is due to the effects of a lack of blood supply to the cells and environmental factors (example: drying or bacterial contamination).<sup>9</sup>

Successful replantation of an avulsed tooth depends solely on extraoral drying time and the storage medium of the avulsed tooth.<sup>10</sup> Clinical outcome studies have demonstrated that the immediate replantation of avulsed tooth is essential for regeneration of periodontal ligament after replantation.<sup>11</sup>

People most likely to be in contact with the child at the time of the injury in school are school professionals, thus their knowledge of emergency procedure is important for the better prognosis of the injured tooth.<sup>2</sup> This study was aimed to assess the knowledge and attitude regarding tooth avulsion and dental first aid among school teachers in rural and urban areas.

## MATERIALS AND METHODS

The study was conducted among 50 school teachers of Chandigarh (urban area) and 50 school teachers of Barwala (rural area). Permission for the study was obtained from the concerned authorities. The objectives of the study were explained to all the school teachers who participated in the study and also a written informed consent was obtained from all teachers. A self-designed questionnaire containing demographic details and specially framed 9 questions in english language were administered to the teachers. The respondents were then asked to tick the most appropriate answer from the given list of answers. Filled questionnaire were collected on the same day. Information regarding the tooth avulsion and its emergency management, as a health talk was given in both English and local language in order to improve the awareness among school teachers. Data collected was statistically analyzed, subjected to chi-square test and represented in the form of tables.

## RESULTS

The results showed that when teachers were asked about knocked-out tooth 25 (50%) teachers in urban area knew what it meant as compared to 33 (66%) teachers in rural area (Table 1).

**Table 1: Do you know, what is knocked-out tooth? (Question 1)**

| Options | Urban area (Chandigarh) | Rural area (Barwala) | p-value (< 0.05) |
|---------|-------------------------|----------------------|------------------|
| Yes     | 25 (50%)                | 33 (66%)             | 0.104            |
| No      | 25 (50%)                | 17 (34%)             |                  |

Regarding question of information on tooth replantation, 34 (68%) teachers knew what tooth replantation is in urban area, while 16 (32%) teachers in rural area were aware of the same (Table 2).

**Table 2: Do you know, what tooth replantation is? (Question 2)**

| Options | Urban area (Chandigarh) | Rural area (Barwala) | p-value |
|---------|-------------------------|----------------------|---------|
| Yes     | 34 (68%)                | 16 (32%)             | 0.0003  |
| No      | 16 (32%)                | 34 (68%)             |         |

When teachers were asked what should be done if knocked out tooth falls on the ground, in urban area 22 (44%) teachers knew what should be done as compared to 13 (26%) teachers in rural area (Table 3).

**Table 3: If the tooth is knocked out and falls on the ground, do you know what should be done? (Question 3)**

| Options | Urban area (Chandigarh) | Rural area (Barwala) | P value |
|---------|-------------------------|----------------------|---------|
| Yes     | 22 (44%)                | 13 (26%)             | 0.059   |
| No      | 28 (56%)                | 37 (74%)             |         |

Knowledge of teachers about placement of tooth back into its socket showed that 27 (54%) urban school teachers answered 'yes', while 32 (64%) teachers in rural area gave this answer (Table 4).

**Table 4: Should the knocked out tooth be placed back into the socket? (Question 4)**

| Options | Urban area (Chandigarh) | Rural area (Barwala) | p-value |
|---------|-------------------------|----------------------|---------|
| Yes     | 27 (54%)                | 32 (64%)             | 0.310   |
| No      | 23 (46%)                | 18 (36%)             |         |

Information of teachers on ideal time within which avulsed tooth should be replanted showed that the number of teachers not aware about this was 18 (36%) in urban area and 30 (60%) in rural area, in urban area 15 (30%) teachers in and 17 (34%) in rural area answered that the optimum time is within 24 hours, 6 hours was the right answer for 5 (10%) teachers in urban area and 1 (2%) in rural area, 2 (4%) teacher in urban area said 5 and 30 min (Table 5).

**Table 5: How immediately the tooth replantation should be performed after the tooth comes out of the socket? (Question 5)**

| Options     | Urban area (Chandigarh) | Rural area (Barwala) | p-value |
|-------------|-------------------------|----------------------|---------|
| 5 min       | 1 (2%)                  | 0 (0%)               | 0.495   |
| 30 min      | 1 (2%)                  | 0 (0%)               |         |
| 1 hour      | 3 (6%)                  | 1 (2%)               |         |
| 6 hour      | 5 (10%)                 | 1 (2%)               |         |
| 24 hour     | 15 (30%)                | 17 (34%)             |         |
| 72 hour     | 7 (14%)                 | 1 (2%)               |         |
| Do not know | 18 (36%)                | 30 (60%)             |         |

When the teachers were asked about their knowledge on handling and cleaning of the avulsed tooth, the number of teachers who were unaware of this procedure was 14 (28%) in urban area and 19 (38%) in rural area, 9 (18%) teachers in urban area and 6 (12%) in rural area suggested that the tooth should not be kept or washed, milk was chosen by 1 (2%) teacher in rural area, 7 (14%) teachers in urban area and 16 (32%) in rural area answered washing it in the tap water, in urban area 9 (18%) teachers gave their opinion to brush the roots and crown (Table 6).

**Table 6: If the tooth falls on the ground and gets dirty, what should you do? (Question 6)**

| Options              | Urban area (Chandigarh) | Rural area (Barwala) | p-value |
|----------------------|-------------------------|----------------------|---------|
| Brush crown and root | 9 (18%)                 | 0 (0%)               | 0.032   |
| Wash with tap water  | 7 (14%)                 | 16 (32%)             |         |
| Wash with milk       | 0 (0%)                  | 1 (2%)               |         |
| Wash with saline     | 11 (22%)                | 8 (16%)              |         |
| Do not wash          | 9 (18%)                 | 6 (12%)              |         |
| I do not know        | 14 (28%)                | 19 (38%)             |         |

For the treatment of the knocked-out tooth, 48 (96%) teachers in urban area and 33 (66%) in rural area chose a nearby dentist for treatment, in urban area 1 (2%) teacher and in rural 10 (20%) teachers opted for General hospital, 4 (8%) teachers in rural area suggested on visiting a Dental college for treatment (Table 7).

**Table 7: First place to seek for treatment? (Question 7)**

| Options            | Urban area (Chandigarh) | Rural area (Barwala) | p-value |
|--------------------|-------------------------|----------------------|---------|
| Emergency hospital | 1 (2%)                  | 3 (6%)               | 0.0002  |
| General hospital   | 1 (2%)                  | 10 (20%)             |         |
| Dentist nearby     | 48 (96%)                | 33 (66%)             |         |
| Private doctor     | 0 (0%)                  | 0 (0%)               |         |
| Medical College    | 0 (0%)                  | 0 (0%)               |         |
| Dental College     | 0 (0%)                  | 4 (8%)               |         |
| Others             | 0 (0%)                  | 0 (0%)               |         |

When asked about the most suitable transport media for storing the tooth, 18 (36%) urban school teachers and 17 (34%) teachers in rural area were not aware of the appropriate media, cotton rolls were chosen by 15 (30%) teachers in urban area and 4 (8%) in rural area, tissue paper was chosen by 6 (12%) teachers in urban area and 3 (6%) in rural area, 2 (4%) teachers in urban area and 10 (20%) in rural area answered tap water, saline water was the right answer for 6 (12%) teachers in urban area and 4 (8%) in rural area, 1 (2%) teacher in rural area opted for milk and other medium (Table 8).

**Table 8: Transport media? (Question 8)**

| Options       | Urban area (Chandigarh) (%) | Rural area (Barwala) (%) | p-value |
|---------------|-----------------------------|--------------------------|---------|
| Napkin        | 1 (2)                       | 4 (8)                    | 1       |
| Tissue paper  | 6 (12)                      | 3 (6)                    |         |
| Cotton rolls  | 15 (30)                     | 4 (8)                    |         |
| Pocket        | 1 (2)                       | 1 (2)                    |         |
| Poly bags     | 1 (2)                       | 5 (10)                   |         |
| Tap water     | 2 (4)                       | 10 (20)                  |         |
| Saline water  | 6 (12)                      | 4 (8)                    |         |
| Milk          | 0 (0)                       | 1 (2)                    |         |
| Saliva        | 0 (0)                       | 0 (0)                    |         |
| Others        | 0 (0)                       | 1 (2)                    |         |
| I do not know | 18 (36)                     | 17 (34)                  |         |

The answer to the question on any prior information received by the teachers on this subject, 50 (100%) teachers in both rural and urban area had not received any information regarding the management of avulsed tooth (Table 9).

**Table 9: Have you ever received any kind of information on management of knocked-out tooth? (Question 9)**

| Options | Urban area (Chandigarh) | Rural area (Barwala) |
|---------|-------------------------|----------------------|
| Yes     | 0 (0%)                  | 0 (0%)               |
| No      | 50 (100%)               | 50 (100%)            |

## DISCUSSION

The results of the study showed insufficient knowledge regarding tooth avulsion and its first aid treatment among school teachers of Chandigarh (urban area) and Barwala (rural area), these results were comparable with previous similar studies.<sup>12-15</sup> In present study, many teachers in both rural and urban area did not know what was knocked-out tooth or tooth replantation. This is very surprising, since tooth avulsion occurs commonly in school children between 7 and 11 years old.<sup>16</sup> However, the teachers themselves cannot be blamed for, since hardly any campaigning or exposure regarding tooth avulsion had been done in Chandigarh or Barwala.

Successful prognosis for avulsed tooth depends on immediate replantation with minimal further damage to cells of the root surfaces. In this study, 32 (64%) teachers in rural areas were aware that the avulsed tooth can be placed back into its socket while 27 (54%) of them were aware of this in urban areas. However, in a study conducted by Hamilton et al only 10.7% of the respondents knew that the knocked-out tooth can be replaced back into its socket but they feared being sued for replanting the tooth incorrectly.<sup>17</sup>

Time is one of the important factor for avulsed tooth to preserve their vitality after replantation. Two teacher in urban area answered that tooth should be replanted within 5 and 30 minutes while none in rural area answered correctly. This result could be attributed to lack of knowledge and information regarding management of tooth avulsion.

In most of tooth avulsion cases, the avulsed tooth would fall on the ground and get dirty. The knowledge to clean a dirty avulsed tooth is also very important. In the present study, 25 teachers in rural areas responded that they would clean the tooth in saline water, milk or tap water as compared to 18 teachers in urban areas. However, nine teachers in urban area reported that they will brush the tooth root and crown unaware that they would severely decrease the chance of successful replantation. Similar

response was obtained in a study conducted by Hamilton et al, where 2.2% respondents wanted to scrub the tooth prior tooth replantation while only 8% washed it with milk.<sup>17</sup>

On review of literature, the appropriate storage media to permit periodontal and pulpal healing are milk, saline water and saliva.<sup>16</sup> 6 teachers in urban areas opted for these as compared to 5 teachers in rural areas. 15 teachers in urban area and 4 teachers in rural areas chose cotton rolls. In contrast, in another study teachers of Porto Rico statistically had more correct answer for transportation media for avulsed tooth.<sup>16</sup>

Regarding procedures to be followed in case of tooth avulsion, 48 (96%) teachers in rural areas would take the child to the dentist nearby as compared to 33 (66%) teachers in rural areas. No teachers in rural or urban area were given any information on management of knocked-out tooth.

## CONCLUSION

This study concluded that, school teachers of both rural and urban area had insufficient information about the management of knocked out tooth. Due to lack of their knowledge on this subject, they are incapable to handle the avulsed tooth. Hence, school teachers should be given appropriate information to handle the child and the tooth during various dental emergencies and this can be accomplished by conducting school educational programmes for teachers and other child supervisors.

## ACKNOWLEDGEMENT

I would like to thank Dr. Deepak Bansal and Dr. Shreen for providing me with this opportunity and monitoring me and guiding me through every phase of this research.

## REFERENCES

1. Bastone EB, Freer TJ, McNamara JR. Epidemiology of dental trauma: a review of the literature. *Aust Dent J* 2000; 45(1):2-9.
2. Abidi SYD, Khan AM, Khan MA, Qazi FUR, Ghazali NZ. Knowledge about the management of avulsed tooth among Karachi school teachers. *Pak Oral & Dent J* 2010; 30(2):515-20.
3. Barbosa TS, Gavião MB. Oral health-related quality of life in children: part II. Effects of clinical oral health status. A systematic review. *Int J Dent Hyg* 2008; 6(2):100-07.
4. Cortes MI, Marcenés W, Sheiham A. Prevalence and correlates of traumatic injuries to the permanent teeth of schoolchildren aged 9-14 years in Belo Horizonte, Brazil. *Dent Traumatol* 2001; 17(1):22-26.
5. Andreasen JO, Andreasen FM. Textbook and color atlas of traumatic injuries to the teeth. 3rd ed. Copenhagen: Munksgaard 1994: 771 p.
6. Andreasen JO, Ravn JJ. Epidemiology of traumatic dental injuries to primary and permanent teeth in a Danish population sample. *Int J Oral surg* 1972; 1:235-9.
7. San J. Maxillofacial and Dental injuries in contact team sports. *Pro Finn Dent Soc* 1988; (Supplement VI): 84.
8. David Meadow, Gary Linder, Howard Needleman. Oral Trauma in children. *Paediatr Dent* 1994; 6(4): 248-251.
9. Prasanna S, Giriraju A, Narayan NL. Knowledge and attitude of primary school teachers toward tooth avulsion and dental first aid in Davangere city: A cross-sectional study. *Int J Clin Pediatr Dent*, September-December 2011; 4(3):203-206.
10. Leung Siu-fai. Traumatic dental injuries to the permanent dentition. *Dental Bulletin* August 2006; 15,11(8).
11. Andreasen JO, Borum MK, Jacobsen HL, Andreasen FM. Replantation of 400 avulsed incisors. Factors related to periodontal ligament healing. *Endo Dent Traumatol* 1995; 11:76-89.
12. Blakytyn C, Surbutis C, Thomas A, Hunter ML. Avulsed permanent incisors: Knowledge and attitude of primary school teachers with regard to emergency management. *Int J Paediatr Dent* 2001; 11:327-32.
13. Mori GG, Turcio KHN, Borro VPB, Mariusso AM. Evaluation of the knowledge of tooth avulsion of school professionals from Adamantina, Sao Paulo, Brazil. *Dent Traumatol* 2007; 23:2-5.
14. Sae-Lim V, Lim LP. Dental trauma management awareness of Singapore preschool teachers. *Dent Traumatol* 2001; 17:71-76.
15. Caglar E, Ferreira LP, Kargul B. Dental trauma management knowledge among group of teachers in two south European cities. *Dent Traumatol* 2005; 21:258-62.
16. Al-Jundi SH, Al-Waeili H, Khairalah K. Knowledge and attitude of Jordanian school health teachers with regard to emergency management of dental trauma. *Dent Traumatol* 2005: 183-87.
17. Blakytyn C, et al. Avulsed teeth knowledge of school teachers. *Int* 2001: 327-32.

**How to cite this article:** Manjeet Kaur, Kanika Gupta, Ruchika Goyal, Navdha Chaudhary. "Knowledge and Attitude of School Teachers Towards Tooth Avulsion in Rural and Urban Areas". *International Journal of Scientific Study*. 2014;1(4):17-20.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Efficacy of Azithromycin Pulse Therapy in Acne Vulgaris Treatment: A Hospital Based Study

Sanjeev Sharma,  
Priyank Kumar<sup>1</sup>, Sanjay  
Banjare<sup>2</sup>, S K Jain<sup>3</sup>

Professor and Head, Department of Pharmacology, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India, <sup>1</sup>Assistant Professor, Department of Dermatology, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India, <sup>2</sup>Post Graduate Student, Department of Pharmacology, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India, <sup>3</sup>Professor, Department of Anatomy, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India

**Corresponding Author:** Dr. S K Jain, Professor, Department of Anatomy, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India. Phone - +91-9997168754. E-mail: drskjain2005@rediffmail.com

## Abstract

**Background:** Acne vulgaris or simply (acne) is a common dermatological problem. Acne most commonly seen in adolescence age, caused by increased androgens in both sexes. It is caused due to *Propionibacterium acnes*. In spite of many range of antibiotics available Azithromycin is one of the antibiotics that has been recently prescribe for treatment of acne which is as effective as doxycycline and minocycline. This study is undertaken to see the efficacy of Azithromycin in treatment of acne vulgaris.

**Methods:** This study is performed on 200 patients (100 male & 100 females) in Teerthankar Mahaveer Medical College and Hospital Moradabad, using special grading system GAGS. The exclusion criteria for the study were pregnancy, a history of macrolide sensitization and retinoid therapy.

**Results:** Grade I patient showed effect of 80%. Grade II 90% recovery. Grade III is also effective as a 90% recovery, but Grade 4 were not much effective only 40% recovered.

**Conclusion:** This study showed that azithromycin has greatest advantage over other systemic antibacterials in acne because it is long acting drug and can be used in single dose three times weekly.

**Keywords:** Acne vulgaris, GAGS & *Propionibacterium acnes*

## INTRODUCTION

Acne vulgaris is a common inflammatory disorder of the Pilo-sebaceous follicles. It is a multi-factorial disease and its patho-physiology centers on the interplay of follicular hyper-keratinization, colonization with *Propionibacterium acnes* (PA), increased sebum production, and inflammation.

This disease has a high prevalence, occurring mainly in adolescence. Although the peak of prevalence is around the 17th year of life, acne lesions can appear earlier and are not uncommonly observed in the age group ranging from 12 to 14 years, in which the condition is under reported.<sup>1</sup>

Antibiotic therapy has long been found useful in the management of moderate-to-severe acne vulgaris. Mechanisms of action include suppressing growth of PA, reducing the production of inflammatory mediators, and acting in immune modulation.

Commonly prescribed antibiotics include tetracyclines, doxycycline, minocycline, limecycline and erythromycin. Azithromycin is one of the antibiotics that has been recently prescribe for treatment of acne which is at least as effective as doxycycline and minocycline.<sup>2-5</sup>

Aziythromycin is a nitrogen-containing macrolide antibacterial agent and a methyl derivative of erythromycin with actions and uses similar to those of erythromycin.<sup>6,7</sup> Its extensive distribution in the tissues allows pulse-dose regimen recommendation for increased compliance.<sup>8</sup>

## MATERIAL & METHOD

The primary focus of this open-label non-comparative therapeutic study was to assess the efficacy of 500 mg of azithromycin thrice weekly (once on every other



day) for 8 weeks in the treatment of Acne vulgaris in TMU patients. This study enrolled 200 patients from the outpatient dermatology clinic at Teerthankar Mahaveer hospital during the period from December 2012 to December 2013. Patients were examined by dermatologists and an assessment was made, including a full count of acne lesions, we used special grading system of GAGS. The lesions were counted at the beginning of the treatment and at weeks. The difference between the number of lesions observed at baseline and the number seen in subsequent examinations was used to evaluate the efficacy of therapy. At every check-up we assessed the clinical response to azithromycin, any adverse events, and patient tolerance. The exclusion criteria were pregnancy, a history of macrolide sensitization and retinoid therapy. Patients with relapsing acne previously treated with antimicrobials such as doxycycline, minocycline, and erythromycin were eligible to be enrolled in the study after a six-month wash-out period. No topical therapy was associated. Patients were advised not to undergo any beauty procedures, such as chemical peels, bleaches during the study period. All patients were also evaluated at 2 months, post-treatment follow-up visit. 200 hundred patients 100 male and 100 female 17-25 yrs of age and with mild to severe acne (score of acne 19-38), in the Global Acne Grading System (GAGS), were included in the study.<sup>9</sup> Every patient was being exact physical examination and graded by GAGS. In GAGS: Acne patients were assigned into 4 grades.

- Mild = 1-18 Score,
- Moderate = 19-30 Score
- Severe = 31-38 Score
- Very Severe >39 Score<sup>9</sup>

In this study patients were excluded if: Global acne score was greater than 39 or lower than 19. Concomitant use of anti-androgenic drugs Isotretinoin use in the last six months Participants were awarded and investigators got written informed consent from them. After that, they were allocated to four groups as a grading system. We prescribed Azithromycin in these groups as follow:

Grade I: 500 mg Azithromycin as initial dose followed by 500 mg weekly pulse doses for 8 week.

Grade II: 500 mg Azithromycin as initial dose followed by 500 mg weekly pulse doses for 8 week.

Grade III: 500 mg Azithromycin as initial dose followed by 500 mg weekly pulse doses for 8 week.

Grade IV: 500 mg Azithromycin as initial dose followed by 500 mg weekly pulse doses for 8 week.

We followed patients over a 08-week period and visited them monthly. At each visit, acne lesions were assessed by blinded dermatologist to treatment protocols and GAGS

was used to evaluate the response of patients to treatment. The patient visits were done at the end of first, second and third month.

**Table 1: Grading of acne vulgaris using visual analogue scale**

| Grade                 | Score | Observation                 |
|-----------------------|-------|-----------------------------|
| Grade 1 (Mild)        | 1-18  | Microcomedone               |
| Grade 2 (Moderate)    | 19-30 | Comedone                    |
| Grade 3 (Severe)      | 31-38 | Inflammatory Papule/Pustule |
| Grade 4 (Very-severe) | >38   | Nodule Nodulo-Cystic        |

## RESULTS

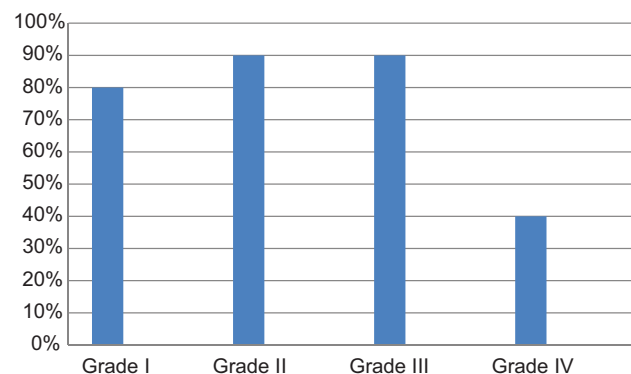
At this open therapeutic trial 200 patients were enrolled (100 males, 100 females) all of them were teenagers and adolescents (ages 17-50 years) with moderate-sever papulo-pustular acne. Grade I patient were achieved good excellence effect 80%. Grade II is also effective as 90% recovery. Grade III is also effective as a 90% recovery. But Grade 4 were not much effective only 40% recovered. And around over all total efficacy of the Azithromycin was 75% for treatment of acne vulgaris.

**Table 2: Evaluation of efficacy of therapy**

| Grade of Response | % of Reduction of Acne |
|-------------------|------------------------|
| Grade I           | Up to 80%              |
| Grade II          | Up to 90%              |
| Grade III         | Up to 90%              |
| Grade IV          | Up to 40%              |

**Table 3: Over all distribution of all acne patients (%)**

| Grade   | Male | Female | Recovered Patient | Total % of Recovered Patient |
|---------|------|--------|-------------------|------------------------------|
| Grade 1 | 15   | 35     | 40                | 80%                          |
| Grade 2 | 35   | 15     | 45                | 90%                          |
| Grade 3 | 20   | 30     | 45                | 90%                          |
| Grade 4 | 30   | 20     | 20                | 40%                          |
| Total   | 100  | 100    | 150               | 75%                          |



**Figure 1: The efficacy of Azithromycin pulse therapy in acne vulgaris treatment**

## DISCUSSION

Acne is multifactorial disease primarily of teenagers with follicular plugging and inflammation. It is the most common skin disease; affecting almost every individual during puberty.<sup>10,11</sup>

Despite the initially high default (expected in our community and circumstances, and this could be partially explained by the delayed response of acne lesions), the response rate and compliance of our patients was encouraging. But the compliance was much improved in those who continued treatment and noticed a desirable response. Also the easy dosing schedule and the higher tolerability of the drug contributed to this compliance. The use of mobile phone for communication had helped us greatly in follow up and to encourage patients continue treatment. The side effects reported were few (gastric upset, abdominal pain, diarrhea and headache) and fortunately, no serious reaction reported. Our patients achieved over all response (75%). Federico who reported a good-excellent response of 90.4% after 4 weeks of therapy<sup>8</sup> and slightly higher than Singhi<sup>12</sup> who reported a response of 70.25 %. Gruber et al<sup>13</sup> compared azithromycin with minocycline and observed a satisfactory clinical response (70-75%) with both the drugs. These findings suggest that azithromycin is a better alternative in patients with moderate to severe acne and has no serious side effects. This study showed that azithromycin has greatest advantage over other systemic antibacterials in acne because it is long acting drug and can be used in single dose three times weekly, no other acne drug has this property. Another advantage is the relatively long disease-free period after discontinuation of therapy which may be explained by the fact that azithromycin persists in tissues for long period.<sup>11,12</sup> The drawback of this study is that it is open-labeled non comparative, but it threw alight to the tolerability, efficacy and safety of this drug in acne, since till now it is not so widely used in India and we expect the chance of *Propionibacterium acnes* resistance to be much lower than to other systemic antibacterials used for acne. The stability of azithromycin in gastric acid may be responsible for the low incidence of gastrointestinal disturbances which is very troublesome in the tetracyclines. Photosensitivity not reported in any patient, though we used the drug during summer season. This is another advantage of azithromycin over other

antibacterials used in acne. Proper patient selection is mandatory as patients with inflammatory acne responded better than those with comedonal acne because the mode of action of azithromycin is mainly antibacterial and anti-inflammatory, but not keratolytic. Further studies are required to identify the optimum dose and duration of therapy and to compare the efficacy of the drug with other systemic antibacterials.

## CONCLUSION

This study showed that azithromycin has greatest advantage over other systemic anti bacterials in acne vulgaris because it is long acting drug and can be used in single dose three times weekly, no other acne drug has this property and its persistence in tissues is more as compared to other antibiotics.

## REFERENCES

1. Herane MI, Ando I. Acne in infancy and acne genetics. *Dermatology* 2003; 206:24-28.
2. Fernandez-Obregon AC. Azithromycin for the treatment of acne. *Int J Dermatol*. 1997;36:239-40.
3. Fernandez-Obregon AC. Azithromycin for the treatment of acne. *Int J Dermatol* 2000; 39:45-50.
4. Kus S, Yucelten D, Aytug A. Comparison of efficacy of azithromycin vs. doxycycline in the treatment of acne vulgaris. *Clin Exp Dermatol* 2005; 30:215-20.
5. Gruber F, Grubisic-Greblo H, Kastelan M, Brajac I, Lenkovic M, Zamolo G. Azithromycin compared with minocycline in the treatment of acne comedonica and papulo-pustulosa. *J Chemother* 1998; 10:469-73.
6. Peters DH, Friedel HA, McTavish D. Azithromycin. A review of its antimicrobial activity, pharmacokinetic properties and clinical efficacy. *Drug* 1992; 44:750-99.
7. Alvarez-Elroco S, Enzler MJ. The macrolides. Erythromycin, clarithromycin and azithromycin. *Mayo Clin Proc* 1999; 74:613-34.
8. Lalak NJ, Morris DL. Azithromycin clinical pharmacokinetics. *Clin Pharmacokinet* 1993;25:370-4.
9. Hardy DJ, Henesey DM, Beyer JM, et al. Comparative in vitro activities of new 14-, 15-, and 16-membered macrolides. *Antimicrob Agents Chemotherapy* 1988; 32: 1710-1719.
10. Neu HC. Clinical microbiology of azithromycin. *Am J Med* 1991; 91 (Suppl. 3A): 12S-18S. 8. Federico B, Francesco S, Gianluca P. et al. Azithromycin: A new therapeutical strategy for acne in adolescents. *Dermatology Online Journal* 13 (4): Volume 14 Number 3.
11. Wolfram S, Paus R, Burgdorf W. Thiem clinical companion Dermatology. Diseases of sebaceous glands. George Thieme Verlag, Germany 2006;ch 34.530.
12. Singhi MK, Ghiya BC, Dhabhai RK. Comparison of oral azithromycin pulse with daily doxycycline in the treatment of acne vulgaris. *Indian J Dermatol Venereol Leprol* 2003;69:274-6.
13. Gruber F, Grubisic-Greblo H, Kastelan M, et al. Azithromycin compared with minocycline in the treatment of acne comedonica and papulo pustulosa. *J Chemotherapy* 1998;10: 269.

**How to cite this article:** Sanjeev Sharma, Priyank Kumar, Sanjay Banjare, S K Jain. "Efficacy of Azithromycin Pulse Therapy in Acne Vulgaris Treatment: A Hospital Based Study". *International Journal of Scientific Study*. 2014;1(4):21-23.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Relationships between Serum 25-Hydroxy Vitamin D Levels and Plasma Glucose and Lipid Levels in Pediatric Patients in a Rural Hospital

N C Shivaprakash,  
Ranjit Baby Joseph<sup>1</sup>

Professor and HOD, Department of Pediatrics, Adichunchanagiri Institute of Medical Sciences, Karnataka, India, <sup>1</sup>Final Year Post-Graduate Resident, Department of Pediatrics, Adichunchanagiri Institute of Medical Sciences, Karnataka, India

**Corresponding Author:** Dr. Ranjit Baby Joseph, Room no: 61, Kalpatharu Bhavana, Adichunchanagiri Institute of Medical Sciences, BG Nagara, Mandya District. E-mail: ranjitbaby@gmail.com

## Abstract

**Objective:** To study the relationships between serum vitamin D levels and plasma glucose or lipid levels in children and adolescents.

**Material & Methods:** We conducted a prospective study on pediatric patients (age 2-18 years) of Adichunchanagiri Institute of Medical Sciences, BG Nagara from December 2011 to November 2012 with simultaneous measurement of 25-hydroxyvitamin D, fasting plasma glucose and a lipid panel (n=53). Pearson correlation coefficient was used to estimate the correlation between 25(OH) D and plasma glucose or lipid levels. Plasma glucose and lipid levels were compared in subjects with 25(OH) D concentrations greater or less than 20 ng/mL.

**Results:** 25(OH) D levels were inversely correlated with fasting plasma glucose levels ( $r=-0.611$ ,  $P<0.001$ ). Lower 25(OH) D levels were also associated with lower serum high-density lipoprotein cholesterol (HDL) concentrations ( $r=0.446$ ,  $P=0.001$ ). The value of vitamin D levels did not vary significantly with age, sex or body mass index. Children who were vitamin D insufficient [25(OH) D  $<20$  ng/mL] had higher fasting plasma glucose ( $P=0.037$ ) and lower HDL levels ( $P=0.044$ ) than children who were vitamin D sufficient [25(OH) D  $>20$  ng/mL].

**Conclusions:** Low 25(OH) D levels in children and adolescents are associated with higher plasma glucose and lower HDL concentrations and these children are more prone to develop type 2 diabetes and cardio metabolic diseases in later life.

**Keywords:** Vitamin D, Fasting blood sugar, Lipid profile, Obesity, Type 2 diabetes, Cardiometabolic diseases

## INTRODUCTION

The discovery of the critical roles of Vitamin D for overall health is a fascinating story in the history of medicine. First are its osseous effects and the association to rickets. Then came the discovery of its anti-infectious role, from the breakthrough by Niels Finson, earning him a Nobel prize in 1903 for the use of a form of 'concentrated light radiation' to treat tuberculosis skin lesions, through the sanatoriums built to treat the patients with sunbathing, until the discovery of cathelicidin- an antimicrobial peptide, regulated by vitamin D, that serves a critical role in mammalian innate immune defense against invasive bacterial infection.<sup>1</sup>

Over the last two decades, understanding of vitamin D synthesis and its function has changed remarkably. With its plethora of biological effects on diverse tissues, vitamin D sustains health throughout the body. It is now believed that vitamin D can protect against multiple sclerosis, type 1 diabetes mellitus and cancer. Among adults low levels of vitamin D have been shown to be associated with increased risks of obesity, hypertension, glucose intolerance, type 2 diabetes mellitus and cardiovascular disease.<sup>2</sup>

In the last 3 decades, there has been a dramatic increase in the prevalence of both childhood obesity and metabolic syndrome, which includes high plasma glucose and low high-density lipoprotein cholesterol (HDL) levels. Because



this profile may predispose children to cardiovascular disease later in life, the identification of modifiable risk factors for metabolic syndrome is crucial in the pediatric age group.<sup>3</sup>

Hypovitaminosis D is now being identified as a prevalent health problem in both adults and children not only in countries with low UV exposure but also in countries close to the equator. Accordingly, vitamin D supplementation could potentially be beneficial to billions of people, but still, hard evidence is lacking especially in Indian children.

There is a relation between the serum 25(OH) D levels and diseases like cancer, cardiovascular diseases and skeletal growth. After supplementation of vitamin D recovery of above said diseases are good.

## AIMS AND OBJECTIVES OF STUDY

To study the prevalence of vitamin D deficiency in children and to know whether it has any relation with the age, sex and body mass index (BMI) and to study relationships between serum vitamin D levels and plasma glucose and lipid levels.

Establishment of a significant relationship helps in the prediction of metabolic syndrome and other cardiovascular complications in future and gives an idea about various measures we can take to prevent or treat it.

## MATERIALS AND METHODS

### Source of Data

The study was a prospective study conducted in pediatric patients both out-patients as well as in-patients in Sri Adichunchanagiri Institute of Medical Sciences and Hospital, (AIMS) B.G.Nagara for the period of 1 year starting from December 2011 to November 2012.

### Method of Collection of Data

The data was collected from patients and the following investigations were done:

- Serum vitamin D
- Fasting plasma glucose
- Serum lipid profile.

### Inclusion Criteria

- Age between 2 years to 18 years.
- Both out-patients as well as in-patients of Sri Adichunchanagiri Institute of Medical Sciences, B.G.Nagara.
- Patients with symptoms like chronic pain, fatigue, poor growth, bone health concerns and obesity.

### Exclusion Criteria

- Age <2 years and >18 years
- Those who are seriously ill
- Hepatic or renal disease
- Metabolic rickets
- Type 1 or 2 diabetes mellitus
- Malabsorptive disorders (inflammatory bowel disease, cystic fibrosis and celiac disease)
- Hyperparathyroidism and hypoparathyroidism
- Earlier kidney, liver or renal transplant
- Malignancy
- Ongoing use of anticonvulsant medications or systemic glucocorticoids
- Congenital heart disease
- Genetic disorders.

Data were collected for patients, including age, sex, height, weight, co-morbidities, and the primary indication for ordering 25 (OH) D levels. Age and sex-specific body mass index (BMI) percentiles were determined with the Agarwal growth charts for Indian children as recommended by the IAP.<sup>4</sup> Vitamin D levels are graded as severe deficiency, deficiency, sufficiency and toxicity as per guidelines.<sup>5</sup> Lipid profile values are analyzed by the suggested cut off values as per lipid profile norms in Indian children.<sup>6</sup>

### Laboratory Methods

25(OH)D assays were done by the Elecsys 2010 and Cobas e411 immunoassay analyzers by the technique of Electrochemiluminescence Immuno assay. Measuring range was 3.00–70.0 ng/mL or 7.50–175 nmol/L (defined by the limit of detection and the maximum of the master curve). Values below the limit of detection are reported as <3.00 ng/mL (<7.50 nmol/L). Values above the measuring range are reported as >70.0 ng/mL (>175 nmol/L) Each parameter in lipid profile was estimated by the COBAS INTEGRA 2<sup>nd</sup> generation cassette which contains an in vitro diagnostic reagent system for the quantitative determination of total cholesterol, HDL, LDL, VLDL and triglycerides in serum and plasma by using the principle enzymatic colorimetric method. Quantitative determination of blood glucose was done on COBAS INTEGRA SYSTEMS by using the principle of enzymatic reference method with hexokinase.

### Statistical Methods

Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients, Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or

more groups. Pearson correlation has been used to find the correlation between Vitamin D with Lipids. The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate tables and graphs.

### Observations and Results

A total of 53 children formed the study subjects who included 30 male children (56.6%) and 23 (43.4%) female children. Majority of the children were between 11-15 years (39.6%). Mean age of the children studied is  $9.72 \pm 4.56$  years.

43 (81.1%) children were included in the study due to evidence of poor growth and 5 (9.4%) due to overweight (BMI 85<sup>th</sup> to 95<sup>th</sup> percentile) and 5 (9.4%) due to obesity (BMI >95<sup>th</sup> percentile).

4 (7.5%) patients had weight <3<sup>rd</sup> percentile, 16 (30.2%) had weight between 3<sup>rd</sup> and 25<sup>th</sup> percentile, 16 (30.2%) had weight between 25<sup>th</sup> and 50<sup>th</sup> percentile, 8 (15.1%) had weight between 50<sup>th</sup> and 75<sup>th</sup> percentile, 8 (15.1%) had weight between 75<sup>th</sup> and 97<sup>th</sup> percentile and 1 (1.9%) had weight >97<sup>th</sup> percentile for age and sex.

2 (3.8%) patients had height <3<sup>rd</sup> percentile, 13 (24.5%) patients had height between 3<sup>rd</sup> and 25<sup>th</sup> percentile, 21 (39.6%) patients had height between 25<sup>th</sup> and 50<sup>th</sup> percentile, 11 (20.8%) had height between 50<sup>th</sup> and 75<sup>th</sup> percentile, 5 (9.4%) had height between 75<sup>th</sup> and 97<sup>th</sup> percentile and 1 (1.9%) had height >97<sup>th</sup> percentile for age and sex.

18 patients (34%) had BMI <5<sup>th</sup> percentile, 9 patients (17%) had between 5<sup>th</sup> and 25<sup>th</sup> percentile, 6 patients (11.3%) had between 25<sup>th</sup> and 50<sup>th</sup> percentile, 8 patients (15.1%) had between 50<sup>th</sup> and 75<sup>th</sup> percentile, 2 patients (3.8%) had between 75<sup>th</sup> and 85<sup>th</sup> percentile, 2 patients (3.8%) had between 85<sup>th</sup> and 90<sup>th</sup> percentile, 3 patients (5.7%) had between 90<sup>th</sup> and 95<sup>th</sup> percentile and 5 patients (9.4%) had >95<sup>th</sup> percentile for age and sex.

The mean level (SD) for 25(OH) D was 17.49 ng/mL (10.13), with a median of 14.7 and a range of <3 to 39.2 ng/mL. 25(OH) D levels were <20 ng/mL in 35 of the 53 subjects (66%).

| Vitamin D levels | No. of patients | %     |
|------------------|-----------------|-------|
| <5               | 5               | 9.4   |
| 5-15             | 22              | 41.5  |
| 15-20            | 8               | 15.1  |
| 20-50            | 18              | 34.0  |
| >50              | 0               | 0.0   |
| Total            | 53              | 100.0 |

The glucose values ranged from 63 to 124 mg/dL. A total of 19 subjects (35.8%) had a glucose level >100 mg/dL.

| FBS (mg/dl) | No. of patients | %     |
|-------------|-----------------|-------|
| ≤99         | 34              | 64.2  |
| 100-126     | 19              | 35.8  |
| >126        | 0               | 0.0   |
| Total       | 53              | 100.0 |

Total cholesterol was found to be <190 in (69.8%) and ≥190 in 16 (30.2%) subjects. HDL was <20 in 3 (5.7%) and ≥20 in 50 (94.3%) subjects. LDL was <130 in 44 (83%) subjects and ≥130 in 9 (17%) subjects. VLDL was <30 in 29 (54.7%) and ≥30 in 24 (45.3%) subjects. Triglycerides was <150 in 29 (54.7%) and ≥150 in 24 (45.3%) subjects. Total cholesterol/HDL was <5.5 in 37 (69.8%) and ≥5.5 in 16 (30.2%) subjects. LDL/HDL ratio was <4.9 in 51 (96.2%) and ≥4.9 in 2 (3.8%) subjects.

| Lipid parameter           | Cut-off | No. of patients | %    |
|---------------------------|---------|-----------------|------|
| Total Cholesterol (mg/dL) | <190    | 37              | 69.8 |
|                           | ≥190    | 16              | 30.2 |
| HDL (mg/dL)               | <20     | 3               | 5.7  |
|                           | ≥20     | 50              | 94.3 |
| LDL (mg/dL)               | <130    | 44              | 83.0 |
|                           | ≥130    | 9               | 17.0 |
| VLDL (mg/dL)              | <30     | 29              | 54.7 |
|                           | ≥30     | 24              | 45.3 |
| TGL (mg/dL)               | <150    | 29              | 54.7 |
|                           | ≥150    | 24              | 45.3 |
| Total cholesterol/HDL     | <5.5    | 37              | 69.8 |
|                           | ≥5.5    | 16              | 30.2 |
| LDL/HDL                   | <4.9    | 51              | 96.2 |
|                           | ≥4.9    | 2               | 3.8  |

Vitamin D vs Age: When the vitamin D levels were correlated with the age of the patients, it was found to be not significantly associated (P=0.476).

| Age in years | Vitamin D Levels |           |          |           | Total      |
|--------------|------------------|-----------|----------|-----------|------------|
|              | <5               | 5-15      | 15-20    | 20-50     |            |
| 2-5          | 1 (20%)          | 5 (22.7%) | 4 (50%)  | 3 (16.7%) | 13 (24.5%) |
| 6-10         | 0 (0%)           | 9 (40.9%) | 2 (25%)  | 4 (22.2%) | 15 (28.3%) |
| 11-15        | 3 (60%)          | 7 (31.8%) | 2 (25%)  | 9 (50%)   | 21 (39.6%) |
| 16-18        | 1 (20%)          | 1 (4.5%)  | 0 (0%)   | 2 (11.1%) | 4 (7.5%)   |
| Total        | 5 (100%)         | 22 (100%) | 8 (100%) | 18 (100%) | 53 (100%)  |

Vitamin D vs Sex: Vitamin D levels were not significantly associated with gender of the patients also (P=0.629).

| Gender | Vitamin D Levels |            |           |            | Total      |
|--------|------------------|------------|-----------|------------|------------|
|        | <5               | 5-15       | 15-20     | 20-50      |            |
| Male   | 3 (60%)          | 14 (63.6%) | 5 (62.5%) | 8 (44.4%)  | 30 (56.6%) |
| Female | 2 (40%)          | 8 (36.4%)  | 3 (37.5%) | 10 (55.6%) | 23 (43.4%) |
| Total  | 5 (100%)         | 22 (100%)  | 8 (100%)  | 18 (100%)  | 53 (100%)  |

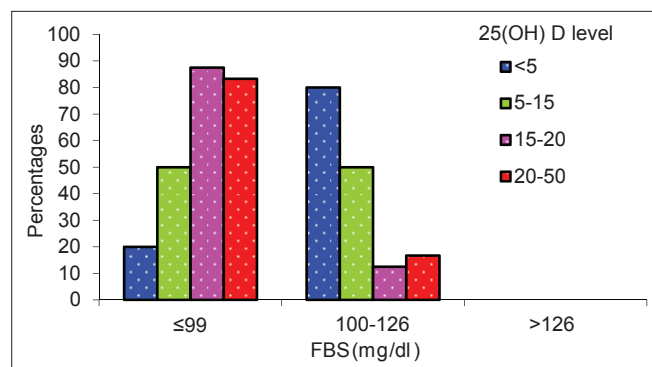
Vitamin D vs BMI: When the vitamin D levels were compared with BMI, it was found not to be significantly correlated (P=0.385)

| BMI Percentile | Vitamin D Levels |           |           |           | Total     |
|----------------|------------------|-----------|-----------|-----------|-----------|
|                | <5               | 5-15      | 15-20     | 20-50     |           |
| <5th           | 1 (20%)          | 8 (36.4%) | 4 (50%)   | 5 (27.8%) | 18 (34%)  |
| 5th-25th       | 0 (0%)           | 6 (27.3%) | 1 (12.5%) | 2 (11.1%) | 9 (17%)   |
| 25th-50th      | 0 (0%)           | 3 (13.6%) | 1 (12.5%) | 2 (11.1%) | 6 (11.3%) |
| 50th-75th      | 0 (0%)           | 3 (13.6%) | 1 (12.5%) | 4 (22.2%) | 8 (15.1%) |
| 75th-85th      | 0 (0%)           | 1 (4.5%)  | 0 (0%)    | 1 (5.6%)  | 2 (3.8%)  |
| 85th-90th      | 0 (0%)           | 0 (0%)    | 1 (12.5%) | 1 (5.6%)  | 2 (3.8%)  |
| 90th-95th      | 1 (20%)          | 1 (4.5%)  | 0 (0%)    | 1 (5.6%)  | 3 (5.7%)  |
| >95th          | 3 (60%)          | 0 (0%)    | 0 (0%)    | 2 (11.1%) | 5 (9.4%)  |
| Total          | 5 (100%)         | 22 (100%) | 8 (100%)  | 18 (100%) | 53 (100%) |

Vitamin D vs Lipids: Lipid parameters studied along with the values of vitamin D include total cholesterol, HDL, LDL, VLDL, Triglycerides, total cholesterol/HDL ratio, LDL/HDL ratio. As per the guidelines, cut off values for each parameter were into taken into consideration for comparing with vitamin D. Increasing levels of 25(OH) D were significantly correlated with increasing levels of HDL and TGL. Vitamin D was also found to have some positive correlation with LDL and VLDL.

Vitamin D vs FBS: FBS values were classified as  $\leq 99$ , 100-126 and  $>126$  for comparing with vitamin D levels. FBS values were found to be significantly associated with vitamin D levels with a P value of 0.012

| FBS (mg/dl) | 25(OH) D level ng/mL |           |           |            | Total      |
|-------------|----------------------|-----------|-----------|------------|------------|
|             | <5                   | 5-15      | 15-20     | 20-50      |            |
| $\leq 99$   | 1 (20%)              | 11 (50%)  | 7 (87.5%) | 15 (83.3%) | 34 (64.2%) |
| 100-126     | 4 (80%)              | 11 (50%)  | 1 (12.5%) | 3 (16.7%)  | 19 (35.8%) |
| $>126$      | 0 (0%)               | 0 (0%)    | 0 (0%)    | 0 (0%)     | 0 (0%)     |
| Total       | 5 (100%)             | 22 (100%) | 8 (100%)  | 18 (100%)  | 53 (100%)  |



With the above available values, Pearson correlation coefficient and its P value were calculated. 25(OH)D was found to have significant positive correlation with HDL levels ( $r=0.446$ , P value=0.001) and LDL/HDL ratio ( $r=0.459$ , P value=0.001). A significant negative correlation was found to be present between 25(OH)D and FBS ( $r = -0.611$ , P value= $<0.001$ ). 25(OH)D was also found to be positively correlated with LDL ( $r=0.295$ , P value=0.032) and TGL ( $r=0.330$ , P value=0.016) but with a lesser significance.

## DISCUSSION

Studies done from different centers from parts of India have drawn attention towards wide prevalence of vitamin D deficiency (VDD). VDD has been reported in all age groups who are residing in rural and urban India.<sup>7</sup>

### Vitamin D Deficiency

Vitamin D deficiency can be easily diagnosed in presence of clinical features of rickets and laboratory support. But rickets is an extreme form of vitamin D deficiency and represents the tip of the iceberg of vitamin D deficiency. Improved understanding of the detrimental effects of insufficient vitamin D before the appearance of rickets led to a growing interest in these lesser degrees of vitamin D deficiency and diagnosing this prerachitic, subclinical vitamin D deficiency is important for nonskeletal health benefits.

Vitamin D deficiency in adults is defined by most experts as a 25(OH) D level  $<20$  ng/mL, on the basis of functional outcomes of vitamin D such as intestinal absorption of calcium and serum parathyroid hormone levels. A level of 25(OH) D of 21 to 29 ng/mL is considered to be indicative of a relative insufficiency of vitamin D, and a level  $>30$  ng/mL is considered to indicate sufficient vitamin D. Because similar studies of functional outcomes have not been evaluated in children, criteria for defining pediatric vitamin D sufficiency and deficiency have not been clearly defined. Therefore, we elected to use a cutoff point of 20 ng/mL for 25(OH) D to divide the study population into vitamin D sufficient and insufficient subgroups as per guidelines given by US Endocrine society.<sup>2,5</sup>

### Prevalence of Vitamin D Deficiency

The mean level for 25(OH) D in our study was 17.49 ng/mL, with a median of 14.7 and a range of  $<3$  to 39.2 ng/mL. 25(OH) D levels were  $<20$  ng/mL in 35 of the 53 subjects (66%). In study done by Johnson MD et al in American children, the mean level for 25(OH)D was 28.8 ng/mL, with a median of 27 and a range of 6.5 to 68.0 ng/mL. 25(OH) D levels were  $<30$  ng/mL in 197 of the 302 subjects (65.2%).<sup>2</sup>

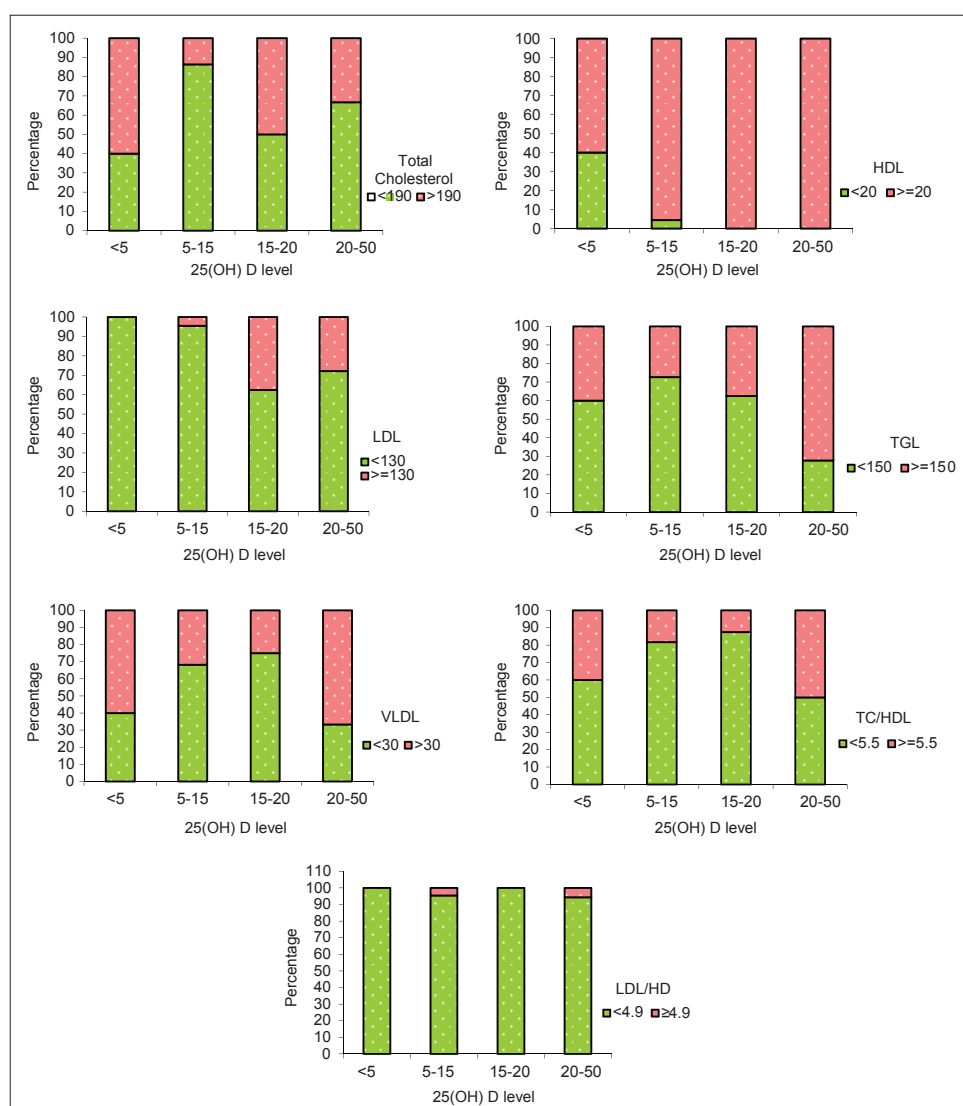
In a study done by Raman MK et al among 290 school girls in Delhi, 93.7% girls were found to be vitamin D deficient.<sup>8</sup>

Study done by Harinarayanan CV et al among 316 children of Andhra Pradesh, 69.3% were found to have vitamin D  $<20$  ng/ml.<sup>9</sup>

### Role of Age, Sex and BMI

We could not find any significant relation in vitamin D levels with age, sex and BMI of the patients similar to

| Lipids  | Cut-offs | 25(OH) D level ng/mL |             |             |              | Total (n=53) | P value |
|---------|----------|----------------------|-------------|-------------|--------------|--------------|---------|
|         |          | <5 (n=5)             | 5-15 (n=22) | 15-20 (n=8) | 20-50 (n=18) |              |         |
| TC      | <190     | 2 (40%)              | 19 (86.4%)  | 4 (50%)     | 12 (66.7%)   | 37 (69.8%)   | 0.088   |
|         | >190     | 3 (60%)              | 3 (13.6%)   | 4 (50%)     | 6 (33.3%)    | 16 (30.2%)   |         |
| HDL     | <20      | 2 (40%)              | 1 (4.5%)    | 0 (0%)      | 0 (0%)       | 3 (5.7%)     | 0.005   |
|         | ≥20      | 3 (60%)              | 21 (95.5%)  | 8 (100%)    | 18 (100%)    | 50 (94.3%)   |         |
| LDL     | <130     | 5 (100%)             | 21 (95.5%)  | 5 (62.5%)   | 13 (72.2%)   | 44 (83%)     | 0.063   |
|         | ≥130     | 0 (0%)               | 1 (4.5%)    | 3 (37.5%)   | 5 (27.8%)    | 9 (17%)      |         |
| TGL     | <150     | 3 (60%)              | 16 (72.7%)  | 5 (62.5%)   | 5 (27.8%)    | 29 (54.7%)   | 0.038   |
|         | ≥150     | 2 (40%)              | 6 (27.3%)   | 3 (37.5%)   | 13 (72.2%)   | 24 (45.3%)   |         |
| TC/HDL  | <5.5     | 3 (60%)              | 18 (81.8%)  | 7 (87.5%)   | 9 (50%)      | 37 (69.8%)   | 0.099   |
|         | ≥5.5     | 2 (40%)              | 4 (18.2%)   | 1 (12.5%)   | 9 (50%)      | 16 (30.2%)   |         |
| LDL/HDL | <4.9     | 5 (100%)             | 21 (95.5%)  | 8 (100%)    | 17 (94.4%)   | 51 (96.2%)   | 0.872   |
|         | ≥4.9     | 0 (0%)               | 1 (4.5%)    | 0 (0%)      | 1 (5.6%)     | 2 (3.8%)     |         |
| VLDL    | <30      | 2 (40.0%)            | 15 (68.2%)  | 6 (75.0%)   | 6 (33.3%)    | 29 (54.7%)   | 0.087   |
|         | >30      | 3 (60.0%)            | 7 (31.8%)   | 2 (25.0%)   | 12 (66.7%)   | 24 (45.3%)   |         |



the study by Johnson MD et al.<sup>2</sup> Abu Shady et al, showed statistically significant inverse association of serum vitamin D with BMI in 215 Egyptian school children but found no significant relation with age and sex.<sup>10</sup>

### Vitamin D and FBS

Evidence for low vitamin D status as a risk factor for T2DM has accumulated steadily since calcium was first shown to be necessary for islet insulin secretion and release. Several



lines of evidence support a role for vitamin D in pancreatic beta cell function. Vitamin D receptors are known to be present in pancreatic B-cells. Vitamin D may also have a beneficial effect on insulin action, because vitamin D receptors are present in skeletal muscle. Vitamin D has been demonstrated to increase expression of the insulin receptor in vitro and therefore enhance insulin responsiveness for glucose transport. Vitamin D may also indirectly enhance insulin action by regulating extracellular calcium and thereby affecting calcium influx through cell membranes and maintaining adequate intracellular cytosolic calcium pool.<sup>2</sup>

We found an inverse correlation between 25(OH) D and fasting plasma glucose levels in our population. Although these associations are statistically significant, their clinical significance remains to be determined. Our results are in agreement with observations by several investigators that suggest a link between vitamin D deficiency and alterations in glucose metabolism.

Cross-sectional studies have shown inverse correlations between 25(OH) D levels and fasting plasma glucose values, hemoglobin A1C level and insulin resistance. The association between 25(OH) D levels and plasma glucose levels is likely caused by the effect of vitamin D on both pancreatic beta cell function and insulin sensitivity. Therefore, hypovitaminosis D is a higher risk factor for type 2 diabetes and the metabolic syndrome.<sup>2</sup>

Effects of vitamin D supplementation on glucose homeostasis have been shown in numerous studies. Study done by Talei et al suggested that the insulin resistance appears to be decreased in T2DM patients who had received vitamin D. Inzucchi et al showed a 60% improvement in insulin sensitivity by increased serum 25 (OH)D concentration from 10 to 30 ng/ml, by which metformin or troglitazone were 54% and 13% respectively. Von Hurst (2009) showed that vitamin D supplementation significantly improved insulin sensitivity and insulin resistance. Ken (2004) found an inverse relation between 25(OH)D concentrations and FBS, but a direct relation with insulin sensitivity.<sup>11</sup>

There are some mechanisms for the effects of vitamin D: presence of vitamin D receptors on pancreatic  $\beta$  cells, Vitamin D activating  $1\alpha$  hydroxylase is expressed in pancreatic  $\beta$  cells, presence of vitamin D response element in the insulin gene, presence of vitamin D receptor in skeletal muscle and the fact that  $1,25(\text{OH})_2\text{D}$  increases transcription of insulin receptor genes, and also suppresses the renin gene reducing hyperglycemic-induced increases in renin levels in pancreatic  $\beta$  cells and blockade of renin-angiotensin activity has been proposed as a novel target for diabetes treatment.<sup>11</sup>

Protective effects of vitamin D on diabetes, may be due to well known effects of vitamin D such as its anti-inflammatory properties, its effects on calcium and phosphorus metabolism and regulation of the insulin receptor gene. It seems that vitamin D increases in calcium content of the cells, which in turn leads to increased transport of glucose into the muscle. Vitamin D also regulates nuclear PPAR (Peroxisome proliferative activated receptor) that has an important role in the insulin sensitivity. Vitamin D deficiency is associated with increases in inflammation. It attenuates the expression of proinflammatory cytokines involved in insulin resistance such as interleukins, IL-1, IL-6, TNF- $\alpha$ , also down regulates NF-Kb (Nuclear factor) activity.<sup>11</sup>

### Vitamin D and Lipids

In our study, a positive correlation was identified between 25(OH) D levels and HDL level. The relationship between 25(OH) D and the lipid profile has been examined in adults with morbid obesity and in healthy adults. Chiu et al<sup>12</sup> noted a negative correlation between 25(OH) D level and total and low-density lipoprotein cholesterol levels, but did not find relationship between 25(OH) D level and HDL level. The positive association between low 25(OH) D levels and low HDL levels is likely caused by the role of vitamin D in maintaining adequate concentrations of apolipoprotein A-1, the main component in HDL. Decreased concentrations of apolipoprotein A-1 have been reported in adults with hypovitaminosis D<sup>13</sup>. We found that the fasting glucose level was significantly higher and HDL level was significantly lower in the group with vitamin D insufficiency. We have also got a positive association of vitamin D with LDL and TGL which is of lesser significance when compared to that of HDL and FBS and may be due to small sample size.

Study done by Abu Shady et al in 215 Egyptian school children, showed statistically significant inverse association of serum OH vitamin D with BMI, triglyceride, serum cholesterol and LDL-cholesterol and direct association with HDL cholesterol<sup>8</sup>. Xiao Yin et al found among 601 adults of China that 25(OH)D was inversely associated with waist circumference, fasting insulin, triglycerides, fasting glucose, and LDL-cholesterol, positively associated with HDL-cholesterol in a multivariable-adjusted regression model.<sup>14</sup>

Fatih Kardas et al from Turkey conducted a study on 114 obese and healthy children. 25-Hydroxy vitamin D levels were positively correlated with adiponectin and HDL-cholesterol (HDL-C) and inversely correlated with body mass index (BMI), LDL-cholesterol (LDL-C), total cholesterol (T-C), triglyceride (TG), fasting glucose, homeostasis model assessment of insulin resistance (HOMA index), systolic blood pressure (SBP), and diastolic blood pressure (DBP).<sup>15</sup>

John WG et al in their study of British South Asians, showed a positive relation of fasting apo A-I concentrations to serum 25(OH)D concentrations, which is independent of glycemia and other dietary, anthropometric and lifestyle risk factors for type 2 diabetes and ischemic heart disease after multiple regression analyses. Subjects with hypovitaminosis D are likely to have an increased risk of ischemic heart disease independent of their increased risk of type 2 diabetes.<sup>16</sup>

Review of the evidence on hypovitaminosis D as a risk factor for metabolic syndrome and its sequelae, T2DM and CVD, suggests long-term vitamin D repletion could reduce these risks. Much of the studies so far available from randomized controlled trials is weakened by low vitamin D dosages, inadequate power, starting supplementation too late in life or after metabolic syndrome disorders have developed or most importantly by not including of many recognizable confounders. On balance, therefore, maintenance of recommended intakes for bone protection has the potential to prove protective for metabolic syndrome. Supplementation has been shown to increase survival in patients with cardiac disorders, whether higher doses would provide useful protection for apparently healthy people in the general population awaits the outcomes of ongoing randomized-controlled trials that, it is hoped, will prove or disprove causality for hypovitaminosis D in metabolic syndrome and its ill-effects.

## RECOMMENDATIONS

There is a need to target high risk groups such as pregnant women and the rapidly growing child. Vitamin D supplementation can be given relatively easily in the form of a 'children's multi-vitamin' supplement. Vitamin D2 (ergocalciferol) or D3 (cholecalciferol) should be provided to pregnant women. We should all be made aware of the need for calcium containing foods and the beneficial role of sunlight. Exposing to sun rays is an effective way of enhancing vitamin D status. Children who are not exposed to sunlight should be supplemented with oral vitamin D and vitamin D rich foods such as oily fish and cod liver oil.

This study has some limitations like lack of information on calcium and vitamin D intake and sunshine exposure of the subjects and the seasonal changes in vitamin D levels. We did not account for parathyroid hormone (PTH) levels. PTH levels may play a role for the effect of VDD. However, effects of PTH levels on metabolic syndrome still remains a controversy as the previous results have been inconsistent. Another limitation is the lack of information on factors influencing glucose and lipid levels such as socioeconomic status, physical activity and family history of diabetes mellitus. The data in this study were derived from a

heterogeneous group of children and adolescents coming to pediatric outpatient clinics for various reasons, and therefore the results may not mirror results that might be found in healthy children and adolescents without symptoms.

However, the strengths of the associations found in our study population suggest that prospective interventional trials are needed to determine whether vitamin D replacement impacts glycemic status or lipid levels in healthy children and adolescents or children and adolescents with risk factors for diabetes mellitus and cardiovascular disease.

## SUMMARY

It has been suggested that low serum levels of vitamin D may increase insulin resistance and in turn the risk of type 2 diabetes mellitus over time. Our findings relate vitamin D deficiency to dyslipidemia in children and add to the sparse body of literature in this area. We found that children and adolescents with varying levels of vitamin D deficiency had significantly increased risk of dyslipidemia. These findings suggest more aggressive lifestyle and dietary interventions with vitamin D supplementation to reduce the risk of dyslipidemia in high risk children. In this study, high vitamin D levels were positively associated with high HDL levels implicating the role of vitamin D in evolution of metabolic syndrome and cardiovascular diseases as vitamin D deficiency predisposes to low level of protective HDL levels.

## CONCLUSION

There is a high prevalence of vitamin D deficiency even in countries receiving abundant sunshine like India. Growing evidence supports a physiologic role for vitamin D in many chronic diseases, in addition to known effects on bone. In children, further studies are needed to determine the optimal circulating concentration of 25(OH)D, and the effects of a given 25(OH)D on various organs. Knowledge gaps also exist regarding the potential physiologic impact of vitamin D deficiency in childhood on health outcomes throughout the lifespan. Vitamin D supplementation is inversely associated with insulin resistance and some cardiometabolic risk factors. Use of Vitamin D supplementation may have beneficial effects in controlling some complications of childhood obesity. Low vitamin D level in children and adolescents are associated with higher plasma glucose and lower HDL concentrations.

The results of this study may not mirror the results that might be found in healthy children and adolescents as the data in this study were derived from a heterogeneous of children and adolescents coming to out-patient clinics for various reasons. However, the strength of the associations

found in our study population suggest that prospective interventional trials are needed to determine whether vitamin D replacement impacts glycemic status or lipid levels in healthy children and adolescents or children with risk factors for diabetes mellitus and cardiovascular diseases. Sensitizing pediatricians to recognize and treat this pandemic would have great impact on child health in the 21st century. Given the high worldwide prevalence of vitamin D deficiency, well-designed outcomes studies in children are urgently needed to address these research priorities.

## REFERENCES

1. Pinhas HO, Carel JC, Hochberg Z. Type 2 Diabetes Mellitus, Metabolic Syndrome, Lipids. Yearbook of Pediatric Endocrinology 2010: Carel JC: Karger. 2010: 155–170.
2. Johnson MD, Nader NS, Weaver AL, Singh R, Kumar S. Relationships between 25 hydroxyvitamin D levels and plasma glucose and lipid levels in pediatric outpatients. *J Pediatr*. 2010; March 156: 444-449.
3. Anoop M, Ranjita M, Wijesuriya M, Banerjee D. The metabolic syndrome in South Asians: Continuing escalation & possible solutions. *Indian J Med Res*. March 2007; ;125345-354.
4. Khadilkar VV, Khadilkar AV. IAP Growth Monitoring Guidelines for Children from Birth to 18 Years. *Indian Pediatrics*. 2007; 44:187-195.
5. Balasubramanian S, Dhanalakshmi K, Amperayani S. Vitamin D Deficiency in Childhood – A Review of Current Guidelines on Diagnosis and Management. *Indian Pediatrics*. July 2013; 50:669-674.
6. Anita K, Gupta S, Madan A, Venkatesan M. Lipid profile norms in Indian children. *Indian Pediatrics*. 1995; 32:1177-1180.
7. Goswami R, Mishra SK, Kochupillai N. Prevalence & potential significance of vitamin D deficiency in Asian Indians. *Indian J Med Res*. March 2008; 127:229-238.
8. Puri S, Raman MK, Agarwal N, et al. Vitamin D status of apparently healthy schoolgirls from two different socioeconomic strata in Delhi: relation to nutrition and lifestyle. *British Journal of Nutrition*. 2008; 99:876-882.
9. Harinarayan CV, Ramalakshmi T, Prasad UV, et al. High prevalence of low dietary calcium, high phytate consumption, and vitamin D deficiency in healthy south Indians. *Am J Clin Nutr*. 2007; 85: 1062-1067.
10. Abu Shady MM, Youssef MM, Megahed HS, et al. Association of Serum 25- Hydroxyvitamin D with dyslipidaemia in Egyptian School Children. *Australian Journal of Basic and Applied Sciences*. 2012; 6(10):541-549.
11. Talaei A, Mohamadi M, Adgi Z. The effect of vitamin D on insulin resistance in patients with type 2 diabetes. *Diabetology & Metabolic Syndrome*. 2013; 5:8.
12. Chiu KC, Chu A, Go VL, Saad MF. Hypovitaminosis D is associated with insulin resistance and beta cell dysfunction. *Am J Clin Nutr*. 2004;79:820-825
13. Auwerx J, Bouillon R, Kesteloot H. Relation between 25-hydroxyvitamin D3, apolipoprotein A I, and high density lipoprotein cholesterol. *Arterioscler Thromb*. 1992; 12:671-674.
14. Yin X, Sun Q, Zhang X, et al. Serum 25(OH)D is inversely associated with metabolic syndrome risk profile among urban middle-aged Chinese population. *Nutrition Journal* 2012; 11:68.
15. Kardas F, Kendirci M, Kurtoglu S. Cardiometabolic Risk Factors Related to Vitamin D and Adiponectin in Obese Children and Adolescents. *International Journal of Endocrinology*; 2013:1-5.
16. John WG, Noonan K, Mannan N, Boucher BJ. Hypovitaminosis D is associated with reductions in serum apolipoprotein A-I but not with fasting lipids in British Bangladeshis. *Am J Clin Nutr*. 2005; 82:517–522.

**How to cite this article:** N C Shivaprakash, Ranjit Baby Joseph. "To Study the Relationships between Serum 25-Hydroxy Vitamin D Levels and Plasma Glucose and Lipid Levels in Pediatric Patients in a Rural Hospital". *International Journal of Scientific Study*. 2014;1(4):24-31.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Sonographic Evaluation of Salivary Gland Tumors – A Hospital Based Study

Vijai Pratap, S K Jain<sup>1</sup>

Associate Professor, Department of Radio-diagnosis, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India, <sup>1</sup>Professor, Department of Anatomy, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India

**Corresponding Author:** Dr. S K Jain, Professor, Department of Anatomy, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India. Phone - +91-9997168754.  
E-mail: drskjain2005@rediffmail.com

## Abstract

**Background:** As stated anatomically there are three paired major Salivary glands, the Parotid, Submandibular and Sublingual. Including other diseases salivary glands are also prone for neoplastic involvement though rarely. As a rule smaller the gland the chances of malignancy are more there. Salivary gland tumors mostly emerge in Parotid gland. After clinical evaluation, ultrasound is the most preferred imaging modality to differentiate benign from malignant conditions. The aim of this study is to find out the incidence of salivary gland tumors among various neck pathologies and the most preferred radio-imaging modality to differentiate between benign and neoplastic salivary gland tumors.

**Methods:** This study was carried out in hospital of Teerthankar Mahaveer Medical College & Research Centre, Moradabad, in which all group of patients were included, following total research protocol as admissible in the research and ethical division of the institute. Ultrasound with frequency of 7–12 MHz, was employed for the study.

**Result:** Out of 40 patients with lumps in the neck 4 patients (10%) were found to have salivary gland tumors in the neck, out of which 5% were malignant and 5% were benign in nature as demonstrated by ultrasonography.

**Conclusion:** Ultrasonography is the most preferred choice of investigation for salivary gland tumors identification, though MRI is the most preferred modality for staging of malignancies of salivary gland tumors.

**Keywords:** Salivary glands, Ultrasonography & Malignancy

## INTRODUCTION

There are three pairs of salivary glands, namely Parotid, Submandibular and Sublingual. Parotid gland is located in the retro-mandibular fossa, Submandibular under the body of the mandible, & the Sublingual in the sublingual space lying lateral to the genioglossus muscle.

Salivary gland tumors are predominantly benign (80%). About 70% of the tumors are located in the parotid gland, 10% in the submandibular gland, and the remainder in the sublingual salivary glands. The size of the salivary gland is inversely proportional to the tumor detected being malignant.<sup>1</sup>

On histological basis, some benign and malignant salivary gland tumors share overlapping cytological features.<sup>2-4</sup>

Identifying the nature of swelling benign or malignant is next to impossible clinically and to rule out any confusion various

imaging modalities are available like Sialography, Computerized Tomography, MRI and Ultrasound. Ultrasound is the first imaging modality of choice for the salivary gland swellings. The advantage of Ultrasound in salivary gland enlargements is that it is comparatively easy to use, non ionizing, & less expensive. In the present study, sonography based differentiation of benign and malignant salivary gland lesions is done.

Although benign and malignant salivary gland tumors often have a similar sonographic appearance, several sonographic features, including a heterogeneous echotexture, indistinct margins, regional lymph node enlargement, and absence of distal acoustic enhancement, have been reported to be more frequently associated with malignancy.<sup>5</sup>

## MATERIAL & METHODS

This study is being carried out in the department of Radio-diagnosis Teerthankar Mahaveer Medical College & its associated



hospital. Forty patients were evaluated for neck swelling in the neck out of which four patients were identified as having salivary gland swelling. A routine protocol was maintained while evaluating the salivary gland lesions, which included informed consent (in patients under 18 yrs of age consent was taken from guardians), presence of female attendant in case of examination of female subject, Institutional research and ethical committee approval was taken before hand.

Patients were subjected to routine laboratory investigations and then taken for Ultrasound examination with the help of Ultrasound system present in the department.

The ultrasound scanner was placed on the skin immediately below the mandible, allowing the visualization of the salivary glands.

Out of forty patients in all 22 patients were male and 18 females. Age group between 21-30 yrs was found to be most susceptible for neck swellings. Ultrasound was performed using linear-array broadband transducer with a frequency of 7-12 MHz.

Bilateral examination of salivary glands was done as it is must do protocol.

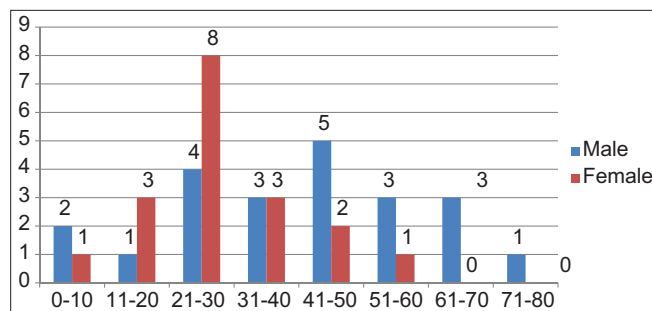
### Sampling Method

Convenience sampling technique was used in this study.

Age and Sex distribution of patients with Neck Masses (Table 1 and Figure 1)

**Table 1: Age and Sex distribution of patients with neck masses**

| Age group (In years) | Male | Female | Total |
|----------------------|------|--------|-------|
| 0-10                 | 2    | 1      | 3     |
| 11-20                | 1    | 3      | 4     |
| 21-30                | 4    | 8      | 12    |
| 31-40                | 3    | 3      | 6     |
| 41-50                | 5    | 2      | 7     |
| 51-60                | 3    | 1      | 4     |
| 61-70                | 3    | -      | 3     |
| 71-80                | 1    | -      | 1     |
| Total                | 22   | 18     | 40    |

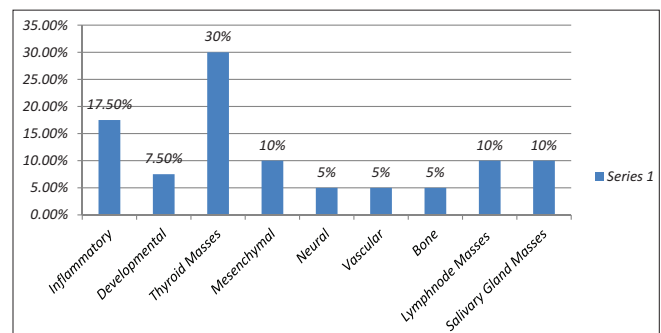


**Figure 1: Age and sex distribution of patients with neck masses**

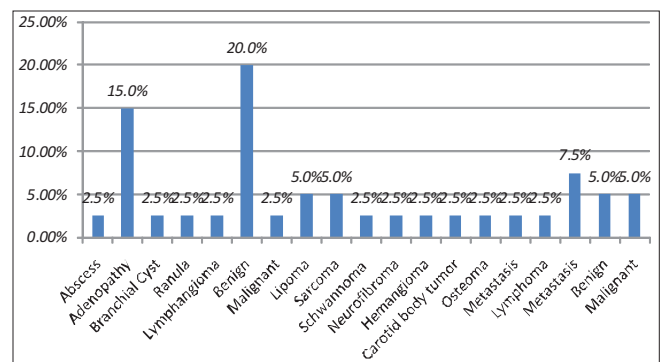
## RESULTS

**Table 2: Distribution of neck Masses according to the nature of the lesion**

| Nature of the lesion                | No. of cases | Percentage of total cases |
|-------------------------------------|--------------|---------------------------|
| Inflammatory                        |              | 17.5%                     |
| Abscess                             | 1            | 2.5%                      |
| Adenopathy                          | 6            | 15%                       |
| Developmental                       |              | 7.5%                      |
| Branchial Cyst                      | 1            | 2.5%                      |
| Ranula                              | 1            | 2.5%                      |
| Lymphangioma                        | 1            | 2.5%                      |
| Thyroid Masses                      |              | 30%                       |
| Benign                              | 8            | 20%                       |
| Malignant                           | 4            | 10%                       |
| Mesenchymal                         |              | 10%                       |
| Lipoma                              | 2            | 5%                        |
| Sarcoma                             | 2            | 5%                        |
| Neural                              |              | 5%                        |
| Schwannoma                          | 1            | 2.5%                      |
| Neurofibroma                        | 1            | 2.5%                      |
| Vascular                            |              | 5%                        |
| Hemangioma                          | 1            | 2.5%                      |
| Carotid body tumor                  | 1            | 2.5%                      |
| Bone                                |              | 5%                        |
| Osteoma                             | 1            | 2.5%                      |
| Metastasis                          | 1            | 2.5%                      |
| Lymphnode Masses (non inflammatory) |              | 10%                       |
| Lymphoma                            | 1            | 2.5%                      |
| Metastasis                          | 3            | 7.5%                      |
| Salivary Gland Masses               |              | 10%                       |
| Benign                              | 2            | 5%                        |
| Malignant                           | 2            | 5%                        |
| Total                               | 40           | 100%                      |



**Figure 2: Distribution of various neck pathologies**



**Figure 3: Showing occurrence of salivary gland tumors in range of 10%**

## SALIVARY GLAND LESIONS

Four cases (10%) of neck, masses in the present study were of salivary gland origin. Two of these were benign (50%) and two (50%) malignant.

### Benign Lesions of Salivary Glands

Benign lesions consisted of a pleomorphic adenoma and a Warthin's tumor.

The Pleomorphic adenoma appeared as a well defined hypoechoic lesion in the right parotid gland.

### Ultrasonographic Findings Obtained are as under (Figure 4)

- Size Approximately 28.1 Mm.
- Limits Were Well Defined
- Contour Was Lobulated
- Internal Structure Was Homogenous
- Calcification Was Almost Absent
- Acoustic Enhancement Seen.

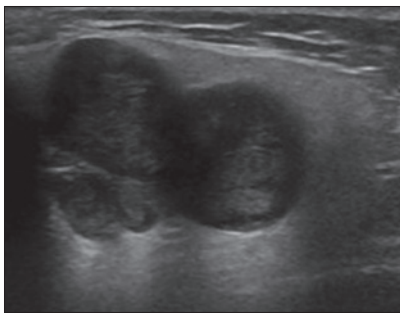


Figure 4: Hypoechoic lesion in the right parotid gland

### Ultrasonographic Findings of Warthin's Tumor (Figure 5)

- Size Approximately 28.9 Mm. And Located In Parotid Gland
- Limits Were Well Defined
- Contour Was Non-Lobulated
- Internal Structure Was Mostly Heterogenous
- Calcification Was Almost Absent
- Acoustic Enhancement Seen

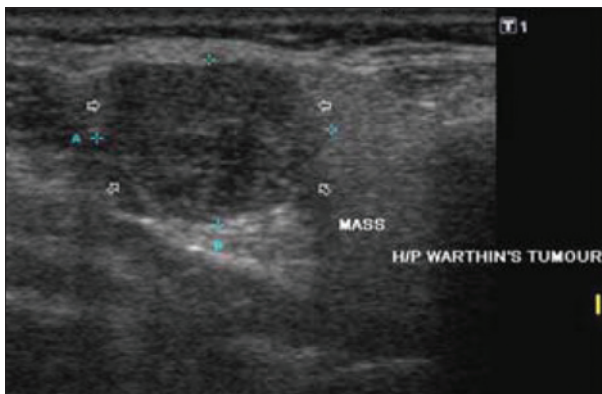


Figure 5: H/P Warthin tumor

One was present in parotid gland and other was in sublingual gland.

### Sonographic Findings of Malignant Lesion of Parotid Gland

- Heterogeneous Hypoechoic Ovoid Mass
- Punctate Calcifications
- Well-Defined Margin
- Posterior Echogenicity
- Enhancement and Distinct Edge Refraction.



Figure 6: Heterogeneous hypoechoic ovoid mass

### Adenoid Cystic Carcinoma of Salivary Gland – Sublingual Gland

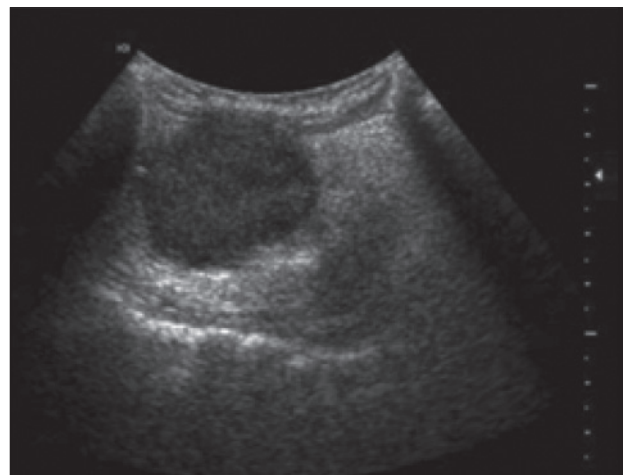


Figure 7: Hypoechoic mass of sublingual gland

## DISCUSSION

Salivary gland tumors are not very common<sup>6</sup> and more so over neoplastic (malignant) lesions are seen in 5–10% of cases.<sup>7</sup>

It will be good for patients if these tumors are diagnosed pre-operatively without going into surgical intervention.

Therefore, many clinical researchers have tried to evaluate the ability of sonography to differentiate benign and malignant tumors.

Sonography is a powerful tool for characterizing salivary gland tumors. Different imaging techniques are valuable in assessing salivary gland disease, out of which the choice of modality depends on local protocol, clinical features and, importantly, the site of suspected pathology. Technical advances, in many imaging centers have made ultrasound nowadays the investigation of choice for major salivary gland disease. It allows a quick, cheap and thorough assessment without the use of ionizing radiation. Ultrasound is able to simultaneously evaluate gland parenchyma and large ducts as well as demonstrate duct dilatation.

Tumors of the salivary glands are not common, representing about 3% of all head and neck tumors. Histopathology of salivary gland tumors is very varied, with a large number of both benign and malignant tumors. Out of this Pleomorphic adenomas are the most common, representing 70-80% of all salivary gland tumors<sup>1</sup> most frequently located in the parotid gland. Cytological examination often faces difficulty in differentiating adenoid cystic carcinoma from Pleomorphic adenoma.<sup>7,8</sup> It is seen histopathologically both lesions contain myxoid material.<sup>9-11</sup> A number of ultrasonographic features are considered typical for pleomorphic adenomas: sharp borders, lobulations of the contour, homogeneous structure, poor vascularization, acoustic enhancement.<sup>12,13</sup> which well correlates with the ultrasonographic pictures of our present study.

Warthin's tumour is the second common salivary neoplasm, typically occurring in older male patients, with a propensity for smokers. It arises from parotid intraglandular lymphoid tissue, typically in the tail, and is multiple or bilateral in approximately 15% cases.

Ultrasound shows an ovoid hypoechoic mass. In our study it was present unilaterally and patient didn't give history of smoking. Sublingual gland tumors are rare and account for only 0.4–2.6 of all salivary gland tumors.<sup>14,15</sup>

However, most of the recorded literature assert that Pleomorphic adenoma is more common than Adenolymphoma.<sup>7,16</sup> Only Schick et al<sup>17</sup> recorded an equal number of cases of Pleomorphic adenoma and Warthin's tumour (7:7), which is also seen in our study.

The majority of sublingual gland tumors are malignant<sup>18</sup> and ACC is the most common. As can be seen in our study out of two malignant lesions one is of Adenoid Cystic Carcinoma, which very well correlates with the study of Anderson LJ et al.<sup>19</sup>

## CONCLUSION

Before going into any type of radiological investigation histological grading of salivary gland tumor is a preliminary step in clinical setting, though not alone.

A variety of radio-imaging modalities may be employed in salivary gland imaging in which Ultrasound has emerged as the technique of choice for major salivary gland disease and forms a useful aid for FNA/biopsy. MRI is of particular value for staging salivary gland malignancy.

As a simple guide If ultrasound is able to differentiate as a benign pathology there is no need to go further imaging.

Through our experience we now know that sonographic features are most accurate but we should keep other modalities in our mind for improving the diagnostic accuracy.

## REFERENCES

1. Gritzmann N, Hollerweger A, Macheiner P, Rettenbacher T, Hubner E. Sonography of the salivary glands. *European Radiology* 2003; 13:364-375.
2. Elagoz S, Gulluoglu M, Yilmazbayhan D, Ozer H, Arslan I. The value of fine-needle aspiration cytology in salivary gland lesions, 1994-2004. *ORL J Otorhinolaryngol Relat Spec* 2007;69:516.
3. Stramandinoli RT, Sassi LM, Pedruzzi PA, Ramos GH, Oliveira BV, Ogata DC, Ioshii SO. Accuracy, sensitivity and specificity of fine needle aspiration biopsy in salivary gland tumours: a retrospective study. *Med Oral Patol Oral Cir Bucal* 2010;15:e32-7.
4. Mihashi H, Kawahara A, Kage M, Kojiro M, Nakashima T, Umeno H, Sakamoto K, Chiziwa H. Comparison of preoperative fine-needle aspiration cytology diagnosis and histopathological diagnosis of salivary gland tumors. *Kurume Med J* 2006;53:23-7.
5. Kovacevic DO, Fabijanic I. Sonographic diagnosis of parotid gland lesions: correlation with the results of sonographically guided fine-needle aspiration biopsy. *J Clin Ultrasound* 2010;38:294-8.
6. Dumitriu D, Duda S, Badea R, Botar-Jid C, Băciut G, Băciut M. B-mode and colour Doppler ultrasound features of salivary gland tumours. *Med Ultrason* 2008;10:31-37.
7. Bradley MJ, Durham LH, Lancer JM. The role of colour flow Doppler in the investigation of the salivary gland tumour. *Clin Radiol* 2000;55:759-762.
8. Stanley MW. Selected problems in fine needle aspiration of head and neck masses. *Mod Pathol* 2002;15:342-50.
9. Elsheikh TM, Bernacki EG. Fine needle aspiration cytology of cellular pleomorphic adenoma. *Acta Cytol* 1996;40:1165-75.
10. Cerulli G, Renzi G, Perugini M, Becelli R. Differential diagnosis between adenoid cystic carcinoma and pleomorphic adenoma of the minor salivary glands of palate. *J Craniofac Surg* 2004;15:1056-60.
11. Kapadia SB, Dusenbery D, Dekker A. Fine needle aspiration of pleomorphic adenoma and adenoid cystic carcinoma of salivary gland origin. *Acta Cytol* 1997;41:487-92.
12. Colella G, Cannavale R, Flamminio F, Foschini MP. Fineneedle aspiration cytology of salivary gland lesions: a systematic review. *J Oral Maxillofac Surg* 2010;68:2146-53.
13. Bialek E, Jakubowski W, Karpinska G. Role of ultrasonography in diagnosis and differentiation of pleomorphic adenomas. *Arch Otolaryngol Head Neck Surg* 2003; 129:929-933.
14. Luukka H, Klemi P, Leivo I, Koivunen P, Laranne J, Makitie A, et al. Salivary gland cancer in Finland 1991-96: and evaluation of 237 cases. *Acta Otolaryngol* 2005;125: 207-214.

15. Gurney TA, Eisele DW, Weinberg V, Shin E, Lee N. Adenoidcystic carcinoma of the major salivary glands treated with surgery and radiation. *Laryngoscope* 2005;115: 1278–1282.
16. Mazaher H, Kashany SS, Sharifian H. Diagnostic accuracy of triplex ultrasound in malignant parotid tumours. *Iran J Radiol* 2007;4:169–174.
17. Steiner E, Gahleitner A, Böhm P, Helbich T, Ba-Salamah A, et al. Differentiation of benign and malignant tumours of the parotid gland: value of pulsed Doppler and colour Doppler sonography. *Eur Radiol* 1998;8:1462–1467.
18. Eneroth CM. Salivary gland tumors in the parotid gland, sub mandibular gland, and the palate region. *Cancer* 1971;27:1415–1418.
19. Anderson LJ, Therkildsen MH, Ockelmann HH, Bentzen JD, Schiodt T, Hansen HS. Malignant epithelial tumors in the minor salivary glands, the submandibular gland and the sublingual gland. Prognostic factors and treatment results. *Cancer* 1991;68:2431–2437.

**How to cite this article:** Vijai Pratap, S K Jain. "Sonographic Evaluation of Salivary Gland Tumors – A Hospital Based Study". *International Journal of Scientific Study*. 2014;1(4):32-36.

**Source of Support:** Nil, **Conflict of Interest:** None declared.



# Relationship Between Depression and Vitamin C Status: A Study on Rural Patients From Western Uttar Pradesh in India

Prerana Gupta, Sanchit Tiwari<sup>1</sup>, Jigar Haria<sup>2</sup>

Assistant Prof in Psychiatry, M.D. Psychiatry, Teerthanker Mahaveer Medical College and Research Centre, Moradabad (U.P.), <sup>1</sup>Senior Demonstrator in Biochemistry, M.Sc. (Med) Biochemistry, Teerthanker Mahaveer Medical College and Research Centre, Moradabad (U.P.), <sup>2</sup>Assistant Prof in Medicine, M.D. Internal Medicine, Teerthanker Mahaveer Medical College and Research Centre, Moradabad (U.P.)

**Corresponding Author:** Dr. Prerana Gupta, Assistant Professor, Department of Psychiatry, Teerthanker Mahaveer Medical College and Research Centre, Moradabad (U.P.). E-mail: preranagupta1978@gmail.com

## Abstract

**Aim & Objective:** To study vitamin C status of rural depressed population of Western U.P vis-a-vis age- and sex-matched healthy controls.

**Materials & Methods:** From patients visiting the Psychiatric outpatient department of TMMC & RC, thirty depressed patients, diagnosed according to Structured Clinical Interview DSM-IV-TR schedule, were selected randomly and their serum vitamin C levels were measured by dinitrophenyl hydrazine method. These levels were compared with 30 age- and sex-matched healthy controls.

**Results:** Mean ( $\pm$  SD) serum vitamin C levels of depressed patients and controls were  $0.18 \pm 0.09$  mg/dl and  $0.41 \pm 0.07$  mg/dl respectively. The difference between these two groups of subjects was statistically significant ( $p$  value  $< 0.001$ ).

**Conclusion:** This study shows low vitamin C status in depressed patients as compared to normal individuals, and suggests that vitamin C supplementation can have a positive effect in the treatment of these patients.

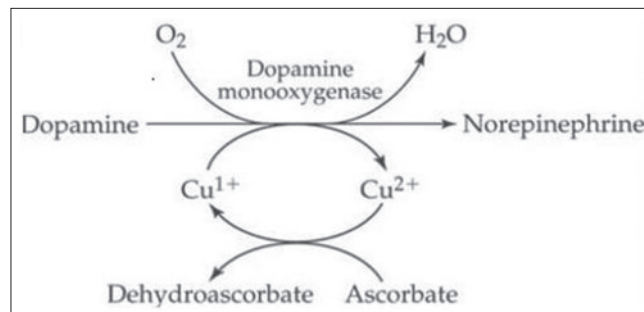
**Keywords:** Depression, Vitamin C

## INTRODUCTION

Depression is a state of extreme sadness that reaches a point where it affects a person's day to day activities and also disturbs socio-occupational functioning. Depression may have a relationship with vitamin C deficiency. When a group of patients were deprived of Vitamin C they experienced symptoms like sad mood, reduced concentration, reduced energy, fatigue and hypochondriasis. They were significantly more anxious and people deficient in vitamin C were also significantly more depressed based on ratings from the Symptom adjective checklist, but the Frieburg personality inventory scale showed no significant depressive scores.<sup>1</sup>

Among diverse functions of vitamin C, one is its role in the synthesis of some neurotransmitters. Vitamin C is a cofactor for dopamine beta-hydroxylase<sup>2</sup> which is involved in the conversion of dopamine to nor-epinephrine.

According to an August 2003 article in vitamin C acts as the co-factor for the enzyme dopamine-beta-hydroxylase to convert dopamine into nor-epinephrine (Figure 1), which plays an important role in the regulation of mood.<sup>3</sup> Evidence for the involvement of Norepinephrine in depression is abundant, and latest studies on neural



**Figure 1: Role of vitamin C in norepinephrine synthesis**

pathways and mechanisms highlight the specific role of Norepinephrine in this disorder.<sup>4</sup> Norepinephrine plays a significant & determinant role in executive functioning regulating cognition, mood, interest, and intelligence, which are fundamental in social relationships.<sup>5</sup>

Vitamin C is also a cofactor for tryptophan-5-hydroxylase required for the conversion of tryptophan to 5-hydroxytryptophan in serotonin production. Vitamin C may therefore be valuable for patients with depression associated with low levels of serotonin.<sup>6</sup> Deficiency of serotonin produces depressant effect and excess of serotonin in brain tissue produces stimulation of cerebral activity.<sup>7</sup> Vitamin C has broad-spectrum antioxidant properties and is essential for the mitochondrial metabolism of fats.<sup>8</sup> Vitamin C is also required for the activity of peptidylglycine alpha-amidating mono-oxygenase.<sup>9</sup> This enzyme catalyses the rate-limiting step in the biosynthesis of neuropeptides.<sup>10</sup>

In a 2011 study, investigators used an objective assessment of physical function and a range of socio-demographic, dietary, and health behaviours to explore the possible factors that could explain the association between depression and mortality in community-dwelling elderly participants aged 65 years and older. Depression was assessed from the 15-item Geriatric Depression Scale (GDS) and physical functioning. Subjects were followed up till death over an average of 9.2 years. At baseline, 20.9% of participants demonstrated depression (GDS-15 score  $\geq 5$ ). Depressed participants were at a higher relative risk of all-cause mortality during follow-up (age- and sex-adjusted hazard ratio = 1.24, 95% confidence interval: 1.04-1.49). These factors collectively explained an estimated 54% of the association between depression and death. Low-grade inflammatory changes and low plasma vitamin C were also independently associated with depression and mortality but did not explain any of the association between depression and mortality. Physical dysfunction might partly explain the co-relation although studies are required to fully elucidate the mechanisms.<sup>11</sup>

Trials were carried out to find out whether patients with generalized anxiety disorder (GAD) and depression have any difference in blood serum levels of vitamins A ( $\beta$ -carotene), C, and E in comparison to normal healthy controls and whether supplementation of adequate doses of vitamins A, E, and C leads to significant reduction in anxiety and depressive scores of the subjects. It was observed that patients with GAD and depression had significantly lower levels of vitamins A, C, and E in comparison to healthy controls. After supplementing these deficient vitamins in the diets of the subjects, a significant reduction in anxiety and depressive scores was observed.<sup>12</sup>

## AIM OF THE STUDY

Keeping the above reports in mind, the present study was carried out on a random sample of 30 patients from rural background in Western U.P. diagnosed as depressed as per the Structured Clinical Interview DSM-IV<sup>13</sup> to find out the levels of vitamin C in their serum and to compare these with 30 healthy age- and sex-matched controls.

## MATERIAL AND METHODS

The study was conducted over a period of six months in Teerthankar Mahaveer Medical College and Research Centre, Moradabad situated in rural surroundings in the western part of U.P. From amongst the patients attending the Psychiatric outpatient department, thirty depressed patients, diagnosed according to SCID schedule,<sup>13</sup> were selected randomly. A thorough physical examination and relevant investigations were done to rule out any physical disease. Thirty age- and sex-matched controls from healthy population belonging to the same area were also included in the study. Serum vitamin C levels were measured in all the subjects by dinitrophenyl hydrazine method.<sup>14</sup> The mean ( $\pm$ SD) serum vitamin C levels of patients with depression were compared with those of controls by Student's t-test.

## RESULTS

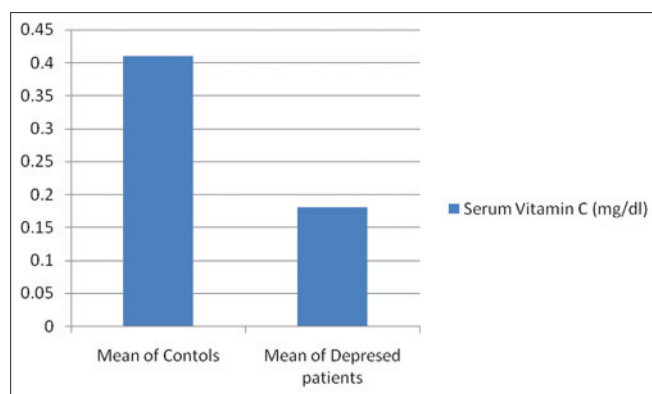
Serum vitamin C levels ranged from 0.3 to 0.6 mg/dl in controls with a mean  $\pm$  SD of  $0.41 \pm 0.07$  mg/dl. In patients with depression, the levels ranged from 0.1 to 0.4 mg/dl with a mean  $\pm$  SD of  $0.18 \pm 0.09$  mg/dl. The difference between the two groups was highly significant with a p value of  $<0.001$  (Table 1) (Figure 2).

**Table 1: Mean $\pm$ SD serum vitamin C levels in controls and depressed patients**

| Analyte           | Control Group (n=30) | Depressed Patients (n=30) | p value  |
|-------------------|----------------------|---------------------------|----------|
| Vitamin C (mg/dl) | $0.41 \pm 0.07$      | $0.18 \pm 0.09$           | $<0.001$ |

## DISCUSSION

Vitamin C is an anti-oxidant, commonly used to boost immunity in the cases of cold and flu. In the treatment of Vitamin C is also very important, because it is needed for the conversion of tyrosine into dopamine, norepinephrine and epinephrine. These are the neurotransmitters providing with both physical and motivational energy and feelings of reward and satisfaction.



**Figure 2: Comparison between mean serum vitamin C level of control and depressed patients**

Vitamin C is needed to convert tryptophan, amino acid present in the animal proteins in the diet, into serotonin, major neurotransmitter of the brain.

Without Vitamin C these biochemical reactions can't be properly carried out and that will result in lesser amounts of neurotransmitter in the brain and body, and consequently, in lower mood and motivational energy.

Serum vitamin C in patients with depression was found to be significantly lower as compared to healthy controls indicating poor vitamin C status in depressed patients. As described above, vitamin C is a cofactor for dopamine beta-hydroxylase, which converts dopamine to nor-epinephrine, and a cofactor for tryptophan-5-hydroxylase required for the conversion of tryptophan to 5-hydroxytryptophan in serotonin production.

Since synthesis of serotonin, dopamine and nor-epinephrine requires vitamin C, it is to be expected that their synthesis would be impaired if vitamin C is deficient. It is an established fact that serotonin, dopamine and nor-epinephrine play important roles in maintaining mood. Deficiency of nor-epinephrine can cause clinical depression and poor memory, and deficiency of serotonin can produce a depressant effect.

Results presented here demonstrate poor vitamin C nutrition in depression in the sample of population studied. Whether this under-nutrition is prevalent in other sections of population needs to be investigated.

Vitamin C under-nutrition may be a causative or contributory factor in the genesis of depression. Hence

correction of this deficiency alongside the conventional treatment of depression is expected to yield better results in patient management.

## CONCLUSION

This study shows low vitamin C status in depressed patients as compared to normal individuals, and suggests that vitamin C supplementation can have a positive effect in the treatment of these patients. Vitamin C has an important role in the formation of neurotransmitters required for normal neuronal functioning and the lack of this important factor can be a cause of treatment failure and resistance in the depressed population.

## REFERENCES

- Hodges, Robert E., et al. Clinical manifestations of ascorbic acid deficiency in man. *The American journal of clinical nutrition*. 1971;24(4):432-443.
- Kaufman S. Coenzymes and hydroxylases: ascorbate and dopamine-beta-hydroxylase; tetrahydropteridines and phenylalanine and tyrosine hydroxylases. *Pharmacol Rev*. 1966;18(1):61-9.
- K Akhilender Naidu. Vitamin C in human health and disease is still a mystery? An overview. *Nutrition Journal*. 2003, 2:7. doi:10.1186/1475-2891-2-7.
- Rush RA, Geffen LB. Dopamine beta-hydroxylase in health and disease. *Crit Rev Clin Lab Sci*. 1980;12(3): 241-77. doi:10.3109/10408368009108731.
- Moret C, Briley M. The importance of norepinephrine in depression. *Neuropsychiatric Disease and Treatment*. 2011;7(Supplement 1):9-13.
- Mann J, Truswell AS. *Essentials of Human Nutrition*. 2nd edition. New York: Oxford University Press; 2002.
- Chatterjea MN, Shinde R. *Textbook of Medical Biochemistry* 7th Edition, 2007, p.488.
- Cooper, Jack R. The role of ascorbic acid in the oxidation of tryptophan to 5-Hydroxytryptophan. *Annals of the New York Academy of Sciences*. 1961;92(1):208-211.
- Murthy A. S., Mains R. E., Eipper B. A. Purification and characterization of peptidylglycine alpha-amidating monooxygenase from bovine neurointermediate pituitary. *J. Biol. Chem*. 1986;261:1815-1822.
- Husten E. J., Tausk F. A., Keutmann H. T., Eipper B. A. Use of endoproteases to identify catalytic domains, linker regions, and functional interactions in soluble peptidylglycine alpha-amidating monooxygenase. *J. Biol. Chem*. 1993;268:9709-9717.
- Hamer, Mark, Christopher J. Bates, Gita D. Mishra. Depression, physical function, and risk of mortality: national diet and nutrition survey in adults older than 65 Years. *American Journal of Geriatric Psych*. 2011;19(1):72-78.
- Gautam M, Agrawal M, Gautam M, Sharma AS, Gautam S. Role of antioxidants in generalised anxiety disorder and depression. *Indian J Psychiatry* 2012;54:244-7.
- SCID-CV (for DSM-IV) (Clinician Version) First, Michael B., Spitzer, Robert L, Gibbon Miriam, and Williams, Janet B.W.: *Structured Clinical Interview for DSM-IV Axis I Disorders, Clinician Version (SCID-CV)*. Washington, D.C.: American Psychiatric Press, Inc., 1996.
- Brady, Oscar L., Gladys V. Elsmie. The use of 2: 4-dinitrophenylhydrazine as a reagent for aldehydes and ketones. *Analyst*. 1926; 51(599): 77-78.

**How to cite this article:** Prerana Gupta, Sanchit Tiwari, Jigar Haria. "Relationship Between Depression and Vitamin C Status: A Study on Rural Patients From Western Uttar Pradesh in India". *International Journal of Scientific Study*. 2014;1(4):37-39.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# The Burden of Anaemia amongst Antenatal Women in the Rural Population of Northern India

M Shams Khan,  
Anupama Srivastav,<sup>1</sup>  
Anil K Dixit<sup>2</sup>

Associate Professor, Dept. of Community Medicine, Rama Medical College Hospital & RC Ghaziabad,

<sup>1</sup>Assistant Professor, Dept. of Community Medicine, Rama Medical College Hospital & RC Kanpur,

<sup>2</sup>Professor & HOD, Dept. of Community Medicine, Rama Medical College Hospital & RC Ghaziabad

**Corresponding Author:** Dr. Mohd. Shams Khan, 301, Utkarsh Shikhar Apart., Near Upvan Hotel, Mount Road, Sadar, Nagpur-440001. E-mail: mohammed.k1954@yahoo.com

## Abstract

**Background:** Nutritional anaemia in pregnant women is one of the India's major public health problems and is major factor responsible for low birth weight. Out of total maternal deaths in world most of them occur due to anaemia.

**Objectives:** To check prevalence of anaemia in pregnant women and its association with literacy status, dietary factors and BMI.

**Material & Methods:** The study was conducted in village Khera at RHTC, Rama Medical College Hospital and Research Centre, Hapur, Uttar Pradesh. It is cross sectional study.

The study was carried from Oct 2012 to June 2013. A total of 321 pregnant women with gestational period between 12 to 20 weeks were registered. The detail clinical examination including measurement of weight and height was carried out. Hemoglobin was estimated and peripheral smear examination was done. Data was analyzed by using Chi-Square Test. P-value less than 0.05 were considered significant.

**Results:** A high prevalence of anaemia (79.75%) was observed in antenatal women. Majority of the antenatal women were moderately anaemic (58.38%) and were under 20 years of age. Occurrence of anaemia in antenatal women was found to be inversely proportional to the literacy status. Statistically significant association ( $P < 0.05$ ) were found amongst anaemic antenatal women with their literacy status and BMI however statistically significant association was not found in various dietary factors.

**Keywords:** Antenatal Women, Anaemia, Basal Metabolic Index, Literacy Status

## INTRODUCTION

Anemia is the most common nutritional deficiency worldwide. It leads to reduced work capacity in adults and leads impact on mental development in children and adolescents. There is some evidence that anemia affects cognition in adolescent girls and causes fatigue in adult women. Anemia may affect visual and auditory functioning and is weakly associated with poor cognitive development in children.<sup>1</sup>

In India, anaemia contributes directly to 20% maternal death and indirectly to further 20%.<sup>2,3</sup> The main causes of Anaemia in the developing countries in Antenatal women includes low dietary intake of iron and folic acid, poor bioavailability of iron and fiber rich Indian diet, poor absorption of iron due to hook worms infestation and blood loss during delivery and heavy menstrual blood loss.<sup>4,6</sup> Iron deficiency & Anaemia during antenatal period

are associated with low birth weight babies, premature birth, increase perinatal and neonatal mortality. Anaemia increases the risk of maternal morbidity & mortality and adverse maternal outcome such as ante partum haemorrhage, post-partum haemorrhage & puerperal sepsis.<sup>7-9</sup> National Nutritional Anaemia prophylaxis programme (NNAPP) was initiated in 1970 during the fourth five year plan with the aim to reduce the prevalence of Anaemia to 25%.<sup>10</sup> After subsequent evaluation it was seen that there was no change in situation. Since 1992 the daily dosage of elemental iron for prophylaxis and therapy has been increased to 100 mg & 200 mg, respectively under Child Survival and Safe Motherhood Programme (CSSM Programme).

This current study was carried out to find out the prevalence of the Anaemia in antenatal women and to determine the association with their literacy status, dietary factors and BMI.



## MATERIAL AND METHODS

Present community based, cross sectional study was carried out at Rural Health Training Centre, Khera, Rama Medical College Hospital. Research centre Hapur, Uttar Pradesh from October 2012 to June 2013. Total 321 antenatal women with gestational period 12-20 weeks, visiting at antenatal clinic were registered for the study. Antenatal women giving history of worm's infestation, bleeding disorder and bleeding in last pregnancy were excluded from the study.

The antenatal women were interviewed by using pre-structured, pre-tested performa. Prior consent was obtained from the subjects. Detail clinical examination was done at Khera, RHTC. Weight and Height measurement of the subject were taken with pre-standardized weighing machine and Height scale. BMI was calculated by the formula weight in Kgs/Height in meter square. Haemoglobin estimation was done by Sahli's method. Anaemia was classified as per WHO criteria.<sup>11</sup> Haemoglobin below 11 gm/dl in Labeled as anaemia during antenatal period. Typing of anaemic was done as per standard peripheral smear examination.<sup>12</sup> Literacy status was assessed according to modified B.G. Prasad Classification.<sup>13-14</sup> Severely anaemic pregnant women were referred to Rama Medical College Hospital, Hapur for further management. Data was analyzed by using Chi-Square Test. P-value < 0.05 were considered significant.

## RESULTS

In this observational study, 47.97% of subjects were from joint family, 39.25% from muscle family and 12.77% from the extended family. Majority of the antenatal women belonged to Hindus religion (75.70%) followed by Muslims (12.14%), Christians (3.73%) and other caste (8.41%) respectively.

As shown in Figure 1, Pie diagram, 79.75% subjects were found anaemic. The prevalence of mild, moderate and severe anaemia was 20.56%, 44.23% and 14.97% respectively. Majority of them were moderately anaemic.

Table no. 1 shows 94.81% and 91.66% of Antenatal women were belonged to illiterate and primary school category. Moderate anaemic was seen amongst middle school (52.12%) and high school category (65.62%). Severe anaemia was detected in illiterate (29.31%) and primary school (23.33%) category. Lower percentage of anaemia was found in higher education category viz: intermediate (40%), Graduate (27.77%) and post graduate (28.5%) subjects. Statistically significant difference were observed ( $\chi^2 = 47.05$ ,  $P < 0.05$ )

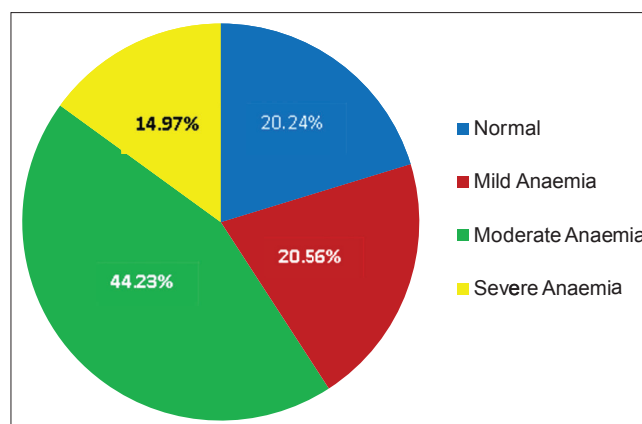


Figure 1: Pie diagram showing – Distribution of anaemia in the antenatal women

Table 1: Distribution of antenatal women according to their literacy status (n=321)

| Women education | Anaemia n (%) |               |              |               | Normal       | Total |
|-----------------|---------------|---------------|--------------|---------------|--------------|-------|
|                 | Mild          | Moderate      | Sever        | Total         |              |       |
| Illiterate      | 18<br>31.03%  | 20<br>34.48%  | 17<br>29.31% | 55<br>94.82%  | 3<br>5.17%   | 58    |
| Primary School  | 20<br>33.33%  | 21<br>35%     | 14<br>23.33% | 55<br>91.66%  | 5<br>8.5%    | 60    |
| Middle School   | 19<br>20.21%  | 49<br>52.12%  | 12<br>12.76% | 80<br>85.10%  | 14<br>14.89% | 94    |
| High School     | 6<br>9.37%    | 42<br>65.62%  | 3<br>4.68%   | 51<br>79.68%  | 13<br>20.31% | 64    |
| Inter-media     | 2<br>10%      | 5<br>25%      | 1<br>5%      | 8<br>40%      | 12<br>60%    | 20    |
| Graduate        | 1<br>5.5%     | 3<br>10.66%   | 1<br>5.5%    | 5<br>27.77%   | 13<br>72.22% | 18    |
| Post Graduate   | 0<br>0%       | 2<br>28.57%   | 1<br>14.28%  | 2<br>28.51%   | 5<br>71.42%  | 7     |
| Total           | 66<br>70.56%  | 142<br>44.23% | 48<br>14.97% | 256<br>79.75% | 65<br>20.24% | 321   |

Table no. 2 shows 34.89% antenatal women were vegetarian and 65.11% were on mixed diet. The percentage of mild anaemia (22.32%) moderate anaemia (44.42%) and severe anaemia (16.07%) were higher amongst vegetarian as compared to those on mixed diet subjects where mild, moderate & severe anaemia was detected as 19.61%, 43.06% & 14.35% respectively.

In this study percentage of pure non-vegetarian subjects was zero. Statistically significant difference was not observed. ( $\chi^2 = 3.86$   $P > 0.05$ ) amongst vegetarian & mixed diet subject.

Table no. 3, shows that majority of the anaemia subject belonged to category of BMI <18.5 kg/m<sup>2</sup> viz: mild anaemia (21.37%), moderate anaemia (48.38%) and severe anaemia (16.93%) respectively. 31.14% of moderate anaemia was seen in the subjects of BMI category 18.5 – 24.9 kg/m<sup>2</sup> and 33.33% mild anaemia was seen in

**Table 2: Distribution of Anaemia according to dietary habits of Antenatal Women (n=321)**

| Type of Diet | Mild Anaemia | Moderate Anaemia | Severe Anaemia | Normal       | Total         |
|--------------|--------------|------------------|----------------|--------------|---------------|
| Vegetarian   | 25<br>22.32% | 52<br>44.42%     | 18<br>16.07%   | 17<br>15.17% | 112<br>34.89% |
| Mixed diet   | 41<br>19.61% | 90<br>43.06%     | 30<br>14.35%   | 48<br>22.96% | 209<br>65.11% |
| Total        | 66           | 142              | 48             | 65           | 321           |

**Table 3: Distribution of Anaemic Antenatal women according to their BMI. (n=321)**

| BMI kg/m <sup>2</sup> | Mild Anaemia | Moderate Anaemia | Severe Anaemia | Normal       | Total         |
|-----------------------|--------------|------------------|----------------|--------------|---------------|
| 18.5                  | 53<br>21.37% | 120<br>48.38%    | 42<br>16.93%   | 33<br>13.30% | 248<br>77.25% |
| 18.5-24.9             | 9<br>14.25%  | 19<br>31.14%     | 5<br>8.19%     | 28<br>45.90% | 61<br>19.00%  |
| >25                   | 4<br>33.33%  | 3<br>25%         | 1<br>8.33%     | 4<br>33.33%  | 12<br>3.73%   |
| Total                 | 66           | 142              | 48             | 65           | 321           |

BMI category >25 kg/m<sup>2</sup>. Statistically significant difference was observed ( $\chi^2 = 18.04$  P<0.05) in different categories.

## DISCUSSION

The high prevalence of Anaemia (79.75%) was observed amongst antenatal women in this study which is similar to earlier studies.<sup>2,3</sup> Higher prevalence of Anaemia was observed in the subjects of lower literacy category and lower prevalence of anaemia was seen in high literacy category. Anaemia in antenatal women is thus inversely related to the literacy status as seen in earlier studies.<sup>15-17</sup> Present study showed the high prevalence of anaemia in vegetarian diet subjects as compare to the subjects on mixed diet & similar results were seen in earlier studies.<sup>18</sup> Prevalence of anaemia was minimal amongst over weight subjects and higher in lower BMI subjects. These results coincides with the earlier studies of Bentley/Griffith.<sup>19</sup>

Normocytic hypochromic and Microcytic hypochromic type of blood was predominantly present in antenatal women which is consistent with the other studies except for dimorphic blood picture.<sup>20</sup> It indicates iron deficient intake and absorption amongst antenatal women irrespective of their literacy status, dietary habits & type of the family.

## CONCLUSION

- As high prevalence of nutritional Anaemia was detected in antenatal women, Nutritional

education & dietary counseling is recommended by nutritionist.

- Supplementation of iron & folic acid should be implemented to all the antenatal women in rural area.

## ACKNOWLEDGEMENT

This study was conducted at RHTC Rama Medical College Hospital and Research Center, Hapur. He wants to thank Principal & Head of Department of Community Medicine for allowing him to carry out this study. He is thankful his colleagues, laboratory staff, nursing staff member, social workers and statistician for their coordination & co-operation during the study.

## REFERENCES

- Killip, Shersten, John M. Bennett, and Mara D. Chambers. "Iron deficiency anemia." *Children* 1994, no. 1999 (2000).
- World Health Organization. Prevention and management of anaemia in pregnancy. WHO/FHE/MSM/93.5 Geneva: WHO, 1993.
- Brabin, B. J., Hakimi, M., Pelletier. An analysis of anemia and pregnancy-related maternal mortality. *The Journal of nutrition*. 2001;131(2):604S-615S.
- Karine Tolentino, Jennifer F. Friedman. An update on Anaemia in less developed countries. *Am. J. Trop. Med. Hyg.* 2007;77(1):44-51
- World Health Organization, Iron deficiency Anaemia; Assessment, Prevention and control. Geneva: WHO, 2001.
- National Nutrition Monitoring Bureau, 2002 (NNMB) Micronutrient Survey Hyderabad: National Institute of Nutrition.
- Scholl T, Hediger M, Fischer R, et al. Anaemia Vs Iron deficiency: increased risk of preterm delivery. *Am J. Clin. Nutr.* 1992;55:985-8.
- Roy S, Chakravorty PS. Maternal and Perinatal outcome in severe anaemia. *J obstet Gynae Ind.* 1992;42:743-50.
- Rangnekar AG, Darbari R. fetal outcome in anaemia during pregnancy. *J obstet Gynae Ind.* 1993;43:172-6.
- Agrawal DK, Agrawal KN, et al. Targets in National Anaemia prophylaxis programme pregnant women. *Indian Paediatric*. 1988;25:319-22.
- Preventing and controlling iron deficiency anaemia through primary health care, Geneva: WHO, 1989.
- Firkin F, Chesterman C, et al. *Clinical Haematology in Medical Practice*, oxford university press, 5<sup>th</sup> edition 1990, Page-31
- The text book of preventive and social medicine. In : Mahajan, Gupta, editors. 3<sup>rd</sup> ed. 2003 Page-117-8.
- Economic survey 2000-2001. Govt. of India, Ministry of Finance, Economic Division.
- Gautam VP, Bansal Y, et al. prevalence of anaemia in pregnant women and its socio demographic associate is a rural area of Delhi. *Ind J. community medicine*. 2002; 27(4):157-60
- Thangaleela T, Vijayalakshmi P. Prevalence of anaemia in Pregnanc. *Ind J. Nutr Dietet*. 1994;31: 26-4.
- Shah, S. N., A. Bakash, A. Rauf, A. Muzzafar, and M. L. Zuthshi. "Incidence of iron deficiency anaemia in rural population of Kashmir. *Indian journal of public health*. 1982;26(3):144-54
- Nadeem Ahmed, Piyush Kalakoti et al. Prevalence of Anaemia & associated Factor in Pregnant Women. *Australasian Medical Journal*. 2010;3(5):276-280.
- Bentley M.E. Griffiths P L. the burden of anaemia amongst women in Indian. *European. J of clinical nutrition*. 2003;07(1):52-60.
- Dass, A., I. Bhatt, and B. Dhaliwal. "Megaloblastic anaemia in pregnancy (In Delhi). *J Obstet Gynae Ind.* 1967;17:37-43.

**How to cite this article:** M Shams Khan, Anupama Srivastav, Anil K Dixit. "The Burden of Anaemia amongst Antenatal Women in the Rural Population of Northern India". *International Journal of Scientific Study*. 2014;1(4):40-42.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Hepatitis B Seropositivity and Vaccination Coverage among Health Care Workers in a Tertiary Care Hospital in Moradabad, UP, India

Sumit Kumar, Rehana Begum<sup>1</sup>, Umar Farooq<sup>2</sup>, Pallavi Kumari<sup>3</sup>

(M.B.B.S.,M.D) Assistant Professor, Dept of Microbiology, Teerthanker Mahaveer Medical College & Research Center, Moradabad, <sup>1</sup>(M.B.B.S.,M.D) Professor & HOD, Dept of Microbiology, Teerthanker Mahaveer Medical College & Research Center, Moradabad, <sup>2</sup>(M.B.B.S.,M.D) Professor, Dept of Microbiology, Teerthanker Mahaveer Medical College & Research Center, Moradabad, <sup>3</sup>(M.B.B.S.,M.D) Assistant Professor, Dept of Physiology, Teerthanker Mahaveer Medical College & Research Center, Moradabad

**Corresponding Author:** Dr. Sumit kumar Assistant Professor, Dept of Microbiology, Teerthanker Mahaveer Medical College & Research Center, Moradabad. E-mail: drsumitkumar.india@gmail.com

## Abstract

**Introduction:** Hepatitis B is one of the major public health problem globally and is the tenth leading cause of death. In India, HBsAg prevalence among the general population is 4-8%, which place India in an intermediate endemic zone and second largest global pool of chronic hepatitis B infection. Among health care workers sero prevalence is two to four times higher than that of the general population. Healthcare workers are known to be prone to infection with the hepatitis B virus. Hepatitis B virus is transmitted through percutaneous or permucosal as with exposures to blood, which occur in the healthcare setting most often as needle sticks or other sharp device injuries. To effectively curb HBV infection prevention programs must be implemented and the applicability of a complete vaccination schedule must be underline.

**Aim & Objective:** The following study was undertaken with the following aim and objective. To study the seropositivity of serum hepatitis in health care workers of TMMC & RC and prophylactic measures in health care workers.

**Material & Method:** Serum sample of 125 health care workers of Teerthanker Mahaveer Medical College and Research Center was taken during two years duration and tested for HBsAg by rapid card test and ELISA test. Vaccination history was taken from health care workers.

**Result:** The present study was done on 125 health care workers of Teerthanker Mahaveer Medical College and Research Center. Among 125 health care workers 4 were found HBsAg positive by rapid card test and ELISA test. Out of 125 health care workers 58(46.4%) were fully vaccinated.

**Conclusion:** The risk of hepatitis B infection is well documented among health care workers, although with use of hepatitis B vaccine the incidence of HBV infection in health care workers has decreased. Therefore there is need for well planned and clear policies for HBV screening and vaccination in health care workers.

**Keywords:** Serum Hepatitis, Health Care Workers, Seropositivity, Prophylaxis

## INTRODUCTION

Hepatitis B is one of the major public health problem globally and is the tenth leading cause of death. Worldwide, more than two billion of the population have evidence of past or recent HBV infection and there are more than 350 million chronic carriers of this infection.<sup>1</sup> In India, HBsAg prevalence among the general population is 4-8%, which place India in an intermediate HBV endemicity zone and India with 50 million cases is also the second largest

global pool of chronic HBV infections. Among healthcare workers sero prevalence is two to four times higher than that of the general population.<sup>2</sup>

Healthcare personnel are persons whose activities involve contact with patients or with blood or other body fluids from patients in a healthcare facilities, labs, or public-safety setting. An exposure that might place Health care workers at risk of infection as a percutaneous injury (e.g, a needle-stick or cut with a sharp object) or contact with mucous

membrane (of eyes, mouth, nose, etc.) or non-intact skin (e.g., exposed skin that is chapped, abraded, or afflicted with dermatitis) with tissue blood or any other body fluids that are potentially infectious.<sup>3</sup>

The causative agent of hepatitis is hepatitis B virus, which remains asymptomatic in most individuals, but it can show features of fulminant, acute, or chronic hepatitis, considering that the last one might lead to serious complications, such as hepatocellular carcinoma & Cirrhosis. Each year, from 500,000 to 1.2 million individuals die as a consequence of hepatitis B virus infection.<sup>4</sup> Hepatitis B virus (HBV) infection is highly prevalent in continents like Africa, Asia, and in the different countries, the infection rate in them ranges from 5% to 20%.<sup>5</sup>

Healthcare workers are known to be prone to infection with the hepatitis B virus.<sup>6</sup> Hepatitis B virus is transmitted through permucosal or percutaneous exposures to blood, which occur in the most of healthcare setting through needle sticks or other sharp device injuries.<sup>7</sup> To effectively curb Hepatitis B virus infection prevention programs must be implemented, and the relevance of a complete vaccination schedule must be underlined.<sup>4</sup> The risk of acquiring hepatitis B virus infection through exposure to blood or its products is highest amongst health care workers. Despite potential risks, a proportion of health care workers never get their vaccinations done. India ranks second to China in the numbers of people with chronic HBV.<sup>8</sup>

It is very important to promote vaccination campaigns and increase knowledge and awareness about hepatitis B among health care workers.<sup>9</sup>

Aim of this study was to study the seropositivity of serum hepatitis in health care workers of TMMC&RC, and prophylactic measures in health care workers.

## MATERIALS & METHODS

The study was done in the Department of Microbiology, Teerthanker Mahaveer Medical College and Research Center over a period of two years.

Serum sample of 125 health care workers of Teerthanker Mahaveer Medical College and Research Center was collected during two years duration. General history of age, sex, socio economic status, marital status was taken. Proper history of the health care workers was taken about needle stick injury and sharp device injury and exposure to blood and blood products during handling the patients. History of vaccination was also taken.

Samples were collected from doctors, nurses, technicians and general service workers.

Aseptically 5 ml venous blood was collected in sterilized plain vial and transported to microbiology laboratory. It was centrifuged and serum was separated. Samples were Tested for HBsAg by rapid card test and ELISA test. To detect HBsAg in samples test were done by using commercially available HEPACARD (J. Mitra. Co. Pvt. Ltd).

ELISA test was also done to detect HBsAg in 125 blood samples, commercially available HEPALISA kit (J. Mitra. Co. Pvt. Ltd) was used.

### Rapid Card Test

HEPACARD is one step rapid visual test for the qualitative detection of HBsAg in human serum or plasma. Use of this assay is intended as an aid in the recognition and diagnosis of acute infections and chronic infectious carriers of hepatitis B virus. It is a one step immunoassay based on the antigen capture or sandwich principle. The particular method uses monoclonal antibodies conjugated to colloidal gold and polyclonal antibodies immobilized on a nitrocellulose strip in a thin line. This test sample is introduced to and flows laterally through an absorbent pad where it mixes with the signal reagent. If the sample contains HBsAg, the colloidal gold-antibody conjugate binds to the antigen, forming an antigen –antibody-colloidal gold complex. Then complex migrates through the nitrocellulose strip by capillary action. Then further complex meets the line of immobilized antibody (test line) T, the complex is trapped forming an antibody – antigen-antibody colloidal gold complex. The pink band formed indicates the sample is reactive for HBsAg. To serve as a procedural control, an additional line of anti-mouse antibody (control line) C, has been immobilized at a distance from the test line on the strip. When the test is performed correctly, this will result in the formation of a pink band upon contact with the conjugate.

### ELISA Test

HEPALISA is a solid phase enzyme linked immunosorbent assay (ELISA) based on the Direct Sandwich principle. The microwells are coated with Monoclonal antibodies with high reactivity for HBsAg. The samples are added in the wells followed by addition of enzyme conjugate (polyclonal antibodies linked to Horseradish Peroxidase (HRPO)). A sandwich complex is formed in the well wherein HBsAg (from serum sample) is trapped or sandwiched between the antibody and antibody HRPO conjugate. Unbound conjugate is then washed off with wash buffer. The amount of bound peroxidase is proportional to the concentration of HBsAg present in the sample. Upon addition of the substrate buffer and chromogen, a blue colour develops.



The intensity of developed blue colour is proportional to the concentration of HBsAg in sample. To limit the enzyme-substrate reaction, stop solution is added and a yellow colour develops which is finally read at 450 nm spectrophotometrically.

## RESULTS

The present study was done on 125 health care workers of Teerthanker Mahaveer Medical College and Research Center, Moradabad

Out of 125 health care workers 80 were men and 45 were female. Among 125 health care workers 4 were found HBsAg positive by both rapid card test method and ELISA test. Out of four positive cases three were men and one was female.

Two positive cases were detected among 41 health care workers of age group 28-37 years. Out of 125 healthcare workers 4 cases were found positive. Among 36 health care workers between 18-36 years only one case was detected positive. Among 32 health care workers between 38-47 years age group one case was detected positive (Table 1).

**Table 1: HBsAg positive in relation to age**

| Age       | No. of health care workers | HBsAg positive | HBsAg positive % |
|-----------|----------------------------|----------------|------------------|
| 18-27     | 36                         | 1              | 2.77%            |
| 28-37     | 41                         | 2              | 4.87%            |
| 38-47     | 32                         | 1              | 3.12%            |
| 48-57     | 12                         | -              | -                |
| 58-onward | 4                          | -              | -                |
| Total     | 125                        | 4              | 3.2%             |

Two positive two cases were detected among 32 general service workers. Among 31 nurses one case was detected HBsAg positive. Among 32 Laboratory technicians one case was detected HBsAg positive. Among 30 doctors positive case was not detected (Table 2).

**Table 2: HBsAg positive in relation to occupation**

| Occupation      | No. of health care workers | HBsAg positive | HBsAg positive % |
|-----------------|----------------------------|----------------|------------------|
| Doctors         | 30                         | -              | -                |
| Nurses          | 31                         | 1              | 3.22%            |
| Lab technicians | 32                         | 1              | 3.12%            |
| General service | 32                         | 2              | 6.25%            |
| Total           | 125                        | 4              | 3.2%             |

Out of 125 health care workers only 58 were fully vaccinated. Not vaccinated health care workers were 52. Incomplete course of vaccination was in 15 health care

workers. Among incomplete course of vaccination one case was HBsAg positive (Table 3).

**Table 3: HBsAg positive in relation to vaccination status**

| Vaccination status               | No. of health care workers | % of health care workers vaccinated | HBsAg positive | HBsAg positive (%) |
|----------------------------------|----------------------------|-------------------------------------|----------------|--------------------|
| Fully vaccinated                 | 58                         | 46.4%                               |                |                    |
| Incomplete course of vaccination | 15                         | 12%                                 | 1              | 6.6%               |
| Not vaccinated                   | 52                         | 41.6%                               | 3              | 5.77%              |
| Total                            | 125                        |                                     | 4              | 3.2%               |

## DISCUSSION

In the present study out of 125 healthcare workers 4 (3.2%) were HBsAg positive and 46.4% health care workers were vaccinated. In a study done by Batista SM et al<sup>4</sup> reported that seropositivity for hepatitis B among dentist is 10.8% from Campo Grande and majority of the dentists (96.6%) are done with HBV vaccination, although only 73.1% completed the three-dose schedule. In dentists from the other regions of Brazil, the infection rates ranged from 10.00% to 17.9%. On the other hand, it was observed that 9% of seropositivity for HBV infection among was there among dentists from United States of America and 7% from Berlin.<sup>4</sup> In a study done on healthcare workers by Shin BM et al<sup>5</sup> positive rate for HBsAg was 2.4%. In 1992, Elavia et al<sup>6</sup> conducted study on healthcare workers and reported that prevalence of HBsAg was 10%. In 2003 E.P. Simard et al conducted a study and reported that in the United States, a 70% decrease in the incidence of acute hepatitis B and estimated 75% of HCWs have been vaccinated against hepatitis B. In a tertiary care hospital in Delhi reported that only 1% of healthcare workers were HBsAg positive by Sukriti et al in 2008 and vaccination in health care workers was 55.4%.<sup>8</sup> In a study done in 2012 by Patricia Carvalho et al<sup>9</sup> seropositivity of hepatitis virus is 8.8% in health care workers. In 2008 in Japan vaccination coverage was found to be 48.2% in dental workers by Nago Y. et al.<sup>10</sup> In a study done by Hutin Y et al. vaccination coverage varies from 18% in Africa to 77% in Australia and New Zealand.<sup>11</sup> In a study done in 2006 by Dannetun E et al in Sweden, the number of HCWs who have received at least one dose is 79%, but only 40% were reported to be fully vaccinated.<sup>12</sup>

The risk of acquiring hepatitis B virus infection through exposure to blood or its products is highest amongst health care workers. To effectively curb Hepatitis B virus infection prevention programs must be reinforced and the relevance of a complete vaccination schedule must be underlined.

## CONCLUSION

Exposure to blood borne pathogens poses a serious risk to healthcare workers.<sup>13</sup> and risk of hepatitis B infection is well documented among healthcare workers & professionals. Although with the use of hepatitis B vaccine the incidence of hepatitis B virus infection in healthcare workers & professional has sufficiently decreased, but there is still lots of scope for improvement, as many healthcare workers have not undergone any vaccination. Therefore, there is a utmost need for clear and well-planned policies for HBV screening and vaccination in healthcare workers, especially the one who are at a greater risk of exposure to blood or other potentially infectious material. To minimize the risk, all healthcares should adhere to standard precautions, including the use of appropriate use of hand washing, protective barrier and disposal of needles and sharp instruments.<sup>13</sup> Energetic steps should be taken in all hospitals for the prevention of hepatitis B virus infection among healthcare workers. Hospitals need to identify methods to improve hepatitis B vaccination coverage levels and should consider developing targeted vaccination programs directed at unvaccinated, at-risk healthcare workers who have frequent or potential exposure to blood or other potentially infectious materials. To effectively curb hepatitis B virus infection prevention programs must be implemented and the relevance of a complete vaccination schedule must be underlined. It is important to promote vaccination campaigns and improve knowledge and awareness about hepatitis B among health care workers.

## REFERENCES

1. WHO. *Hepatitis B: WHO/CDS/CSR/LYO/2002.2: Hepatitis B*. [last accessed on 2009 Nov 9].
2. Varsha Singhal, Dhrubajyoti Bora, and Sarman Singh. Hepatitis B in Health Care Workers: Indian Scenario *J Lab Physicians*. 2009 Jul-Dec; 1(2): 41–48.
3. US Public Health Service. Centers for Disease Control and Prevention. Updated U.S. Public Health Service Guidelines for the Occupational Exposures of HBV, HCV, and HIV and Recommendations for Postexposure Prophylaxis. *MMWR*. 2001;50:1–52.
4. Batista SM, Andreasi MS, Borges AM, Lindenberg AS, Silva AL, Fernandes TD, et al. Seropositivity for hepatitis B virus, vaccination coverage, and vaccine response in dentists from Campo Grande, Mato Grosso do Sul, Brazil. *Mem Inst Oswaldo Cruz, Rio de Janeiro* May 2006;101(3):263–7.
5. Shin BM, Yoo HM, Lee AS, Park SK. Seroprevalence of Hepatitis B Virus among healthcare workers in Korea. *J Korean Med Sci*. 2006;21:58–62.
6. Elavia AJ, Banker DD. Hepatitis B virus infection in hospital personnel. *Natl Med J India*. 1992;5(6):265–8.
7. Simard EP, Miller JT, George PA, Wasley A, Alter MJ, Bell BP, et al. Hepatitis B vaccination coverage levels among healthcare workers in the United States 2002–2003. *Infect Control Hosp Epidemiol*. 2007;28:783–90.
8. Sukriti, Pati NT, Sethi A, Agrawal K, Agrawal K, Kumar GT, et al. Low levels of awareness, vaccine coverage, and the need for boosters among healthcare workers in tertiary care hospitals in India. *J Gastroenterol Hepatol*. 2008 Nov;23(11):1710–5.
9. Patricia Carvalho, Maria Isabel Schinoni, Jacy Andrade, et al. Hepatitis B virus prevalence and vaccination response in health care workers and students at the Federal University of Bahia, Brazil. *Annals of Hepatology*, 2012;11(3):330–337.
10. Nagao Y, Matsuoka H, Kawaguchi T, Ide T, Sata M. HBV and HCV infection in Japanese dental care workers. *Int J Mol Med*. 2008;21:791–9.
11. Hutin Y, Hauri A, Chiarello L, Catlin M, Stilwell B, Ghebrehiet T, et al. Injection Safety Best Practices Development Group. Best infection control practices for intradermal, subcutaneous, and intramuscular needle injections. *Bull World Health Organ*. 2003;81:491–500.
12. Dannetun E, Tegnell A, Torner A, Giesecke J. Coverage of hepatitis B vaccination in Swedish healthcare workers. *J Hosp Infect*. 2006;63:201–4.
13. Swapnil S. Bumb, Bhaskar DJ, Chandan Agali R, Himanshu Punia. Oral Health Professionals Are your Vaccinations Up to Date? *HealTalk*. 2012;5:19–20.

**How to cite this article:** Sumit Kumar, Rehana Begum, Umar Farooq, Pallavi Kumari. "Hepatitis B seropositivity and vaccination coverage among health care workers in a Tertiary care hospital in Moradabad, UP, India". *International Journal of Scientific Study*. 2014;1(4):43–46.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Electric Burns Injuries of Head and Neck Region: A Retrospective Study

Sameer Jain,  
S C Sharma<sup>1</sup>,  
S P Sinha<sup>2</sup>, S K Jain<sup>3</sup>

(MS General Surgery) Assistant Professor, Dept of Surgery. TMMC&RC, Moradabad, <sup>1</sup>(MS General Surgery) Assistant Professor, Dept of Surgery. TMMC&RC, Moradabad, <sup>2</sup>(MS General Surgery) Professor & Head Dept of Surgery, TMMC&RC, Moradabad, <sup>3</sup>(MS Anatomy) Professor Anatomy, Dept of Anatomy TMMC&RC, Moradabad

**Corresponding Author:** Dr. S P Sinha, Department of General Surgery, Professor & Head, Teerthankar Mahaveer Medical College & Research Centre, Moradabad.  
E-mail: shankerprasadsinha1950@gmail.com

## Abstract

**Introduction:** Electric burn patients are increasing every day with increasing use of importance of electricity. This is more common in semi-urban and rural areas where the people are less aware regarding the safety of electrical burns in contrast to develop countries.

**Aim & Objectives:** To assess the incidence of electric burn injuries in head and neck area and enforce strict laws and create public awareness to prevent the same.

**Materials and Methods:** A retrospective analysis was done in our Department of General Surgery from March 2010 to March 2013 with 113 patients affected with burns. Out of them, 89 patients had electric burns with rest of them being chemical, thermal and other burns. Out of 89 patients, 51 patients had electric burns of head and neck region that were included in the study.

**Results:** Electric burns injuries involving head and neck region was seen in 61.4% of total victims. The most common age group was 20-40 yrs. Incidence was higher in rural population with 81.9% compared to urban 28.1%. Electricians, workers in electricity board comprised 59.26% of victims. In all patients, debridement was done and collagen membrane was grafted and some patients required reconstructive procedures 35.2% of patients.

**Conclusion:** Electric burns are not uncommon in rural areas of India. The incidence electric burn injuries can be decreased if there is a public awareness especially among the electric workers regarding hazards of high voltage tension lines explained and use of safety equipments made mandatory.

**Keywords:** Electric burns, Head and neck, Safety measures

## INTRODUCTION

Electricity forms the main modality of support to every one's life. In the modern times the use of electricity has increased many times and so has the incidence of high/low voltage electrical burn injuries. The incidence of high/low voltage electrical injuries are much higher in rural, semi-urban areas of developing countries. Literature says that about 0.8-1.0% of accidental deaths happen due to electricity burns and constitute around 6-9% of all burns patients. Electrical injuries cause around 1000 deaths in States each year with a mortality rate of 3-15%.<sup>1-3</sup>

## MATERIAL & METHODS

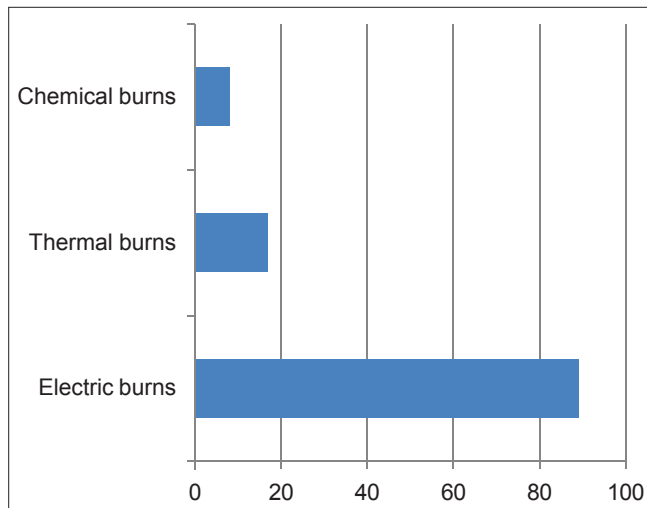
This retrospective study was conducted in Department of General Surgery in Teerthankar Mahaveer Medical College & Hospital, Moradabad from March 2010 to March 2013 with 113 patients affected with burns. Out of them 51 patients had electric burns of head and neck region with rest of them being chemical, thermal and other burns. Only electric burn patients were included in this study.

As soon as the patient arrived in department of emergency, patients were hemo-dynamically stabilised for their vitals

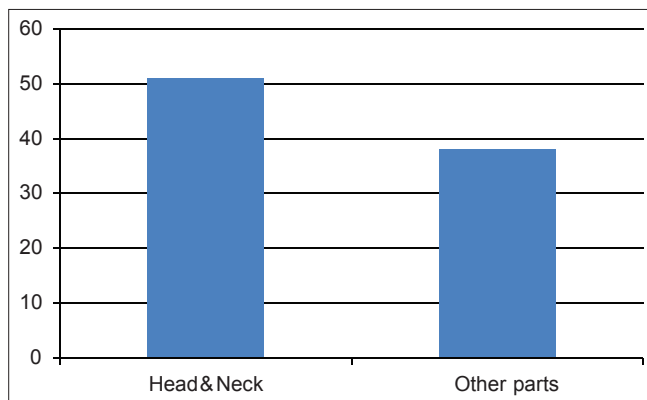
using strict ATLS protocols. Medical history and clinical examination of the patients were carried out. Fluid replacement was titrated to maintain urine output of 0.5-1.0 ml/kg/hr and complete surgical profile was taken to rule out myoglobinuria. Patients with only electric burn injuries of head and neck were included in this study. A complete personal history regarding occupation, cause of electrical burn injury, site and duration of contact, voltage of the of electric current (voltage) was taken. Routine investigations like electrocardiogram, arterial blood gas, chest x-ray and renal function test were performed in every patient.

## RESULTS

Out of total 113 patients (Table 1) of burn injuries, 51 patients had involvement of head and neck region (Table 2). Males were more commonly affected 42 males against 9 females. Incidence of injuries were higher in rural areas with 81.9% as compared to urban with 28.1% (Table 3). The patients in this study had the age range from 20 years to 40 years.



**Table 1: Total patients affected with burns**

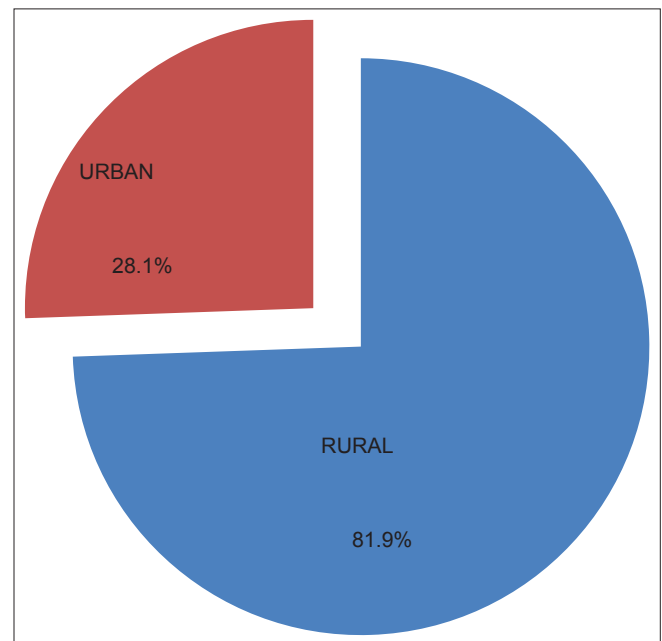


**Table 2: Distribution of electric burn injuries**

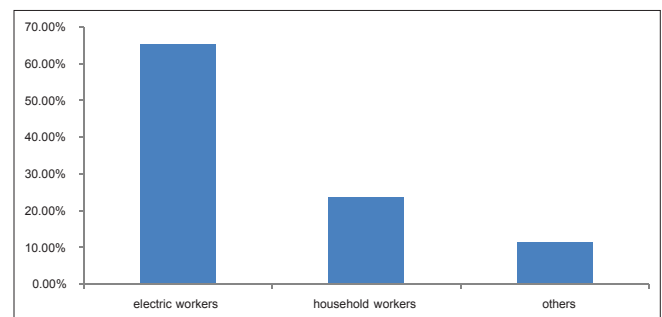
Most of the patients were associated with electric department workers with 65.3%, house hold workers 23.5%, and others indirectly associated with electricity jobs were 11.2% (Table 4). Electric burn injuries of head and neck were comprising of 61.4% when compared to other parts. 64.8% of patients underwent debridement of the wound injuries, collagen grafting procedures. 35.2% of patients required skin grafting. We did not find any major complications in our study.

## DISCUSSION

Electric burn injuries of head and neck were more common in males occurring in age group of 20 to 40 years, This might be due to the occupational hazards are most common associated with them as they are the earning group of the family.<sup>4,7</sup> The young adults were associated with electric burns of head and neck due to their aggressiveness of performing activities and their carelessness and risk taking behavior. Most of the electric



**Table 3: Areas of distribution**



**Table 4: Occupation based injuries**



workers were young adults and improper instructions for the precautions.

Electric burns of head and neck region comprised of 61.4% of high/low voltage injuries and is quite high than other parts of the world.<sup>8-10</sup> The main reason may be less or no public awareness about the precautions in rural and semi urban population for using helmets, electric gloves and risk of touching live wires. It was also due to lack of proper insulated transmission lines and lack of enforcement of strict rules among the population.<sup>11-14</sup> The electric burn injuries are more in winter months when these non insulated wires are exposed outside.

Among occupation, electrical department workers were the most commonly affected and the reason was lack of proper training and non enforcement of strict laws for prevention of electric burns. Hence use of electric gloves, helmets, rubber boots were used to prevent the injuries. Head and neck injuries might be more common due to the first exposed area of the body for the injuries. 64.8% of patients underwent debridement of the wound injuries, collagen grafting procedures. 35.2% of patients required skin grafting. There were no major complications found in this study.

We conclude that electric burn injuries of head and neck are most common in rural and semi-urban areas of population. This can be prevented by enforcement of strict laws and training for all the electric department workers and also creating mass media public awareness among the general

public. All the tension lines must be insulated in rural and semi-urban areas to prevent the chances of electric burn injuries.

## REFERENCES

1. Lee RC. Injury by electrical forces: pathophysiology, manifestations, and therapy. *Curr Probl Surg*. 1997;34(9):677-764.
2. Haberal MA. An eleven-year survey of electrical burn injuries. *J Burn Care Rehabil*. 1995;16:43-8.
3. Hussmann J, Kucan JO, Russell RC, Bradley T, Zamboni WA. Electrical injuries-morbidity, outcome and treatment rationale. *Burns*. 1995; 21: 530-5.
4. Haberal M. Electrical burns: A five year experience *The Journal of Trauma* 1986; 26 (2) 103-109.
5. Marshall KA and Fisher JC. Salvage and reconstruction of electrical hand injury. *Am J Surg* 1977; 134 (3): 385-387.
6. Garcia-Sanchez V and Morell PG. Electrical burns: high and low tension injuries. *Burns* 1999; 25: 357-360.
7. Achauer B, Applebaum R and Vander Kam VM. Electrical burn injury to upper extremity *Br J Plast Surg*. 1994; 47: 331-340.
8. Rai J, Jeschke MG, Barrow RE and Herndon DN. Electrical injuries: a 30-year review. *J Trauma*. 1999; 46: 933-6.
9. Haberal M, Ucar N and Bilgin N. Epidemiological survey of burns treated in Ankara. *Burns*. 1995; 21: 601-6.
10. Craige W and MacDonald W. High voltage injuries. *Am J Surg* 1978; 136: 693-696.
11. Mohammadi AA, Amini M and Mehrabani D. A survey on 30 months electrical burns in Shiraz University of Medical Sciences Burn Hospital. *Burns*. 2008; 34: 111-3.
12. Opara, K. O., et al. "Pattern of severe electrical injuries in a Nigerian regional burn centre." *Nigerian Journal of Clinical Practice* 9.2 (2007): 124-127.
13. Jaiswal, Ashish K., et al. "Epidemiological and socio-cultural study of burn patients in MY Hospital, Indore, India." *Indian Journal of Plastic Surgery* 40.2 (2007): 158.
14. Sakallioğlu, A. E., et al. "Burns in Turkish children and adolescents: nine years of experience." *Burns* 33.1 (2007): 46-51.

**How to cite this article:** Sameer Jain, S C Sharma, S P Sinha, S K Jain. Electric Burns Injuries of Head and Neck Region: A Retrospective Study. *International Journal of Scientific Study*. 2014;1(4):47-49.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Sonomammographic Evaluation & Characterization of Breast Lumps

Shalini Saraswat,  
Shruti Chandak<sup>1</sup>,  
Omprakash<sup>2</sup>,  
Vijai Pratap<sup>3</sup>,  
Amit Kumar<sup>4</sup>

*D.N.B., Assistant Professor, Department of Radiodiagnosis, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, <sup>1</sup>M.D., Assistant Professor, Department of Radiodiagnosis, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, <sup>2</sup>Professor & Head of Department, Department of Radiodiagnosis, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, <sup>3</sup>M.D., Associate Professor, Department of Radiodiagnosis, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, <sup>4</sup>M.D., Assistant Professor, Department of ENT, Teerthanker Mahaveer Medical College & Research Centre, Moradabad*

**Corresponding Author:** Dr. Shalini Saraswat, Assistant Professor,  
Department of Radiodiagnosis,  
Teerthanker Mahaveer Medical College & Research Centre, Moradabad.  
E-mail: drshalinisaraswat@yahoo.com

## Abstract

**Introduction:** Modern breast USG is an established, ideal and accurate tool for the investigation and characterization of breast lumps. It also compliments X-ray mammography in further evaluation and diagnosis of breast masses and thus avoids unnecessary breast surgeries in benign conditions. We present a case series of 64 patients with ultrasound findings in various breast lumps and pathologies.

**Aims & Objective:** In this study we planned to evaluate and characterize breast lumps with USG examination.

**Material & Method:** The present study was conducted in the Department of Radio-diagnosis, TMMC & RC, TMU, Moradabad. Patients under study were referred from the department of Surgery, medicine and gynaecology & obstetrics. Patients included for study were evaluated by Clinical and Ultrasound examination. Histopathological confirmation was done in all the cases by FNAC/ excision biopsy.

**Result:** On examination distribution of lesions was found to be Fibroadenoma (31.1%), Breast cyst (20.7%), Intraductal papilloma (5.2%), Lipoma (3.4%), Breast abscess (3.4%), Galactocele (3.4%), Cystosarcoma phyllodes (3.4%), Hamartoma/ Fibroadenlipoma (3.4%) & Fat necrosis (3.4%), Invasive ductal carcinoma (17.4%), Invasive lobular carcinoma (5.2%).

**Conclusion:** Sonomammography is a very dynamic and powerful tool for the evaluation of lumps. It considerably improves the visualization and evaluation of tumors in radiodense breasts as well it improves the specificity of mammography when used to complement X-ray mammography.

**Keywords:** Breast, Ultrasound, Sonomammography, X-Ray mammography

## INTRODUCTION

As there is increased awareness and incidence of breast cancer in women, a breast lump may alarm both the patient and clinicians. Breast sonography is appropriate modality in the initial evaluation of a woman younger than 30 years with a palpable lump and also helpful in the evaluation of mammographic masses, focal asymmetric densities, and palpable abnormalities not seen mammographically.<sup>1</sup> Although the cause may be benign, additional evaluation and histopathological confirmation might be needed.

Sonographic feature analysis of breast masses continues to improve<sup>2</sup>, though inter observer variability continues to be a problem, in avoiding biopsy.<sup>3,4</sup> An illustrated Breast Imaging Reporting and Data System (BI-RADS) ultrasonographic lexicon<sup>5</sup> may be helpful in improving observer performance.

## MATERIAL & METHOD

The present study was conducted in the Department of Radio-diagnosis, TMMC & RC, TMU, Moradabad. Patients

under study were referred from the evaluated by Clinical and Ultrasound examination.

### Patient Evaluation

Patients were evaluated along the following lines.

#### A. Clinical examination

A detailed clinical history was taken from all cases, general physical and local examination were carried out.

#### B. Radiological evaluation

Ultrasonography

High-resolution real time sonography of the breast lumps was done in all patients. Scanning done with 7-10 MHz transducers on Medison Diagnostic ultrasound system installed in Department of Radio-diagnosis, TMMC & RC, Teerthanker Mahaveer University, Moradabad. The sonographic examination for inner part of breast was performed in supine position and for the outer part of breast; patient was placed in contralateral posterior oblique position with the ipsilateral arm raised. Scanning was performed in transverse and sagittal planes. Color Doppler (CD) & Power Doppler (PD) also used for assessment of vascularity of the lesion. Histopathological confirmation done in all the cases by FNAC/ excision biopsy.

## RESULTS

**Table 1: Lesion detection in 64 patients on breast USG examination**

| Nature of lesion | No. of cases |
|------------------|--------------|
| Lesions          | 58           |
| Indeterminate    | 02           |
| Normal           | 04           |

Number of Patients, N=64

**Table 2: Ultrasonic characterization of 58 lesions in breast**

| Nature of lesion            | No. of cases | Percentage |
|-----------------------------|--------------|------------|
| Fibroadenoma                | 18           | 31.1       |
| Breast cyst                 | 12           | 20.7       |
| Intraductal papilloma       | 03           | 5.2        |
| Lipoma                      | 02           | 3.4        |
| Breast abscess              | 02           | 3.4        |
| Galactocele                 | 02           | 3.4        |
| Cystosarcoma phyllodes      | 02           | 3.4        |
| Hamartoma/Fibroadenolipoma  | 02           | 3.4        |
| Fat necrosis                | 02           | 3.4        |
| Invasive ductal carcinoma   | 10           | 17.4       |
| Invasive lobular carcinomas | 03           | 5.2        |
| Total                       | 58           |            |

Number of Lesions, N=58

**Table 3: Histopathological categorization of 56 lesion detected on breast USG examination**

| Nature of lesion | No. of cases | Percentage |
|------------------|--------------|------------|
| Benign           | 41           | 73.2       |
| Indeterminate    | 02           | 3.5        |
| Malignant        | 13           | 23.3       |

Histopathological categorization of lesion, N=56

## DISCUSSION

In our series, 64 patients with complaints of breast lumps were assessed. Mostly patients presented with clinical features of lumps/swelling, pain, nipple discharge and combination of these complaints.

Out of 64 patients, lesions were detected in 58 patients on ultrasound examination, while 4 patients were normal on clinical & ultrasound examination and two patients were with indetermined lesions on USG.

Fibroadenoma were the largest group, representing 31.1% (18 out of 58) of lesions. It is usually seen in young women. On ultrasound it is usually homogenous, well defined, hypoechoic, ellipsoid, wider than tall, and may even show posterior enhancement. It may also present with foci of calcifications within. The calcifications within a fibroadenoma are coarse and may show posterior acoustic shadowing. Complex fibroadenomas have a higher incidence of transformation into breast cancer.<sup>6</sup> On CD & PD, mostly lesions presented with mild/ absent vascularity.

Breast cysts comprised 20.7% (12 out of 58) of lesions. It shows either simple or complex cystic features on USG. A significant number of complex cysts, especially those with a solid intracystic components, may turn out to be malignant on histopathology.<sup>7</sup> On USG simple cysts presented as completely anechoic lesion, with a thin echogenic capsule, posterior acoustic enhancement, and thin clear edge shadow. Complex cysts showed internal echoes, septations or thick irregular walls. Sometimes it may appear as hypoechoic or solid echogenic lesion, depends on its contents. On CD & PD mostly lesions present with increased peripheral vascularity. Air shadowing was also noted along with inflammatory changes in adjacent breast parenchyma.

Intraductal papillomas comprised of 5.2% (3 out of 58) of all lesions. Papillomas in the breast may be intracystic (Figure) or intraductal. They are difficult to differentiate from papillary carcinomas only on sonography and a FNAC/biopsy is required for confirmation. In our study, most of the patients with clinical complaint of bloody

nipple discharge were turned out to be Intraductal and Intracystic Papillomas/papillary carcinoma. On USG it presented as a complex cystic lesion with an intracystic, solid, polypoidal echogenic mass of varying sizes. On CD & PD, lesions presented with increased vascularity within solid echogenic component.

2 out of 58 lesions (3.4%) were turned out to be lipoma. These are fatty tumors in the breast parenchyma and may vary in appearance on USG, ranging from uniformly echogenic to heterogeneous or completely anechoic lesions. In our study, breast USG showed well-defined, oval, echogenic mass lesion partially compressible on probe pressure, without any significant vascularity on Doppler.

2 out of 58 (3.4%) lesions turned out to be breast abscess. Acute breast abscesses may occur during lactation and are clinically present with high-grade fever, painful lump, skin erythema and oedema. On USG, it showed a large complex heterogeneous cystic lesion with mobile internal echoes and adjacent inflammatory breast tissue with increased peripheral vascularity on CD & PD.

2 out of 58 (3.4%) lesions turned out to be galactoceles, which usually occur during lactation or shortly after breastfeeding is stopped, are mostly caused by an obstructed milk duct. In our study, both patients presented with complaint of breast lump during lactation. On USG, it showed a complex mass lesion filled with uniform dense echoes. On aspiration, this yielded a milky substance

2 out 58 lesions (3.4%) were turned out to be cystosarcoma phylloides. These are rapidly growing, benign-looking lesions with internal cleft and cystic spaces and moderately vascular on Doppler.<sup>8</sup> They are fibroepithelial stromal tumors that may be benign or malignant. Recurrence rate is high and may rarely metastasize. In our study, both patients presented with complaint of rapidly growing breast lump. On USG, it showed a well-defined, lobulated, hypoechoic, encapsulated, with multiple, linear, anechoic internal "clefts" and cystic spaces. On CD & PD, lesions presented with increased vascularity

2 out of 58 (3.4%) lesions turned out to be hamartomas. These are fat-containing, benign tumors in the breast, with varying amount of fibrous and fatty components. On USG, it showed heterogeneous nature with mixed hypoechoic, echogenic areas and focal calcifications within.

2 out of 58 (3.4%) lesions turned out to be of fat necrosis. Fat necrosis is a common entity. However, may pose difficulty to clinicians and sonologist. Fat necrosis may result from accidental trauma, after surgery or radiation therapy. The sonographic features of fat necrosis are varied

and depend on the degree of fibrosis. In our study, on USG, it showed complex mass with echogenic bands that shift in orientation with changes in patient position, and an echogenic mass with posterior acoustic enhancement in other patient.

10 out of 58 (17.2%) lesions showed malignant features on USG and turned out to be invasive ductal carcinoma on histopathology. On USG, it presented with irregular, ill-defined, microlobulated, heterogeneously hypoechoic lesions with infiltrative indistinct margins. These lesions were taller than wide in dimension.

3 out of 58 (5.2%) lesions showed malignant features on USG and turned out to be invasive lobular carcinoma on histopathology. This is the second most common breast malignancy and may be seen in elderly women. It is often missed on X-ray mammography. On sonography, its appearances are variable, ranging from lesions similar to ductal carcinomas to barely visualized areas of architectural distortion with picket-fence shadowing. Some of these tumors may even not be visualized on USG.<sup>9</sup> In our study, it showed large, ill-defined, heterogeneous, hypoechoic lesions with area of architectural distortion on USG.

On histopathological confirmation out of 58 lesions, 41 lesions turned out to be benign, malignancy was detected in 13 lesions and 2 lesions were remain of indeterminate category.

## CONCLUSION

Sonomammography is a very dynamic and powerful tool for the evaluation of breast lumps. The advantages of USG include good availability, cheaper, fast, with no ionizing radiation. As well as it helps in the assessment of vascularity of the lesion. USG should be used as the primary investigation or in conjunction with X-ray mammography for the evaluation and characterization of the breast lumps.

## REFERENCES

1. Bassett LW. Imaging of breast masses. *Radiol Clin North Am.* 2000; 38:669-691.
2. Stavros AT, Thickman D, Rapp CL, et al. Solid breast nodules: use of sonography to distinguish between benign and malignant lesions. *Radiology.* 1995; 196:123-134.
3. Baker JA, Kormuth PJ, Soo MS, et al. Sonography of solid breast lesions: observer variability of lesion description and assessment. *AJR Am J Roentgenol* 1999; 172:1621-1625.
4. Rahbar G, Sie AC, Hansen GC, et al. Benign versus malignant solid breast masses: US differentiation. *Radiology* 1999; 213:889-894.
5. Mendelson EB, Berg WA, Merritt CR. Toward a standardized breast ultrasound lexicon, BI-RADS: ultrasound. *Semin Roentgenol* 2001; 36:217-225.



6. Sklair-Levy M, Sella T, Alweiss T, Craciun I, Libson E, Mally B. Incidence and management of complex fibroadenomas. *AJR Am J Roentgenol.* 2008;190:214–8.
7. Berg WA, Campassi CI, Ioffe OB. Cystic lesions of the breast: Sonographic-pathologic correlation. *Radiology.* 2003;227:183–91.
8. Bassett LW. Imaging of breast masses. *Radiol Clin North Am.* 2000;38:669–91.
9. Butler RS, Venta LA, Wiley EL, Ellis RL, Dempsey PJ, Rubin E. Sonographic evaluation of infiltrating lobular carcinoma. *AJR Am J Roentgenol.* 1999;172:325–30.

**How to cite this article:** Shalini Saraswat, Shruti Chandak, Omprakash, Vijai Pratap. "Sonomammographic Evaluation & Characterization of Breast Lumps". *International Journal of Scientific Study.* 2014;1(4):50-53.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Psychiatric Morbidity Associated with Hip Fractures – A Hospital Based Study

Prerana Gupta, Julfiqar<sup>1</sup>,  
S K Jain<sup>2</sup>

Assistant Prof in Dept of Psychiatry, M.D. Psychiatry, Teerthankar Mahaveer Medical College and Research Centre, Moradabad (U.P.), <sup>1</sup>Professor, Department of Orthopaedics, MS (Ortho) Teerthankar Mahaveer Medical College and Research Centre, Moradabad (U.P.), <sup>2</sup>Professor, Department of Anatomy, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India.

**Corresponding Author:** Dr. S K Jain, Professor, Department of Anatomy, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, India. Phone - +91-9997168754  
E-mail: drskjain2005@rediffmail.com

## Abstract

**Background:** Most prevalent type of fractures encountered in elderly population are fall related hip fractures, which are even more common in female elderly population. Studies have shown such type of fractures are associated with psychiatric morbidity. This study is being taken into account for evaluation of different type of psychiatric morbidities associated with hip fractures in elderly population.

**Methods:** This retrospective study is conducted Teerthankar Mahaveer medical college hospital, Moradabad, on 45 patients, who underwent hip surgery in last six months.

**Results:** Maximum number of patients with hip fracture were in the age range of (81-90 yrs), more so over in that category females with hip fractures were 80.95%, and least number of patients with hip fractures were in the age range of (61-70 yrs.).

**Conclusion:** Delirium, dementia and depression are most severe type of neuro-psychiatric co-morbidities are associated with elderly hip fractures. These co-morbidities may be minimized by pre-operative and post-operative care.

**Keywords:** Hip fractures, Delirium, Dementia and Depression

## INTRODUCTION

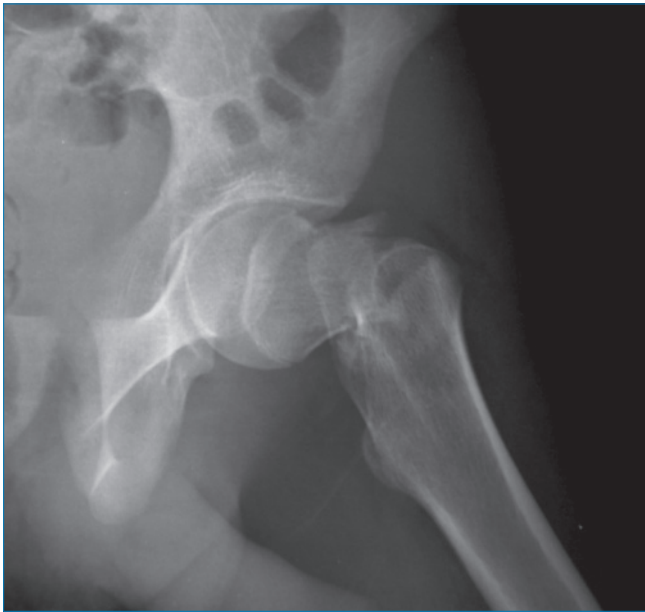
Hip fractures are the most severe type of fall-related injuries among elderly patients and are associated with high morbidity, mortality and impairment in quality of life.<sup>1,2</sup> There are two major anatomic types: intra-capsular and extra-capsular type of hip fractures. Research has shown that advancing age is more strongly associated with risk of inter-trochanteric fractures than sub-capital fractures.<sup>3</sup> In women the proportion of the hip fractures rises significantly with age whereas the proportion of inter-trochanteric fractures among men decreases with age. The rise in hip fractures incidence in elderly<sup>4</sup> will lead to exponential rise in patients with co-morbid conditions like dementia, depression and delirium. Hip fractures were defined according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada (ICD-10-CA) as either subcapital fractures (S72.0-S72.091) or intertrochanteric fractures (S72.1-S72.191). High rates of psychiatric morbidity

have been reported amongst subjects with hip fracture as compared to community rates.<sup>5-8</sup> Among the co-morbidities, neuropsychiatric disorders represent a major challenge in terms of mortality and functional outcome of hip fracture patients.

Delirium is the most studied organic psychiatric disorder in patients who sustained a hip fracture, and it has been associated with increased morbidity and mortality rates, a longer length of hospital stay, and an increased risk of nursing home placement.<sup>9</sup>

Its incidence ranges from 16% to 62% after surgery for hip fracture.<sup>10</sup> It usually peaks between 2 and 5 days after surgery.<sup>11</sup>

Prevalence of depression in older people after hip fracture ranged from 9% to 47% and largely exceed the 2% and 10% respectively reported for major and minor depressive disorder in the aged-matched not affected people.<sup>12</sup>



**Figure 1: Intra-capsular fracture hip (62 yrs male)**

The amount of research on hip fracture outcomes is quite extensive. Significant predictors of the degree of recovery from hip fracture include pre fracture variables such as age, functional ability, mental status, and psychiatric conditions such as dementia and depression.<sup>13</sup>

Although females have a higher incidence of hip fracture than males, men who fracture a hip often show higher mortality rates than women.<sup>14,15</sup>

The research findings relating cognitive status to hip fracture survival and return of functional status clearly indicate that the presence of cognitive deficits, either dementia or delirium, was associated with death and delayed return of mobility.

## AIM & OBJECTIVE

The high rates of mortality and morbidity after hip fracture in elderly demands further research so that we can combat those predisposing factors and decline in the incidence in associated co-morbid conditions can be made.

## MATERIAL & METHODS

This retrospective study was conducted in department of Psychiatry and Orthopaedics, Teerthankar Mahaveer medical college hospital, Moradabad, on 45 patients (Male=8, Female=37) above 60 years, who had undergone surgery for hip fracture, for last six months were included in the study. Snowball sampling technique was used. We recorded age, sex, socio-economic status, rural/urban background, type of fracture, pre-operative physical and mental status.

Diagnostic and Statistical Manual of Mental Disorders (DSM-IV criteria) (1994)<sup>16</sup> type of anesthesia used, operation performed, drugs and advice prescribed at the time of discharge. Before starting the study necessary research protocol including ethical and research committee approval was taken. Data recording was done from medical record section with prior permission of Medical Superintendent.

## RESULTS

As can be using Table 1, that maximum number of patients with hip fracture was in the age range of (81-90 yrs), more so over in that category females with hip fractures were 80.95%, and least number of patients with hip fractures were in the age range of (61-70 yrs).

Maximum percentage of female patients was in age range of more than 91 yrs of age (88.88%).

Out of 45 patients in whom the study was conducted 82% were females.

**Table 1**

| Age (Years) | Total=45 |         | Female=37 |         | Male=8 |         |
|-------------|----------|---------|-----------|---------|--------|---------|
|             | Number   | Percent | Number    | Percent | Number | Percent |
| 61-70       | 3        | 8       | 2         | 66.66   | 1      | 33.34   |
| 71-80       | 12       | 27      | 10        | 83.33   | 2      | 16.67   |
| 81-90       | 21       | 46      | 17        | 80.95   | 4      | 19.05   |
| >91         | 9        | 19      | 8         | 88.88   | 1      | 11.12   |

**Table 2**

| Variables               | Trochanteric fracture<br>N=14 | Cervical fracture<br>N=31 |
|-------------------------|-------------------------------|---------------------------|
| Mean age (yrs)          | 81.9                          | 78.8                      |
| Standard deviation (SD) | ±6.8                          | ±5.2                      |
| Range (yrs)             | 75-91                         | 69-89                     |

As can be observed using Table -2 that out of 45 patients having hip fractures 14 (31.11%) patients were having Trochanteric, and 31 (68.89%) patients suffered Cervical fractures. Trochanteric fractures were mostly seen in age range of ( 75-91  $\pm$  6.8 yrs), while Cervical fractures were mostly present in age range of (69-89  $\pm$  5.2 yrs). Mean age for Trochanteric fractures was (81.9 yrs) and for Cervical fractures, it was (78.8 yrs).

**Table 3: Type of psychiatric disorder**

| Depression |         | Dementia |         | Delirium |         |
|------------|---------|----------|---------|----------|---------|
| Number     | Percent | Number   | Percent | Number   | Percent |
| 12         | 26.66   | 19       | 42.22   | 10       | 22.22   |

Out of 45 patients who underwent hip surgery, 12 (26.66%) developed depression, 19 (42.22%) dementia and 10 (22.22%) developed delirium. In all 91.11% developed some sort of psychiatric disorders and remaining 4 (8.88%) went unnoticed or didn't show any sort of psychiatric illness. Dementia was the most common psychiatric illness developed by the patients.

There was non-significant ( $p > .005$ ) difference in percentage of development of psychiatric illness between male and female elderly patients.

## DISCUSSION

Retrospective study for (six months) as done by us has also been carried out earlier by Meyn MA Jr et al in 1977, MacCollum MS et al in 1989 & Yan I, Zhou B et al in 1999.<sup>17-19</sup>

Our study showed rise in incidence of trochanteric fractures in elderly females with increasing age, but this is not so with elderly males. This result is similar to as observed by Karagas et al. (1996)<sup>20</sup> in showing a rise in the proportion of intertrochanteric fractures in women with increasing age, but not in men.

In our study the relative proportion of trochanteric fractures increased from 32% to 62% from youngest group of elderly females to oldest group of elderly females while in elderly males it came down from 56% to 44%. The predisposing factor for this might be loss of trabecular and cortical bone with age, which may differ between male and females.<sup>21</sup> Rising proportion of trochanteric fractures in women may reflect greater trabecular bone loss with age in women.

Falls cause a hip fracture in 0.6% of people under 64 years, in 10.8% of people over 64 years, in 12.9% over 74, and in 14.2% over 79.<sup>22</sup> In our study we found 8%, 27%, 46% and 19% in age groups 61-70, 71-80, 81-90 & >91 yrs respectively.

Hip fractures, comprise femoral neck, greater and lesser trochanter, and subtrochanteric parts and most studies consider these together as a single unit. However, this may obscure etiological and occurrence patterns that result from differences in anatomical structure and bone composition.<sup>23</sup>

Elderly hip fractures are not important only to Orthopaedicians but also for Psychiatrists. Accordingly to Hemsall, V.J., Robertson et al<sup>24</sup> showed  $12 \pm 20\%$  mortality in the first year after hip fracture and Laxton, C., Freeman, C et al<sup>25</sup> showed that remaining suffered impaired quality of life.

Prevalence of psychiatric illness in elderly hip fracture population is  $9 \pm 47\%$  for depression and  $31 \pm 88\%$  for cognitive impairment are described (Williams et al 1985a<sup>26</sup> Williams et al 1985b<sup>27</sup> Billington et al 1986<sup>28</sup>, Berggren et al 1987<sup>29</sup> & Gustafson, 1988<sup>30</sup>). So much of variation in prevalence is probably due to differing sampling methodology, screening tools used. Such type of wide variation in psychiatric illness was not reported in our study. This is because of the fact that we employed uniform criteria (snowball sampling method) to access the condition.

The presence of depression in older persons who fracture a hip also is a determining factor in recovery.<sup>31</sup>

A year later analysis of the same study, showed that elderly patients with persistent depression were at a much higher risk for not returning to pre fracture levels.<sup>32</sup>

Our study on 45 patients who developed, 12 (26.66%) depression, 19 (42.22%) dementia and 10 (22.22%) delirium well in accordance with similar studies conducted by Van Marwijk HW, Wallace P et al & Lenze EJ, Munin MC et al.<sup>33,34</sup>

## CONCLUSION

Functional outcome in elderly patients having hip fractures are significantly related to the presence of neuropsychiatric co-morbidities. The most frequent ones in elderly are delirium, dementia and depression. Early detection of these co-morbidities may improve survival, and level of functional recovery. We the authors of this study strongly support the pre-treatment assessment of neuropsychiatric disorders using appropriate screening tools and further assessment of patient condition at 1, 3 and 6 months post-operatively.

## REFERENCES

1. Chang KP, Center JR, Nguyen TV, Eisman JA: Incidence of hip and other osteoporotic fractures in elderly men and women: Dubbo osteoporosis epidemiology study. *J Bone Miner Res* 2004;19(4):532-536.
2. Johnell O, Kanis J: Epidemiology of osteoporotic fractures. *Osteoporos Int*. 2005;16:S3-S7.
3. Fox KM, Magaziner J, Hebel JR, Kenjora JE, Kasher TM: Intertrochanteric versus femoral neck hip fractures: differential characteristics, treatment, and sequelae. *J Gerontol* 1999; 54A(12):M635-M640.
4. Schwartz AV, Kelsey JL, Maggis et al. International variation in the incidence of hip fractures: Cross national project on osteoporosis for World Health Organization programme for research on aging. *Osteoporosis Int*. 1999; 9:242-53.
5. Holmes J, House A. Psychiatric illness predicts poor outcome after surgery for hip fracture: a prospective cohort study. *Psychol Med*. 2000; 30:921-9.
6. Wu Q, Liu J, Gallegos-Orozco JF, Hentz JG. Depression, fracture risk, and bone loss: a meta-analysis of cohort studies. *Osteoporos Int*. 2010; 21:1627-35.



7. Ranhoff AH, Holvik K, Martinsen MI, Domaas K, Solheim LF. Older hip fracture patients: three groups with different needs. *BMC Geriatr.* 2010; 10:65.
8. Vochteloo AJ, Moerman S, van der Burg BL, *et al.* Delirium risk screening and haloperidol prophylaxis program in hip fracture patients is a helpful tool in identifying high-risk patients, but does not reduce the incidence of delirium. *BMC Geriatr.* 2011;11:39.
9. Juliebo V, Bjoro K, Kogseth M, *et al.* Risk factors for preoperative and postoperative delirium in elderly patients with hip fracture. *Am J Geriatric Soc.* 2009;57:1354–1361.
10. Bitsch MS, Foss NB, Kristensens BL, *et al.* Pathogenesis of and management strategies for postoperative delirium after hip fracture. *Acta Orthop Scand Aug.* 2004;75(4):378–389.
11. Streubel PN, Ricci WM, Gardner MJ. Fragility fractures: preoperative, perioperative and postoperative management. *Curr Orthopaedic Trauma Oct.* 2009;20:482–489.
12. Oude Voshaar RC, Banerjee S, Horan M, *et al.* Predictor of incident depression after hip fracture surgery. *Am J Geriatric Psychiatry.* 2007;15:9.
13. Craik, R.L. Disability following hip fracture. *Physical Therapy.* 1994;74:387-398.
14. Beals, R.K. Survival following hip fracture: Long follow-up of 607 patients. *Journal of Chronic Diseases.* 1972;25:235-244.
15. Lu-Yao, G.L., Baron, J.A., Barrett, J.A. & Fisher, E.S. Treatment and survival among elderly Americans with hip fractures: A population-based study. *American Journal of Public Health.* 1994;84:1287-1291.
16. American Psychiatric Association 1994. Diagnostic and statistical manual of mental disorders (4th edn). Washington, DC: American Psychiatric Association.
17. Meyn MA Jr, Hopson C, Jayasankar S. Fractures of the hip in the institutionalized psychotic patient. A mortality and morbidity survey of 106 cases. *Clin Orthopaed Related Res* 1977;122: 128-34.
18. MacCollum MS, Karpman RR. Approaches to senior care: Hip fractures in nonagenarians. *Orthopaed Rev* 1989;18:471-7.
19. Yan I, Zhou B, Prentice A *et al.* Epidemiological study of hip fracture in Shenyang, people's republic of china. *Bone* 1999;24:151-5
20. Karagas, Margaret R., Grace L. Lu-Yao, Jane A. Barrett, Michael L. Beach, John A. Baron. Heterogeneity of hip fracture: age, race, sex, and geographic patterns of femoral neck and trochanteric fractures among the US elderly." *American journal of epidemiology.* 1996;143(7) 677-682.
21. Bjorgul K, Reikeras O: Incidence of hip fracture in southeastern Norway. *Int Orthopaedics* 2007;31:3665-669.
22. Berg WP, Alessio HM, Mills EM, *et al.* Circumstances and consequences of falls in independent community-dwelling older adults. *Age Ageing.* 1997;26:261–8.
23. Siris, Ethel S., Ya-Ting Chen, Thomas A. Abbott, Elizabeth Barrett-Connor, Paul D. Miller, Lois E. Wehren, and Marc L. Berger. "Bone mineral density thresholds for pharmacological intervention to prevent fractures." *Archives of Internal Medicine.* (2004);164(10):1108.
24. Hempsall, V. J., D. R. Robertson, M. J. Campbell, R. S. Briggs. Orthopaedic geriatric care--is it effective? A prospective population-based comparison of outcome in fractured neck of femur. *Journal of the Royal College of Physicians of London.* (1990);24(1):47.
25. Laxton, Clare, Carol Freeman Chris Todd. Morbidity at 3 months after hip fracture: Data from the East Anglian audit. *Health Trends.* (1997);29(2):55-60.
26. Williams, Margaret A., Emily B. Campbell, William J. Raynor, Susan M. Mlynarczyk, Sandra E. Ward. Reducing acute confusional states in elderly patients with hip fractures. *Research in nursing & health.* 1985;8(4):329-337.
27. Williams, Margaret A., Emily B. Campbell, William J. Raynor, Mary A. Musholt, Susan M. Mlynarczyk, Laraine F. Crane. "Predictors of acute confusional states in hospitalized elderly patients." *Research in Nursing & Health.* (1985);8(1):31-40.
28. Billig, N., Ahmed, S. W., Kenmore, P., Amaral, D. & Shakhashiri, M. Z. Assessment of depression and cognitive impairment after hip fracture. *Journal of the American Geriatrics Society.* 1986;34:499-503.
29. Berggren, D., Gustafson, Y., Eriksson, B., Bucht, G., Hansson, L. I., Reiz, S. & Winblad, B. Postoperative confusion after anesthesia in elderly patients with femoral neck fractures. *Anesthesia and Analgesia.* 1987;66:497-504.
30. Gustafson, Y., Berggren, D., Brannstrom, B., Bucht, G., Norberg, A., Hansson, L. I. & Winblad, B. (1988). Acute confusional states in elderly patients treated for femoral neck fracture. *Journal of the American Geriatrics Society.* 1988;36:525-530.
31. Mossey, J.M., Mutran, E, Knott, K. & Craik, R. Determinants of recovery 12 months after hip fracture: The importance of psychosocial factors. *American Journal of Public Health.* 1989;79: 279-286.
32. Mossey, J.M., Knott, K. & Craik, R. The effects of persistent depressive symptoms of hip fracture recovery. *Journal of Gerontology: Medical Sciences.* 1990;45: M163-168.
33. Van Marwijk HW, Wallace P, de Bock GH, *et al.* Evaluation of the feasibility, reliability and diagnostic value of shortened versions of the geriatric depression scale. *Br J Gen Pract.* 1995;45(393):195–199.
34. Lenze EJ, Munin MC, Skidmore ER, *et al.* Onset of depression in elderly persons after hip fracture: implication for prevention and early intervention of late-life depression. *Am J Geriatric Soc.* 2007;55:81–87.

**How to cite this article:** Prerana Gupta, Julfiqar, S K Jain. "Psychiatric Morbidity Associated with Hip Fractures - A Hospital Based Study". *International Journal of Scientific Study.* 2014;1(4):54-57.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Cariogram – A Multi-factorial Risk Assessment Software for Risk Prediction of Dental Caries

Anup N,  
Preeti Vishnani<sup>1</sup>

MDS, Professor & Head, Department of Public Health Dentistry, Jaipur Dental College, Jaipur, Rajasthan, India, <sup>1</sup>Post-Graduate Student, Department of Public Health Dentistry, Jaipur Dental College, Jaipur, Rajasthan, India

**Corresponding Author:** Dr. Preeti Vishnani, Post-Graduate Student, Department of Public Health Dentistry, Jaipur Dental College, Jaipur, Rajasthan, India. E-mail: preeti7vishnani@gmail.com

## Abstract

For years, Swedish researchers have recognized caries risk assessment as an important part of routine dental practice for caries management. This paper reviews a new way of illustrating the caries risk profile of an individual through a computer program, the Cariogram, which was described by Professor Bratthal in 1976. Cariogram is a risk as well as a prediction model. It presents a 'weighted' of the input data related to caries such as caries experience, related disease, diet, fluoride content, saliva and plaque amount. It's a didactic tool which illustrates the multifactorial etiologic factors of dental caries in a graphical manner as well as it provides targeted preventive strategies. Many studies have been done to validate the software as a caries risk assessment tool since 2000. This paper attempts to embrace the studies related to Cariogram.

**Keywords:** Cariogram, Caries-risk assessment, Dental caries

## INTRODUCTION

Caries risk assessment is a vital element in the comprehensive management of the disease. It has gained a great deal of attention in the recent literature.<sup>1,2</sup> Caries risk assessment approaches must ruminate the risk implications from various factors that influence carious activity. Accurate prediction of caries risk help in directing targeted preventive actions to those who are at high caries risk, before cavities could develop. Unsurprisingly, if the chief etiological factors could be identified, appropriate individualized treatment can be carried out with good results.<sup>3</sup>

The multifactorial etiology of dental caries points to the inevitability of developing new caries risk assessment models that would embrace the different factors or parameters which influence new carious lesions. Currently, caries-risk assessment models comprehend a combination of factors such as diet, fluoride exposure, a susceptible host, and microflora that interact with a variety of social, cultural, and behavioural factors. No single test takes into account all the caries etiological factors and can accurately predict an individual's susceptibility to caries risk.

There are two different approaches described for caries risk assessment models: the risk model and the prediction

model. The risk model is used to determine the causative caries factors called risk factors but it cannot predict the caries outcome. The prediction model estimates the risk of caries progression in the future. Risk models counting multiple variables result in better predictions as the disease process is multifactorial. The most commonly used statistical methods for caries risk assessment are multiple regression analyses.<sup>4</sup>

Caries preventive measures must be integrated based on knowledge and understanding of the predicted risk. Caries risk assessments during treatment aids as a monitor for the success of the treatment. They may also be very valuable for screening populations in community preventive programs. In light of today's prominence on health care reform, dental insurers may eventually use risk assessment to determine a patient's benefit package.

For each patient, risk assessment allows for customization of a prevention program. A patient at low caries risk may not need office fluoride treatments or a six-month recall appointment. On the contrary, a patient at high risk of developing caries may need home fluoride treatments and a three month recall appointment. Risk assessment consents dental care to be rendered more resourcefully.

As an aid for professionals and a didactic tool for patients, a computer program (Cariogram) for caries risk assessment has been developed.<sup>5</sup> The Cariogram is a modest and expedient tool for caries risk assessment that uses an algorithm to assess caries risk.<sup>6,7</sup> It analyses the input data, chiefly biological factors such as past caries experience, related diseases, diet contents & frequency, plaque amount, Mutans streptococci count, fluoride programme, saliva secretion & buffer capacity. All these etiological factors are assessed and the risk is calculated. Preventive measures to evade the development of new caries are also proposed by the software.<sup>8</sup>

### What is Cariogram?

It is a graphical picture illustrating in an interactive way the individual's/patient's risk for developing new caries at some point in the future, concurrently, it expresses the magnitude at which the multiple etiological factors of caries affect the caries risk for that particular patient. The Cariogram under no circumstances, states a particular number of cavities that will or will not occur in the future. It rather elucidates a possible over-all risk picture, based on the interpretation of gathered information.

### Purpose of the Cariogram

1. To determine the caries risk graphically, expressed as the "Chance to avoid new caries" (i.e. to avoid getting new cavities or 'holes') in the near future.
2. To exemplify to what extent different factors affect this 'Chance'.
3. To encourage preventive measures to be introduced before new cavities could develop.

### Cariogram – Aims

- Illustrates the interaction of caries related factors.
- Illustrates the chance to avoid caries.
- Expresses caries risk graphically.
- Recommends targeted preventive actions.
- Can be used in the clinic.
- Can be used as an educational programme.

This program cannot supersede the personal and professional judgement of caries risk made by the examiner. However, it may provide beneficial hints and may even serve as a base for discussions with the patient about various risk factors and preventive approaches. In other words, it does not conquest the verdict or the obligations of the examiner, but may assist in the clinical decision-making.<sup>3</sup>

## HISTORY

Over the past few spans, Swedish researchers had been working on the development of new concepts for caries risk assessment. The ground-breaking work of Bo Krasse and his team at the Dental School in Goteberg laid the

underpinning for the development of a comprehensive model of the caries risk profile for use in the management of dental caries. Building on this work, Douglas Bratthall and associates at the Dental School in Malmo had endeavoured to make the practical application of risk assessment more accessible by developing a computer-based caries risk assessment model.<sup>9</sup>

Bratthall in 1976 developed a new model, the Cariogram which can be used for illustration of caries-related factors. Professor Bratthall is program manager for the World Health Organisation oral database. His work on Cariogram instigated after he penned to oral health experts around the world asking them to fill in a questionnaire on the factors which most influence caries reduction. Several thought it was better brushing, others believed it was better diet or fluoride. He categorically wanted to find a way of explaining all the different factors affecting caries and how they relate to each other.<sup>10</sup>

In November 1997, after extensive trials, the Swedish version of the Cariogram was launched officially. Since then, Cariogram have been created in several languages to be used in different countries. The concept and formula for the Cariogram was developed by Professor D. Bratthall and the PC version was designed in collaboration with Dr L. Allander and K-O. Lybegård B.Sc. It can be downloaded by everyone from the Internet page: <http://www.db.od.mah.se/car/cariograminfo.html>. The English version is available from that page, at no cost.<sup>3,4</sup>

The 'Cariogram' is a new concept, professed initially as an edifying model, targeting at illustrating the multifactorial upbringing of dental caries in a simple way. It has steadily evolved over a long epoch of time until it became a reality. Originally, the Cariogram was a circle alienated into three segments. Each segment represented factors that strongly influence carious activity, diet, bacteria and susceptibility. The necessity to clarify why, in some individuals, carious activity could be low inspite of, for example, more amount of sucrose consumption, deprived oral hygiene practices or non-use of fluorides, led to the development of the model.<sup>9</sup> As it presents the interaction of relevant factors in caries in a graphical manner, it is called as Cariogram, and the process of preparing such graphs, is known as Cariography.<sup>11</sup>

### Contributing factors in creating a Cariogram

1. Immediate factors-involved in caries process directly at the site of lesion
  - a) Attack mechanisms- dental plaque, microorganisms, and diet.
  - b) Defence mechanisms- Salivary protective systems and fluoride exposure

2. Indicators of caries risk- factors that do not participate in the ‘making’ of a cavity
  - a) Socioeconomic status
  - b) Past caries experience

### The five sectors of Cariogram (Figure 1)

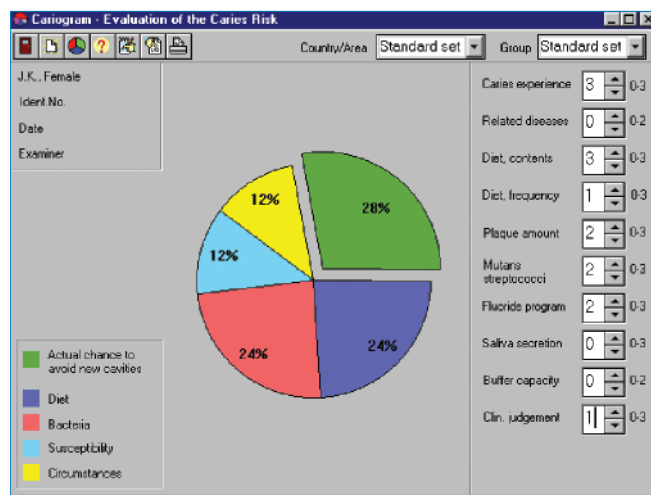
**Green sector** - denotes the “Actual chance to avoid caries”. It is what is left, after the other factors take their segment.

**Dark blue sector** - “Diet” (diet contents and diet frequency).

**Red sector** - “Bacteria” (amount of plaque and mutans streptococci).

**Light blue sector** - “Susceptibility” (fluoride programme, saliva secretion and saliva buffer capacity).

**Yellow sector** - “Circumstances” (Past caries experience and related diseases).



**Figure 1: Example of a Cariogram displaying high caries risk with the ‘chance of avoiding caries (new cavities)’ estimated only to be 28%**

“The larger the green sector, the better the dental health of the patient.”

The Cariogram shows the overall risk of the patient i.e. high, intermediate or low caries risk. The problems such as fractured teeth or fillings, discolorations etc are not taken in to consideration by the program.<sup>3</sup>

### Studies to validate the computer program - ‘Cariogram’ as caries risk assessment tool and Caries risk profiles according to Cariogram

Though the concept of Cariogram came in 1996, the studies to validate the program were started in 2000 and eventually the program has proved to be expedient. (Table 1). There have been many studies done to record the caries risk profiles of varying population using the Cariogram (Table 2).

## CONCLUSION

Risk assessment has enthused from the sheer addition of individual risk factors to a tactic in which risk factors are prejudiced on the basis of alleged role they play in the etiology of the disease. A caries risk software, Cariogram, has been developed along the same line of thought. The credence of the component factors included in the program is derived from proficient unanimity. Cariogram acts as a prediction model that predicts who is at high risk, as well as it is a risk model categorising the risk factors to facilitate planning of interventions. Cariogram program is effective and has shown promising results in prophesying caries. It assesses and graphically exemplifies a caries risk profile for an individual. The pie chart presentation helps in increment of patient motivation. It also provides endorsements for targeted preventive measures to overcome new caries

**Table 1: Studies to validate the Cariogram**

| Author   | Year | Study setting          | Findings   |
|--|------|------------------------|--|
| Gunnel Hansel Petersson, Douglas Bratthal                                | 2000 | Sweden                 | The ‘opinion’ of the Cariogram on caries risk was in agreement with that of the majority of dentists and dental hygienists. <sup>12</sup>  |
| Gunnel Hansel Peterson, Svante Twetman, Douglas Bratthal                 | 2002 | Malmo, Sweden          | The Cariogram predicted caries increment more accurately than any included single-factor model. <sup>13</sup>  |
| Gunnel Hansel Peterson, Solveig Fure, Douglas Bratthal                   | 2003 | Malmo, Sweden          | The Cariogram was able to sort the elderly individuals into risk groups that reflected the actual caries outcome. <sup>14</sup>  |
| Svante Twetman, Douglas Bratthal, Gunnel Hansel Peterson                 | 2005 | Sweden                 | When the Cariogram was used as a predictor for the metabolic state of the disease, the sensitivity and specificity was 75% and 71%, respectively. <sup>15</sup>  |
| Anna Y. Alian, Mary E. McNally, Solveig Fure, Downen Birkhed             | 2006 | Goteburg, Sweden       | Cariogram software program highlights both relevant caries-related factors and practical therapeutic interventions for selected patients. <sup>16</sup>  |
| Ana Riuz Miravet, Jose Maria Montiel Company, Jose Manuel Almerich Silla | 2007 | University of Valencia | The past caries experience, Streptococcus mutans count, fluoridation programme and buffer capacity of the saliva are the factors included in the Cariogram that showed significant correlation with the caries risk determined by the program. Other factors that the Cariogram does not include directly, such as, DMFT, DMFS and the plaque index, also showed high correlation with risk. <sup>17</sup> |

*Contd.*



**Table 1: Contd.**

|   |      |                           |  |
|---|------|---------------------------|--|
| A Zukanovic, S Kobaslija, M Ganibegovic   | 2007 | Bosnia                    | Cariogram model can successfully determine caries risk profiles for 12-year-old children of different socioeconomic status and can be used in developing preventive strategies for reducing caries risk in children. <sup>18</sup>   |
| Sonbul Helal, Al-Otaibi, Birkhed Downen   | 2008 | Saudi Arabia              | direct association between the categorized outcomes of the Cariograms and the DiS and Di+mS indices. <sup>19</sup>   |
| Pernilla Lif Holgerson, Svante Twetman, Christina Stecksén-Blicks   | 2009 | Sweden                    | A modified Cariogram applied on preschool children was not particularly useful in identifying high caries risk patients in a low-caries community. <sup>2</sup>  |
| Guglielmo Campus, Maria Grazia Cagetti, Gianluca Sacco, Guido Benedetti, Laura Strohmenger, Peter Lingstrom | 2009 | Sessari, Italy            | Significant linear trend between the five categories of Cariogram and dmfs/DMFS. <sup>20</sup>   |
| Gunnel Hansel Petersson, Per-Erik Isberg and Svante Twetman   | 2010 | Sweden                    | The accuracy of caries prediction in schoolchildren was significantly impaired when the Cariogram model was applied without enumeration of salivary tests. <sup>21</sup>   |
| Devinder Utreja, Mauli Simratvir, Avninder Kaur, Kawaldeep Singh Kwatra, Paramdeep Singh, Varun Dua         | 2010 | Panchkula, Haryana, India | Cariogram had a diagnostic accuracy of 63.33%. <sup>22</sup>   |
| G Campus, MG Cagetti, S Sale, G Carta, P Lingstrom  | 2012 | Sessari, Italy            | The validity of Cariogram was confirmed, the software fulfilling the criteria for a good risk assessment model: precision, accuracy and ease of use. <sup>23</sup>   |
| Mamata Hebbal, Anil Ankola, Sharada Metgud  | 2012 | Belgaum, Karnataka, India | The Cariogram model can identify the caries-related factors that could be the reasons for the estimated future caries risk, and therefore help the dentist to plan appropriate preventive measures. <sup>24</sup>  |
| Esra Uzer Celik, Necmi Gokay, Mustafa Ates  | 2012 | Izmir, Turkiye            | Cariogram is effective and can be used for caries risk assessment instead of single variables. <sup>8</sup>  |
| M Tellez, J Gomez, I Pretty, R Ellwood, A Ismail  | 2012 | Philadelphia, USA         | The Cariogram had limited prediction utility in preschool children, and a moderate to good performance for sorting out elderly individuals into caries risk groups. <sup>25</sup>  |
| Rodrigo Andrés Giacaman, Paulina Miranda Reyes, Valeria Bravo León  | 2013 | Talca, Chile              | Caries risk from Cariogram appears to be unrelated with caries experience or caries lesions in a high-caries adult population. <sup>26</sup>   |
| J H Lee, H H Son, H Y Kim, J Chang  | 2013 | Seoul, Korea              | The simplified Cariogram model without salivary secretion rate and lactobacilli count did not significantly change the outcome produced from the conventional model. However, single exclusion of lactobacilli count noticeably changed the caries risk profile. <sup>27</sup> |
| Gunnel Hansel Petersson, E Ericson, Per-Erik Isberg, Svante Twetman   | 2013 | Malmö, Sweden             | The proportion of subjects assessed with high or very high risk was similar using the Public Dental Service guidelines and the Cariogram model, the agreement between the models was fair. <sup>28</sup>   |

**Table 2: Caries Risk Profiles Using Cariogram**

| Authors   | Year | Study population   | Findings   |
|---|------|--|--|
| Gunnel Hansel Peterson, S Fure, Svante Twetman, Douglas Bratthal                            | 2004 | 400 children and 150 elderly in Sweden   | 26% and 3% elderly and children respectively, belonged to high risk group. <sup>29</sup>   |
| GL Tayanin, Gunnel Hansel Peterson, Douglas Bratthal  | 2005 | Hundred 12-13 years old children in Laos compared with 392 Swedish Children  | According to the 'opinion' of the Cariogram, the Laotian children demonstrated significantly higher caries risk than Swedish children. <sup>30</sup>   |
| Anas H. Al Mulla, Saad Al Kharsa, Heidrun Kjellberg, Downen Birkhed                         | 2009 | Hundred Orthodontic patients aged between 12-29 years  | Patients with high ( $\geq 5$ ) DFS numbers before orthodontic treatment ran a higher risk of developing caries. <sup>31</sup>   |
| Khalid Medrad, Helal Sonbul, Moataz Gholman, Clas Reit, Downen Birkhed, Jeddah              | 2010 | Two hundred Saudi adults (Two groups- Endodontic Group with a minimum of 2-root filled teeth and Non-Endodontic Group) | No association between caries risk profile and presence of root-filled teeth, but reinforced the opinion that root-filling procedures might make the tooth more susceptible to caries. <sup>32</sup> |
| Gunnel Hansel Petersson, Per-Erik Isberg and Svante Twetman                                 | 2010 | Four hundred thirty eight schoolchildren aged 10-11 years at baseline  | One third of the children had high risk while 18.4% showed a lower risk. <sup>33</sup>   |
| Y B Patil, S. Hegle- Shetiya, P V Kakodkar, R Shirahatti                                    | 2011 | Fifty four mentally challenged children (7-17 years old) in Pimpri, Pune, Maharashtra, India                           | Increment in "chance to avoid caries" from 47% to 87%. <sup>34</sup>   |
| Hani Fadel, Khalid Al Hamdan, Ysear Rhbeini, Lars Heijl & Downen Birkhed                    | 2011 | 112 periodontal disease patents in Riyadh and Jeddah, Saudi Arabia   | 22% displayed high caries risk (Chance to avoid new cavities=40%) <sup>35</sup>  |
| Katerina Kavvadia, Andreas Agouropoulos, Sotiria Gizani, Lisa Papagiannouli, Svante Twetman | 2012 | 814 two-six-year-old Greek preschool children in Athens  | The Cariogram revealed that 26% of the children had high caries risk, while only 9% exhibited low caries risk. <sup>36</sup>   |
| Naif Abdullah Almosa, Anas H. Al-Mulla, Downen Birkhed                                      | 2012 | 89 orthodontic patients aged between 13-29 years in Gothenburg, Sweden   | The "chance to avoid new cavities" in orthodontic patients at de-bonding was 28% in governmental group and 61% in the private group. <sup>37</sup>   |

formation. Cariogram has been found satisfactory when used in the clinic, as it allows more objective handling during data interpretation and, as part of an educational program, in elucidating the caries situation to patients and encouraging preventive measure. However, it might be possible to develop simpler models with regression analyses to define the risk for caries. Assessing caries risk using fewer variables by regression analyses the use of Cariogram, being less time consuming and more economic, may be confined by as this method is less time consuming and more economic.

Country like India, needs the emphasis on assessing the caries risk and identifying high risk individuals who will develop caries. Preventive measures can then be beleaguered at this group thereby not only plummeting the encumbrance of the restorative care but also eliminating pain and refining the quality of life.

## REFERENCES

- Guideline on caries-risk assessment and management for infants, children and adolescents. Reference manual; 34(6):118-25.
- Tsang P, Qi F, Shi W. Medical approach to dental caries: Fight the disease, not the lesion. *Pediatr Dent*. 2006;28(2):188-98.
- Bratthall D, Hansel-Petersson G, Stjernsward J. Cariogram Internet Version 2.01. April 2; 2004.
- Bratthall D, Petersson GH. Cariogram-a multifactorial risk assessment model for a multifactorial disease. *Community Dent Oral Epidemiol*. 2005;33:256-64.
- Holgerson PL, Twetman S, Stecksén-Blicks C. Validation of an age-modified caries risk assessment program (Cariogram) in preschool children. *Acta Odontologica Scandinavica*. 2009;67:106-12.
- Kavvadia K, Agouropoulos A, Gizani S, Papagiannouli L, Twetman S. Caries risk profiles in 2- to 6- year old Greek children using the Cariogram. *Eur J Dentistry*. 2012;(6):415-21.
- Giacaman RA, Reyes PM, Lean VB. Caries risk assessment in Chilean adolescents and adults and its association with caries experience. *Braz Oral Res*. 2013; 27(1):7-13.
- Celik EZ, Gokay N, Ates M. Efficiency of new caries risk assessment in young adults using Cariogram. *Eur J Dent*. 2012;(6):270-79.
- Axelsson P. Diagnosis and risk prediction of dental caries. Sweden: Quintessence; 2000.
- Software for scoring caries factor. *British Dental Journal*. 2003. 26;194(8):418.
- Bratthall D. Dental caries—intervened—interrupted—interpreted. Concluding remarks and cariography. *Eur J Oral Sci*. 1996;104[4(Pt 2)]:486-91.
- Petersson GH, Bratthall D. Caries risk assessment: a comparison: between the computer program 'cariogram', dental hygienists and dentists. *Swed Dent J*. 2002;24(4):129-37.
- Petersson GH, Twetman S, Bratthall D. Evaluation of a computer program for caries risk assessment in schoolchildren. *Caries Res*. 2002;36(5):327-40.
- Petersson GH, Fure S, Bratthall D. Evaluation of a computer based caries risk assessment program in an elderly group of individuals. *Acta Odontol Scand*. 2003;61(3):164-71.
- Twetman S, Petersson GH, Bratthall D. Caries risk assessment as a predictor of a metabolic control in young Type I diabetes. *Diabet Med*. 2005;22(3):312-15.
- Alien YA, McNally ME, Fure S, Birkhed D. Assessment of caries risk in elderly patients using the cariogram model. *J Can Dent Assoc*. 2006;72(5):459-63.
- Miravet AR, Company JMM, Silla JMA. Evaluation of caries risk in a young adult population. *Med Oral Patol Oral Cir Bucal*. 2007;12:E412-18.
- Zukanovic A, Kobaslija S, Ganibegovic M. Caries risk assessment in Bosnian children using cariogram computer model. *Int Dent J*. 2007 Jun;57(3):177-83.
- Sonbul H, Al-Otaibi, Birkhed D. Risk profiles of adults with several dental restorations using the cariogram model. *Acta Odontol Scand*. 2008;66:351-57.
- Campus G, Cagetti MG, Sacco G, Benedetti G, Strohmenger L, Lingstrom P. Caries risk profiles in Sardinian schoolchildren using Cariogram. *Acta Odontologica Scandinavica*. 2009;67:146-52.
- Petersson GH, Isberg PE, Twetman S. Caries risk assessment in schoolchildren using a reduced Cariogram model without saliva tests. *BMC Oral Health*. 2010;10:5-10
- Utreja D, Simratvir M, Kaur A, Kwata KS, Singh P, Dua V. An evaluation of the cariogram as a predictor model. *Int Dent J*. 2010;60(4):282-84
- Campus G, Cagetti MG, Sale S, Carta G, Lingstrom P. Cariogram validity in schoolchildren: a two-year follow-up study. *Caries Res*. 2012;46(1):16-22.
- Hebbal M, Ankola A, Metgud S. Caries risk profile of 12 year old schoolchildren in an Indian city using Cariogram. *Med Oral Patol Oral Cir Bucal*. 2012;17(6):e1054-61
- Tellez M, Gomez J, Pretty I, Ellwood R, Ismail A. Evidence on existing caries risk assessment systems: are they predictive of future caries?. *Community Dent Oral Epidemiol*. 2013;41(1):67-78
- Giacaman RA, Reyes PM, Lean VB. Caries risk assessment in Chilean adolescents and adults and its association with caries experience. *Braz Oral Res*. 2013; 27(1):7-13.
- Lee JH, Son HH, Kim HY, Chang J. Caries risk profiles of Korean dental patients using simplified cariogram models. *Acta Odontol Scand*. 2013;71(3-4):899-05.
- Petersson GH, Ericson E, Isberg PE, Twetman S. Caries risk assessment in young adults using Public Dental Service guidelines and the Cariogram- a comparative study. *Acta Odontol Scand*. 2013;71(3-4):534-40.
- Petersson GH, Fure S, Twetman S, Bratthall D. Comparing caries risk factors and risk profiles between children and elderly. *Swed Dent J*. 2004;28(3):119-28.
- Twetman S, Petersson GH, Bratthall D. Caries risk assessment as a predictor of a metabolic control in young Type I diabetes. *Diabet Med*. 2005;22(3):312-15.
- Al Mulla AH, Al Kharsa S, Kjellberg H, Birkhed D. Caries risk profiles in orthodontic patients at follow-up using cariogram. *Angle Orthodontist*. 2009.79(2):323-30.
- Merdad K, Sonbul H, Gholman M, Reit C, Birkhed D. Evaluation of the caries profile and caries risk in adults with endodontically treated teeth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010;110:264-69.
- Petersson GH, Isberg PE, Twetman S. Caries risk profiles in schoolchildren over 2 years assessed by cariogram. *Int J Ped Dent*. 2010;20:341-46.
- Patil YB, Shetiya SH, Kakodkar PV, Shirahatti R. Evaluation of a preventive program based on caries risk among mentally challenged children using the Cariogram model. *Community Dental Health*. 2011;28:286-91.
- Fadel H, Hamdan KA, Rhbeini Y, Heijl L, Birkhed D. Root caries and risk profiles using the Cariogram in different periodontal disease severity groups. *Acta Odontologica Scandinavica*. 2011;69: 118–24.
- Kavvadia K, Agouropoulos A, Gizani S, Papagiannouli L, Twetman S. Caries risk profiles in 2- to 6- year old Greek children using the Cariogram. *Eur J Dentistry*. 2012;(6):415-21.
- Almosa NA, Al-Mulla AH, Birkhed D. Caries risk profile using the cariogram in governmental and private orthodontic patients at de-bonding. *Angle Orthodontist*. 2012;82(2):267-74.

**How to cite this article:** Nagaraj A, Vishnani P. "Cariogram – A Multi-factorial Risk Assessment Software for Risk Prediction of Dental Caries". *International Journal of Scientific Study*. 2014;1(4):58-62.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Adenomatoid Odontogenic Tumour: Report of a Case and Review of Literature

Vikas Singh,  
D J Bhaskar<sup>1</sup>,  
R Chandan Agali<sup>2</sup>,  
Mallika Kishore<sup>3</sup>,  
Safalya S Kadtane<sup>4</sup>,  
Harender Singh<sup>5</sup>

Post Graduate Student, Department of Public Health Dentistry, Teerthanker Mahaveer University, Moradabad (U.P), India, <sup>1</sup>Professor & H.O.D, Department of Public Health Dentistry, Teerthanker Mahaveer University, Moradabad (U.P), India, <sup>2</sup>Reader, Department of Public Health Dentistry, Teerthanker Mahaveer University, Moradabad (U.P), India, <sup>3</sup>Post Graduate Student, Department of Oral Medicine and Radiology, Institute of Dental Sciences, Bareilly (U.P), India, <sup>4</sup>Post Graduate Student, Department of Public Health Dentistry, Teerthanker Mahaveer University, Moradabad (U.P), India, <sup>5</sup>Post Graduate Student, Department of Public Health Dentistry, Teerthanker Mahaveer University, Moradabad (U.P), India

**Corresponding Author:** Dr. Vikas Singh, Department of Public Health Dentistry, Final Year Postgraduate Student, Teerthanker Mahaveer Dental College & Research Centre.  
E-mail: drvikas7@gmail.com

## Abstract

Adenomatoid odontogenic tumor (AOT) is a distinct odontogenic tumor that is exclusively odontogenic epithelium in origin which accounts for about 3-7% of all odontogenic tumors. It is a benign (hamartomatous), noninvasive lesion with slow but progressive growth. It is predominantly found in young and female patients, located more often in the maxilla in most cases associated with an unerupted permanent tooth. Treatment is conservative surgical excision and the prognosis is excellent. AOT frequently resembles other odontogenic lesions such as dentigerous cysts. Immunohistochemically AOT is characterized by positive reactions with certain cytokeratins. Here we report a case of adenomatoid odontogenic tumor (AOT) in the maxilla in a young girl aged 14 years.

**Keywords:** Adenomatoid odontogenic tumor, True neoplasm, Maxilla

## INTRODUCTION

Adenomatoid odontogenic tumour was first described in 1907 by Dreibladdt, as a pseudo adenoameloblastoma.<sup>1</sup> Over the years a variety of terminologies have been used to designate this extremely fascinating entity like adenoameloblastoma, adenoameloblastic odontoma, epithelial tumour associated with ameloblastic adenomatoid tumour, developmental cysts, and adenomatoid or pseudo adenomatous ameloblastoma.<sup>2</sup> Philipsen and Birn proposed the name adenomatoidodontogenictumour in 1969 and suggested that it not be regarded as a variant of ameloblastoma because of its different behaviour.<sup>3,4</sup> Adenomatoid odontogenic tumor is also called 'two-thirds tumor,' because 2/3<sup>rd</sup> occur in young females, 2/3<sup>rd</sup> of adenomatoid tumors occur in the maxilla, 2/3<sup>rd</sup> of the cases are associated with un-erupted teeth, and two-thirds of the affected teeth are canines.<sup>5</sup> There are 3 variants of adenomatoid odontogenic tumour, the follicular type (accounting for 73% of cases), which has a central lesion associated with an embedded tooth; the extrafollicular

type (24% of case), which has a central lesion and no connection with the tooth; and the peripheral variety (3% of cases).<sup>6</sup> The WHO histological typing of odontogenic tumors, jaw cyst and allied lesions (2005) has defined AOT as a tumor of odontogenic epithelium with duct-like structures and with varying degree of inductive changes in the connective tissue.<sup>7</sup> Conservative surgical enucleation is the most suggested choice of treatment. Recurrence rate for AOT is exceptionally rare. Except only three cases which are reported in Japanese patients showed recurrence of this tumor, therefore, the prognosis is excellent when completely removed in toto.<sup>5</sup>

## CASE REPORT

A 14-year-old female child reported to the Department of public health dentistry with a complaint of swelling in the right upper front tooth region since 5 months. History of the present illness revealed that initially the swelling was small in size and gradually it increased to reach upto the present size. It was not associated with any pain or



discharge with no history of trauma associated with it. Extra oral examination revealed mild facial asymmetry with the obliteration of the nasolabial fold (Figure 1). Intraoral examination revealed a solitary diffuse swelling was present on the right anterior maxillary teeth region extending from mesial aspect of 51 to mesial aspect of 13 roughly oval in shape measuring about 1×2 cm in greatest dimension. The colour of overlying mucosa was normal. On palpation, all inspeitory findings are confirmed the swelling was soft in consistency, non tender. In hard tissue examination, there was retained 51 with clinically missing 11. There was vestibular obliteration with respect to 51,12,13 (Figure 2). So, based on the history and clinical examination a provisional diagnosis of dentigerous cyst i.r.t 11 was given with a differential diagnosis of adenomatoid odontogenic tumor. In investigations fine needle aspiration cytology was done which revealed a straw coloured fluid and protein estimation level was 4.9 gm/dL. (Figure 3). Intraoral periapical radiograph showed a well defined unilocular radiolucency was seen with respect to 51 with impacted 11. Root resorption in relation to 51 was noted (Figure 4).



**Figure 1: Extraoral view showing obliteration of nasolabial fold**



**Figure 2: Intraoral view demonstrates the palatal aspect of the swelling**

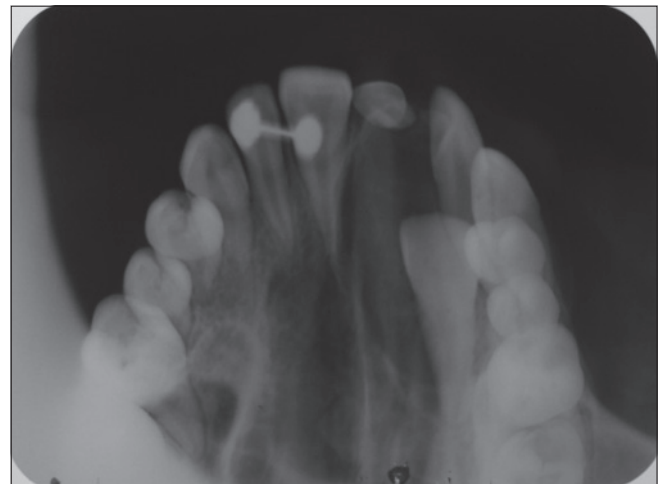
Occlusal radiograph also shows well defined radiolucency with impacted 11 (Figure 5). Orthopantomograph of the patient was also taken with showed similar findings (Figure 6). In the treatment surgical excision was done and the specimen was sent for the histopathological examination which revealed cuboidal to columnar cells arranged in the form of nests and rosettes. Tubular appearance, solid areas, duct-like pattern, and whorled arrangement of cells is evident. Few cells were also arranged in a plexiform pattern



**Figure 3: Fine needle aspiration cytology revealed straw coloured fluid**



**Figure 4: Intraoral periapical radiograph of the region from maxillary right incisor to the canine region showing unilocular radiolucency**



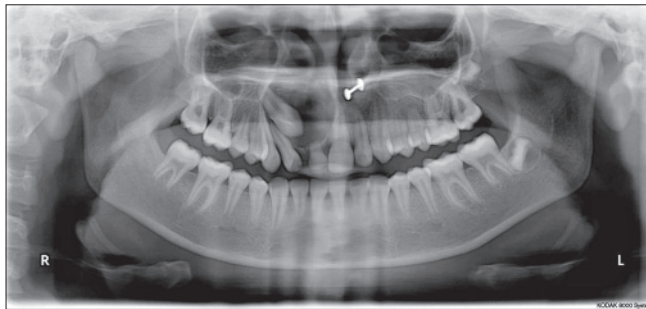
**Figure 5: Occlusal radiograph**



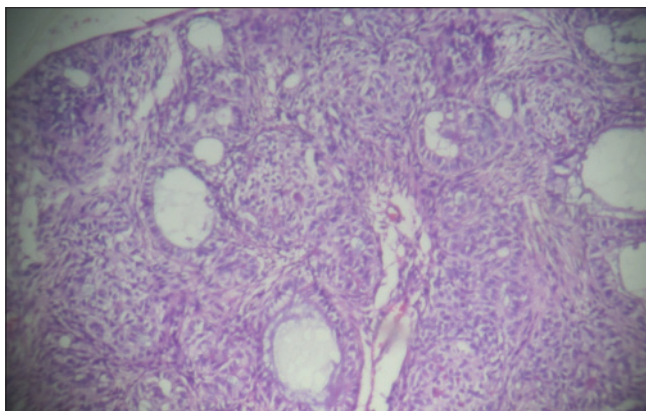
and cribriform areas are also seen, At high magnification, sheets, nests of polyhedral cells along with ductal pattern lined by cuboidal to columnar cells (Figure 7), At low magnification, sheets of epithelial cells along with ductal pattern (Figure 8), which confirmed the final diagnosis of Adenomatoid odontogenic tumour i.r.t.11.

## DISCUSSION

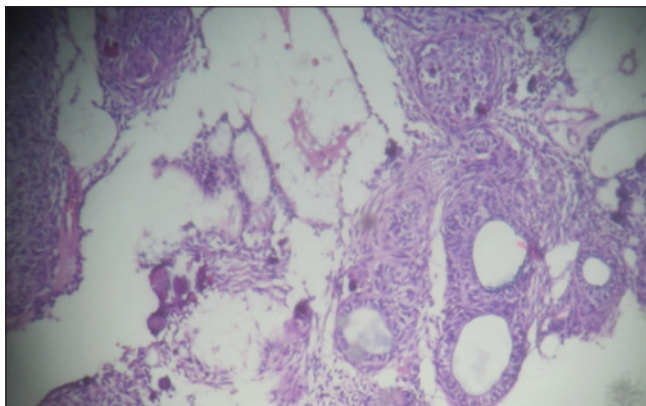
AOT is a benign, non-invasive odontogenic lesion showing slow growth. It is generally intraosseous, but can also occur rarely in peripheral locations.<sup>8</sup> Sixty-nine percent of



**Figure 6: Orthopantomograph (OPG) reveals Unilocular Radiolucency with an impacted 11**



**Figure 7: High magnification**



**Figure 8: Low magnification**

adenomatoid odontogenic tumours are diagnosed in the second decade of life, and more than half occur during the teenage years. There is 2:1 female to male ratio for all age groups and all variants. Generally the tumours do not exceed 1–3 cm in greatest diameter, but they can be larger, usually occurs within the tooth bearing areas of jaws and often found in association with impacted teeth.<sup>9,10</sup> The origin of AOT is believed to be from an odontogenic source, The cytological features are similar to those of the enamel organ, reduced enamel epithelium, dental lamina and their remanants.<sup>8</sup> The lesions are typically asymptomatic, but growth of the types with central lesion results in cortical expansion. The involved teeth are commonly impacted, and adjacent teeth may be slightly displaced.<sup>11</sup> The radiographic findings of AOT frequently resemble other odontogenic lesions such as dentigerous cysts, calcifying globule-maxillary cysts, calcifying odontogenic cysts, odontogenic tumors, ameloblastomas, odontogenic keratocysts and periapical disease.<sup>12</sup> Displacement of neighbouring teeth due to tumor expansion is much more common than root resorptions. The peripheral lesions may show some erosions of the adjacent cortical bone.<sup>9</sup> Intraoral periapical radiographs allows perception of the radiopacities in AOT as discrete foci having a flocculent pattern within radiolucency even with minimal calcifies deposits while panoramic often do not. Approximately 78% of AOTs shows those calcified deposits.<sup>13</sup> Conservative surgical enucleation is the treatment modality of choice. Guided tissue regeneration with membrane technique is suggested for periodontal intrabony defects caused by AOT after complete removal of the tumor.<sup>14</sup>

## CONCLUSION

AOT is an uncommon odontogenic lesion, seen but it can be usually identified from its clinical and radiographic appearance. Persistence of deciduous teeth for a longer duration and unerupted succeeding permanent teeth, when associated with a swelling, always need to be investigated for odontogenic lesions.

## REFERENCES

1. Batra P, Prasad S, Parkash H. Adenomatoid odontogenic tumour: Review and case report. *J Can Dent Assoc.* 2005;71:250-3.
2. Stafne EC. Epithelial tumors associated with developmental cysts of the maxilla: report of 3 cases. *Oral Surg Oral Med Oral Pathol* 1948;1:887.
3. Mallon HL, Sabes WR, Monaco F. Ameloblastic adenomatoid tumor. *Oral Surg Oral Med Oral Pathol* 1968;25:143-4.
4. Garg D, Palaskar S, Shetty VP, Bhushan A. Adenomatoid odontogenic tumor-hamartoma or True neoplasms: A case report. *J Oral Sci.* 2009;51:155-9.
5. Philipsen HP, Reichart PA, Nikai H: The adenomatoid odontogenic tumour (AOT): An update. *Oral Medicine & Pathology.* 1997, 2:55-60.
6. Dare A, Yamaguchi A, Yoshiki S, Okano T. Limitations of panoramic radiography in diagnosing adenomatoid odontogenic tumor. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1994;77(6):662-8.

7. Vimi S Mutalik, Ashish Shreshtha, Sunil S Mutalik, and Raghu Radhakrishnan. Adenomatoid odontogenic tumor: A unique report with histological diversity. J Oral Maxillofac Pathol. 2012;16(1): 118-121.
8. Rick GM. Adenomatoid odontogenic tumour. Oral Maxillofac Surg Clin North Am. 2004;16:333-354.
9. Philipsen HP, Reichart PA, Zhang KH, Nikai H, Yu QX. Adenomatoidodontogenic tumor: biologic profile based on 499 cases. J Oral Pathol Med 1991; 20(4):149-58.
10. Philipsen HP, Srisuwan T, Reichart PA. Adenomatoidodontogenic tumor mimicking a periapical (radicular) cyst: a case report. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002; 94(2):246-8.
11. Geist SY, Mallon HL. Adenomatoidodontogenic tumor: report of an unusually large lesion in the mandible. J Oral Maxillofac Surg. 1995; 53(6):714-7.
12. Konouchi H, Asaumi J, Yanagi Y, Hisatomi M, Kishi K: Adenomatoid odontogenic tumor: correlation of MRI with histopathological findings. Eur J Rad 2002;44:19-23.
13. Toida M, Hyodo I, Okuda T, Tatematsu N: Adenomatoidodontogenic tumor: report of two cases and survey of 126 cases in Japan. J Oral Maxillofac Surg. 1990;48:404-408.
14. Blumenthal NM, Mostofi R: Repair of an intrabony defect from an adenomatoid odontogenic tumor. J Periodontol. 2000;71:1637-1640.

**How to cite this article:** Vikas Singh, D J Bhaskar, Chandan Agali R, Mallika Kishore, Safalya S Kadtane, Harender Singh. "Adenomatoid Odontogenic tumour: Report of a Case and Review of Literature". International Journal of Scientific Study. 2014;1(4):63-66.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

# Post-operative Analgesic Effect of Intrathecal Clonidine versus Fentanyl Added to Bupivacaine in Patients Undergoing Cesarean Section: A Prospective Comparative Study

Gaurav Dwivedi

Assistant Professor, Department of Anesthesia, Santosh Medical College, Ghaziabad, Uttar Pradesh, India

**Corresponding Author:** Gaurav Dwivedi, Assistant Professor, Department of Anesthesia, Santosh Medical College, Ghaziabad, Uttar Pradesh, India. E-mail: geedee12@rediffmail.com

## Abstract

**Objectives:** The objectives of the study were to compare and assess the analgesic efficacy of intrathecal clonidine and fentanyl postoperatively added to bupivacaine in cesarean section.

**Materials and Methods:** Ninety patients scheduled for cesarean section under spinal anesthesia were randomly allocated to one of the three following groups to receive bupivacaine 10 mg combined with 75 µg clonidine (Group C), bupivacaine 10 mg combined with 0.5 mL fentanyl (Group F), and bupivacaine 10 mg combined with 0.5 mL distilled water (Group P), intrathecally. The time to first analgesic request, analgesic requirement in the first 24 h after surgery, sensory and motor blockade onset time, duration of sensory and motor blockade, the incidence of hypotension, ephedrine requirements, bradycardia, and hypoxemia were recorded.

**Results:** The duration of anesthesia in clonidine group ( $275.10 \pm 96.09$ ) was longer compared to the placebo ( $211.73 \pm 74.80$ ) and fentanyl ( $192.33 \pm 30.36$ ) groups. This difference between Group C versus F ( $P = 0.006$ ) and P groups ( $P < 0.001$ ) was significant. Similarly, the mean time to first analgesic request was also longer in Group C ( $519.44 \pm 86.25$ ) than in Groups F ( $277.88 \pm 94.25$ ) and P ( $235.43 \pm 22.35$  min). This difference between Group C versus F ( $P < 0.001$ ) and P groups ( $P < 0.001$ ) was significant.

**Conclusion:** Intrathecal clonidine 75 µg with bupivacaine prolonged the time to first analgesic request compared to fentanyl.

**Keywords:** Clonidine, Fentanyl, Postoperative analgesia

## INTRODUCTION

Pain control after cesarean improves breastfeeding and satisfaction of mother. In addition, inadequate analgesia leads to elevated plasma catecholamine concentrations, resulting in adverse effect on all organ systems.<sup>[1]</sup> Neuraxial analgesia using only local anesthetic often provides suboptimal analgesia with higher side effects. Many drugs have been adjusted to local anesthetics to provide optimal analgesia with the lower side effects such as opioids, epinephrine, ketamine, midazolam, clonidine, and magnesium.<sup>[2,3]</sup> Opioids are usually used for providing better analgesia and reducing the side effects. Fentanyl exhibits close structural similarities to local anesthetics and has demonstrable local anesthetic effect on sensory C primary afferent nerve fibers, which may facilitate analgesic effects.<sup>[4,5]</sup> Furthermore, fentanyl is the most frequently intrathecal lipophilic opioid used as analgesic

agent with minimal cephalad spread making it the least likely of all the intrathecal opioids to cause delayed respiratory depression.<sup>[5]</sup> However, in parturients, the advantageous analgesia has to be balanced against maternal and fetal side effects such as bradycardia, respiratory depression, arterial hypotension, nausea, vomiting, and pruritus. Furthermore, it is reported that a single administration of an opioid may also induce a long lasting increase of threshold pain sensitivity, leading to delayed hyperalgesia.<sup>[6]</sup> On the contrary, it is reported that clonidine by stimulation of  $\alpha_2$  adrenoreceptors beyond the analgesic effects possesses antihyperalgesic properties.<sup>[7-9]</sup> Clonidine mimics the effects of norepinephrine and its anti-hyperalgesic mechanisms that partly depend on fortification of noradrenergic inhibitory controls in the dorsal horn of the spinal cord.<sup>[10]</sup> The safety of intrathecal clonidine has been extensively evaluated in animals, humans, and obstetrical anesthesia.<sup>[6,11-16]</sup> Furthermore, it is reported

that clonidine administered through intrathecal route was undetectable in the fetal circulation with no obvious effect on the neonatal Apgar scores.<sup>[12,16,17]</sup>

We hypothesized that clonidine may provide a better pain relief after cesarean section compared to fentanyl. In addition, unlike spinal opioids, clonidine does not produce pruritus, hyperalgesia, or respiratory depression. To test our hypothesis, we designed this randomized-double-blind, placebo-controlled study to compare the post-operative analgesic effect of intrathecal clonidine and fentanyl added to bupivacaine in patients undergoing cesarean section.

## MATERIALS AND METHODS

After approval of the Institutional Ethical Committee and written informed consent, Ninety-six patients 18–45 years old ASA physical status I or II, scheduled for cesarean section under spinal anesthesia, were enrolled in a prospective, double-blind, and randomized parallel study. Exclusion criteria included significant coexistence of conditions such as hepatorenal and cardiovascular diseases, any contraindication to regional anesthesia such as local infection or bleeding disorders, allergy to bupivacaine or clonidine, long-term opioid use, or a history of chronic pain. The patients were randomly allocated to one of three groups of 30 members each using the computer-generated randomization list. Blinding was achieved through the use of equal amounts of drugs (2.5 mL), while each syringe was labeled as A, B, and C according to its contents. Identical coded syringes prepared by the personnel not involved in the study were randomly handed to the anesthetists, who were unaware of the identity of the drugs. The clonidine group received bupivacaine 10 mg combined with 75  $\mu$ g of preservative free clonidine; the fentanyl group received bupivacaine 10 mg combined with 25  $\mu$ g fentanyl and the placebo group received bupivacaine 10 mg combined with 0.5 mL distilled water, intrathecally. All patients received an intravenous preload of 5–7 mL/kg lactated Ringer's solution before a subarachnoid block. Later, using an aseptic technique, a 25-gauge Quincke needle was inserted intrathecally through a midline approach into the L4–5 interspaces by the anesthetist who was unaware of patient assignment while the patient was in sitting position. After a successful dural puncture, the anesthetic solution was injected. The primary outcomes of this randomized, double-blind and placebo-controlled clinical trial are to evaluate the time to first requirement of analgesic supplement and total analgesic consumption in the 1<sup>st</sup> 24 h post-operative. The secondary outcomes included the assessment of sensory block onset time, onset of motor block, duration of blockade, hemodynamic variables, the incidence of hypotension, ephedrine requirements,

bradycardia, hypoxemia (saturation of peripheral oxygen ( $\text{SpO}_2$ ) < 90), and adverse events such as sedation, dizziness, pruritus, and post-operative nausea and vomiting.

In this study, the post-operative analgesia was defined as the time to first requirement of analgesic supplement from the time of injection. No additional analgesic was administered unless requested by the patient. Sensory block was assessed by a pinprick test. The onset of sensory block was defined as the time between the end of injection of the intrathecal anesthetic and the absence of pain at the T10 dermatome; the duration of sensory block was defined as the time for regression of the sensory from the maximum block height to the T10 dermatome as evaluated by pinprick. The maximum level of sensory block was evaluated by pinprick after 20 min following completion of injection. Motor block was assessed by the modified Bromage score (0) No motor loss; (1) Inability to flex the hip; (2) Inability to flex the knee; and (3) Inability to flex the ankle; the onset of motor block was defined as the time from intrathecal injection to Bromage block 1, whereas the duration of motor block was assumed when the modified Bromage score was zero. The duration of spinal anesthesia was defined as the period from spinal injection to the first occasion when the patient complained of pain in the post-operative period. Patients were preoperatively instructed to use the verbal rating scale (VRS) from 0 to 10 (0) No pain, and (10) Maximum imaginable pain for pain assessment. If the VRS exceeded four and the patient requested a supplement analgesic, diclofenac Na sup. 100 mg every 8 h was given to relieve the post-operative pain as needed (q 8 h PRN). If the time course following the administration of diclofenac Na decreased to less than 8 h and the patient made another request for supplement analgesic, pethidine 25 mg IV was given.

The mean arterial pressure (MAP), heart rate (HR), and peripheral oxygen saturation ( $\text{SpO}_2$ ) were recorded by an anesthetist blinded to the patient Group 5 min before the intrathecal injection and also 2, 4, 6, 8, 10, 15, and 20 min after injection. If systolic blood pressure (SBP) was 20% below the baseline (5 min before the intrathecal injection) or less than 90 mmHg, and ephedrine 5 mg was administered intravenously. Furthermore, if HR was <50 beats/min, 0.5 mg of atropine sulfate was administered intravenously. A follow-up telephone call was made 24 h after surgery and again 1 and 6 months later, during which the patients were asked about the side effects and dysesthesia of the lower limbs or buttocks. Based on the previous studies with a power of 0.9 and an  $\alpha$  equal to 0.05, we included 30 patients in each group to allow for dropouts and protocol violations. Continuous variables were tested for normal distribution by the Kolmogorov–Smirnov test. Parametric data were expressed as mean and standard deviation (SD) and analyzed by independent *t*-test. Non-parametric data



were expressed as median and interquartile range (IQR) and analyzed using the Mann–Whitney *U*-test. The effect of time on hemodynamic parameters was analyzed using repeated measurement analysis of variance. The Chi-square test was used to analyze the incidence of side effects. Pain scores, motor scores, and sensory level were evaluated within the groups using the Wilcoxon's signed-rank test.  $P < 0.05$  was considered as significant, statistically.

## RESULTS

A total of 96 patients initially enrolled in this study, six patients had to be excluded because of logistical reasons or other violations of the study protocol. Ninety patients were included and randomly assigned to their treatment groups [Figure 1].

There were no significant differences in age, height, and weight among the three groups. The duration of surgery was also similar [Table 1].

The mean onset of sensory block was  $90 \pm 23$  sec in Group C  $95.33 \pm 39.17$  sec in Group F and  $78.5 \pm 26.00$

sec in Group P. The difference between Group C versus Groups F ( $P = 0.523$ ) and P ( $P = 0.075$ ) was insignificant. Similarly, this difference in Groups F and P was also insignificant ( $P = 0.055$ ). The mean duration of sensory block in Group C ( $169.66 \pm 25.69$  min) was longer than Group F ( $122.23 \pm 32.78$  min) and Group P ( $133.53 \pm 32.68$  min). The difference between Group C versus Groups F ( $P < 0.001$ ) and P ( $P < 0.001$ ) was significant, but the difference between Groups F and P ( $P = 0.186$ ) was found to be insignificant. The mean onset of motor block was  $81.33 \pm 26.71$  in Group C,  $80.00 \pm 30.62$  in Group F, and  $81.83 \pm 27.21$  sec in Group P. The difference between Group C versus Groups F ( $P = 0.858$ ) and P ( $P = 0.943$ ) was insignificant. Similarly, the difference in Groups F and P was insignificant ( $P = 0.807$ ). The median value found for the maximum height of block was T6 for all three groups. The mean duration of motor blockade time was significantly longer in Group C ( $182.66 \pm 33.12$  min) than F ( $136.76 \pm 28.85$  min) and P groups ( $143.16 \pm 33.94$ ). The difference in mean duration of motor blockade time between Group C versus F ( $P < 0.001$ ) and P groups ( $P < 0.001$ ) was significant whereas no significant difference in duration of motor block between F and P groups was

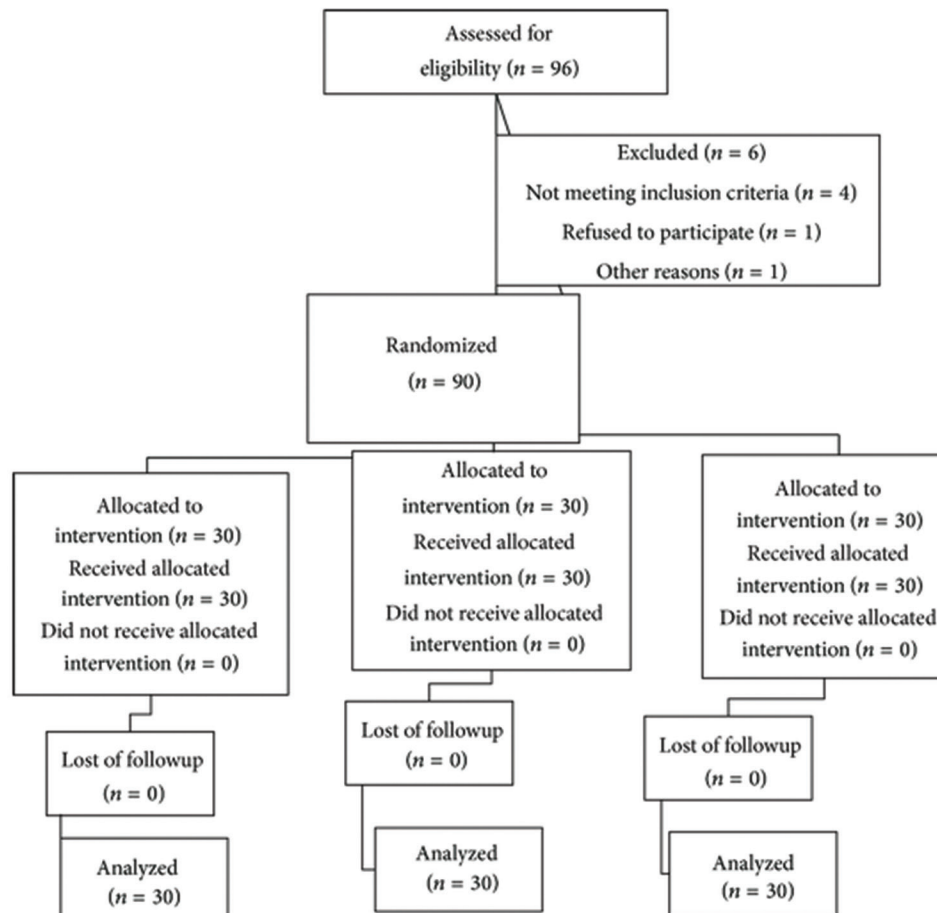


Figure 1: Consort flow of diagram



found ( $P = 0.435$ ). The duration of anesthesia in clonidine group ( $275.10 \pm 96.09$ ) was longer compared to the placebo ( $211.73 \pm 74.80$ ) and fentanyl ( $192.33 \pm 30.36$ ) groups.

As shown in Table 2, the patients who were given clonidine had a significantly prolonged duration of anesthesia compared with control ( $P < 0.001$ ) and F groups ( $P = 0.006$ ). As to the duration of anesthesia, the mean

time to first analgesic request was also significantly longer in Group C ( $519.44 \pm 86.25$ ) than in Groups F ( $277.88 \pm 94.25$ ) and P ( $235.43 \pm 22.35$  min). This difference between Group C versus F ( $P < 0.001$ ) and P groups ( $P < 0.001$ ) was significant. Likewise, the difference between Groups F and P was also significant ( $P = 0.022$ ). The total number of analgesic request by patients during 24 h after surgery in clonidine group was significantly smaller than in control group ( $P = 0.002$ ). Total analgesic consumption during 24 h after surgery failed to demonstrate a significant difference between F and C groups ( $P = 0.318$ ).

As shown in Table 3, the mean variation of MAP and HR was defined as the difference between the highest and the lowest MAP and HR in each patient.

The mean variation of MAP was  $50.70 \pm 21.65$  in Group C,  $33.73 \pm 10.73$  in Group P, and  $50.00 \pm 76.14$  in Group

**Table 1: Demographic data for three study groups.**

| Groups                    | Group C<br>(n = 30) | Group F<br>(n = 30) | Group P<br>(n = 30) |
|---------------------------|---------------------|---------------------|---------------------|
| Age (years)               | 30.43±3.70          | 30.20±5.41          | 29.16±5.11          |
| Weight (kg)               | 88.5±15.4           | 88.5±13.6           | 89.7±11.9           |
| Height (cm)               | 166±4.6             | 160±8.4             | 162±6.1             |
| Duration of surgery (min) | 85.63±15.70         | 79.16±20.11         | 81.70±18.76         |

Values are presented as mean±SD. C: Clonidine, F: Fentanyl, and P: Placebo. There are no significant differences among the three groups

**Table 2: Characteristics of spinal anesthesia**

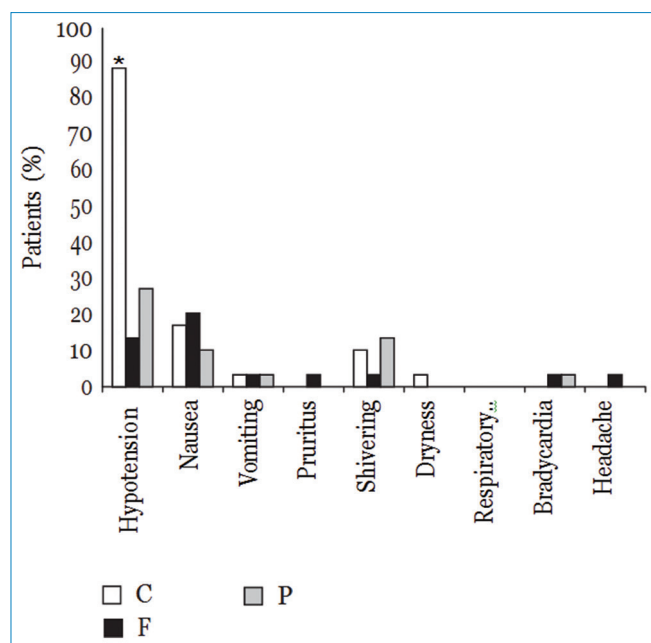
| Groups  | Group C (n = 30) | Group F (n = 30) | Group P (n = 30) | P      |
|---|------------------|------------------|------------------|--------|
| Onset time of sensory block (second)                              | 90±23            | 95.33±39.17      | 78.5±26.00       | NS     |
| Duration of sensory block (min)                                   | 169.66±25.69     | 122.23±32.78     | 133.53±32.68     | <0.001 |
| Onset time of motor block (second)                                | 81.33±26.71      | 80.00±30.62      | 81.83±27.21      | NS     |
| Duration of motor block (min)                                     | 182.66±33.12     | 136.76±28.85     | 143.16±33.94     | <0.001 |
| Time to first request of analgesic (min)                          | 519.44±86.25     | 277.88±94.25     | 235.43±22.35     | <0.001 |
| Duration of spinal anesthesia                                     | 275.10±96.09     | 211.73±74.80     | 192.33±30.36     | <0.001 |
| Total ephedrine requirement                                       | 10.83±5.26       | 4.16±5.84        | 2.16±5.52        | <0.001 |
| Total analgesic consumption in 24 h (number of analgesic request) | 2 (2-2)          | 2 (1-3)          | 3 (2-3)          | 0.011  |

Values are presented as mean±SD or median IQR C: Clonidine, F: Fentanyl, and NS: Non-significant ( $P > 0.05$ ).

**Table 3: Hemodynamic variables in the three groups.**

| Groups              | Group C (n = 30) | Group P (n = 30) | Group F (n = 30) | P      |
|---------------------|------------------|------------------|------------------|--------|
| MAP 5 min before SA | 97.23±7.62       | 94.76±8.82       | 95.05±5.36       | NS     |
| MAP 2 min after SA  | 73.25±17.46      | 85.78±11.13      | 74.76±15.95      | 0.003  |
| MAP 4 min after SA  | 69.54±15.39      | 79.57±11.69      | 74.93±13.71      | 0.021  |
| MAP 6 min after SA  | 89.84±34.82      | 73.98±13.39      | 82.12±12.61      | 0.030  |
| MAP 8 min after SA  | 91.72±20.19      | 79.08±13.00      | 87.54±10.57      | 0.006  |
| MAP 10 min after SA | 92.96±16.70      | 75.63±12.55      | 89.11±7.93       | <0.001 |
| MAP 15 min after SA | 92.52±17.22      | 78.92±11.95      | 92.66±9.09       | 0.001  |
| MAP 20 min after SA | 87.20±15.81      | 78.14±8.94       | 107.70±76.69     | 0.041  |
| MAP 25 min after SA | 83.64±17.55      | 75.21±9.31       | 86.38±4.66       | 0.001  |
| MAP 30 min after SA | 78.43±13.34      | 66.58±8.87       | 89.73±5.56       | <0.001 |
| HR 5 min before SA  | 99.40±11.88      | 97.90±15.40      | 98.73±13.61      | NS     |
| HR 2 min after SA   | 96.46±16.05      | 101.20±19.13     | 101.73±16.15     | NS     |
| HR 4 min after SA   | 89.13±13.62      | 96.46±17.38      | 97.26±15.03      | NS     |
| HR 6 min after SA   | 87.50±13.43      | 97.16±19.61      | 98.90±17.58      | 0.024  |
| HR 8 min after SA   | 84.40±10.87      | 95.06±20.14      | 92.73±17.36      | 0.037  |
| HR 10 min after SA  | 87.36±13.29      | 96.23±22.76      | 91.70±13.68      | NS     |
| HR 15 min after SA  | 83.46±10.48      | 101.76±17.82     | 89.13±14.32      | <0.001 |
| HR 20 min after SA  | 85.56±12.38      | 102.26±20.37     | 88.26±14.49      | <0.001 |
| HR 25 min after SA  | 88.73±11.46      | 99.50±18.04      | 90.86±12.33      | 0.011  |
| HR 30 min after SA  | 86.76±9.20       | 97.83±17.07      | 89.50±11.36      | 0.004  |

Data are presented as mean±SD. C: Clonidine, F: Fentanyl, P: Placebo, MAP: Mean arterial blood pressure (mm Hg), HR: Heart rate (bpm), SA: Spinal anesthesia, and NS: Non-significant.



**Figure 2: Side effects observed in three study groups. C: Clonidine, F: Fentanyl, and P: Placebo. Significant difference between the three groups**

F. This difference between Groups C versus P ( $P < 0.001$ ) was significant whereas no significant difference between F versus C ( $P = 0.962$ ) and P ( $P = 0.251$ ) groups was found. The overall difference in ephedrine requirement between the three groups was significant, statistically ( $P < 0.001$ ). The mean variation of HR was  $34.33 \pm 9.7$  in Group C,  $33.43 \pm 10.73$  in Group P, and  $32.86 \pm 10.17$  in Group F. The difference between Group C versus P ( $P = 0.761$ ) and F ( $P = 0.571$ ) groups was also insignificant as it was for the difference between Groups F and P ( $P = 0.851$ ). As shown in Figure 2, the three groups were found to have no significant difference in terms of other intraoperative and post-operative side effects including pruritus, nausea, vomiting, and headache, shivering, and respiratory depression.

No patient in either group showed any sensory or motor complications within the next six months follow-up after surgery. All newborns in our study were free of any adverse effect.

## DISCUSSION

Based on the data found in our study, it was concluded that administration of intrathecal clonidine  $75 \mu\text{g}$  with bupivacaine prolonged intraoperative anesthesia and the time to first analgesic request after cesarean delivery compared to fentanyl and control groups. These findings are consistent with the previous studies.<sup>[18,19]</sup> Analgesic properties of clonidine have been shown to depend on the activation of  $\alpha_2$  receptors located in the dorsal horn. Presynaptic

stimulation of  $\alpha_2$  receptors inhibits neurotransmitter release and postsynaptic stimulation prevents neuronal transmission through hyperpolarization.<sup>[10]</sup>

The second observation which should be emphasized is that although intrathecal clonidine  $75 \mu\text{g}$  with bupivacaine prolonged intraoperative anesthesia and the time to first analgesic request compared to fentanyl yet the total analgesic consumption in the first 24 h post-operative was similar in fentanyl and clonidine groups after elective cesarean delivery. The possible explanation for this finding is that the analgesic effect of clonidine follows a dose-dependent manner. Eisenach et al. reported that a dose of  $150 \mu\text{g}$  clonidine is required to observe antihyperalgesic effect, while a lower dose ( $50 \mu\text{g}$ ) is ineffective.<sup>[8,18,20]</sup> The selected dose of intrathecal clonidine in current study was based on several reasons. First, intrathecal clonidine displays the risk of adverse intraoperative hemodynamic effects. Rochette et al. showed that clonidine at a dose of  $1 \mu\text{g}/\text{kg}$  was not associated with hemodynamic disturbance.<sup>[21]</sup> Furthermore, Bajwa et al.<sup>[22]</sup> found that the optimal dose for clonidine to produce effective analgesia without inducing hypotension in emergency cesarean section is  $37.5 \mu\text{g}$ . However, most studies have reported that although clonidine at a lower intrathecal dose  $< 0.5 \mu\text{g}/\text{kg}$  body weight was devoid of its diverse side effects, at the same time, the antinociceptive effect of this drug was also reduced significantly.<sup>[7,12-14,16]</sup> Second, it is reported that intrathecal clonidine possesses an analgesic plateau effect at  $75 \mu\text{g}$  and higher doses could only increase the duration but not the intensity of analgesia.<sup>[8]</sup>

The third finding which should be considered is that intrathecal clonidine clearly increases the duration of both sensory block and motor block as well as post-operative pain relief. This finding is also consistent with the previous studies.<sup>[18,23,24]</sup> The mechanism of clonidine-induced potentiation of sensory block in spinal anesthesia is reported to be dependent on presynaptic (decrease in transmitter release) and postsynaptic (increase in hyperpolarization) action.<sup>[25,26]</sup>

The fourth finding which should be taken into account is that transient hypotension episodes and vasopressor requirement in clonidine group were significantly greater than F and P groups, a finding in agreement with the previous studies.<sup>[27,28]</sup> Except for sympatholytic action of clonidine and profound analgesia which also reduces sympathetic activity, no other clear explanation is available. In contrast, some studies have reported that clonidine at doses between  $37.5$  and  $150 \mu\text{g}$  failed to cause a significant decrease in blood pressure when added to a high dose of bupivacaine ( $18 \text{ mg}$ ).<sup>[13,29]</sup> However, these apparently controversial findings may be due to either the difference in bupivacaine and clonidine doses or dissimilarity in population and the type of surgeries. The fifth observation which should be noted

is that clonidine lacks the ability to prevent post-spinal shivering; by contrast, it is confirmed that clonidine, when administered intravenously, is an effective drug to prevent shivering in patients undergoing spinal anesthesia,<sup>[30,31]</sup> a finding compatible with that found in a study by Jeon *et al.*<sup>[32]</sup> The possible reason for this finding could be attributed to the inability of clonidine to inhibit afferent thermal conduction at the level of spinal cord. All newborns, in our study, were free of any adverse effect. We concluded that intrathecal clonidine 75 µg with bupivacaine prolonged intraoperative anesthesia and the time to first analgesic request compared to fentanyl; however, the total analgesic consumption in the 1<sup>st</sup> 24 h post-operative was similar in fentanyl and clonidine groups following elective cesarean delivery. Further studies are needed to evaluate the analgesic efficacy of clonidine with other neuraxial drug combinations such as epinephrine, ketamine, and magnesium to provide better analgesia and reduce the incidence and severity of side effects.

## CONFLICTS OF INTEREST

The authors of this paper have not declared any conflicts of interest.

## REFERENCES

- Chaney MA. Side effects of intrathecal and epidural opioids. *Can J Anaesth* 1995;42:891-903.
- Khezri MB, Yaghobi S, Hajikhani M, Asefzadeh S. Comparison of postoperative analgesic effect of intrathecal magnesium and fentanyl added to bupivacaine in patients undergoing lower limb orthopedic surgery. *Acta Anaesthesiol Taiwan* 2012;50:19-24.
- Safari F, Dabbagh A, Sharifnia M. The effect of adjuvant midazolam compared with fentanyl on the duration of spinal anesthesia with 0.5% bupivacaine in opium abusers. *Korean J Anesthesiol* 2012;63:521-6.
- Gissen AJ, Gugino LD, Datta S, Miller J, Covino BG. Effects of fentanyl and sufentanil on peripheral mammalian nerves. *Anesth Analg* 1987;66:1272-6.
- Hindle A. Intrathecal opioids in the management of acute postoperative pain. *Continuing Educ Anaesth Crit Care Pain* 2008;8:81-5.
- Laulin JP, Celerier E, Larcher A, Le Moal M, Simonnet G. Opiate tolerance to daily heroin administration: An apparent phenomenon associated with enhanced pain sensitivity. *Neuroscience* 1999;89:631-6.
- Eisenach JC, de Kock M, Klimscha W. Alpha(2)-adrenergic agonists for regional anesthesia. A clinical review of clonidine (1984-1995). *Anesthesiology* 1996;85:655-74.
- Eisenach JC, Hood DD, Curry R. Relative potency of epidural to intrathecal clonidine differs between acute thermal pain and capsaicin-induced allodynia. *Pain* 2000;84:57-64.
- Lavand'Homme PM, Roelants F, Waterloos H, Collet V, de Kock MF. An evaluation of the postoperative antihyperalgesic and analgesic effects of intrathecal clonidine administered during elective cesarean delivery. *Anesth Analg* 2008;107:948-55.
- Yoshimura M, Furue H. Mechanisms for the anti-nociceptive actions of the descending noradrenergic and serotonergic systems in the spinal cord. *J Pharmacol Sci* 2006;101:107-17.
- Guevara-Lopez U, Aldrete JA, Covarrubias-Gomez A, Hernandez-Pando RE, Lopez-Munoz FJ. Absence of histological changes after the administration of a continuous intrathecal clonidine in Wistar rats. *Pain Pract* 2009;9:122-9.
- D'Angelo R, Evans E, Dean LA, Gaver R, Eisenach JC. Spinal clonidine prolongs labor analgesia from spinal sufentanil and bupivacaine. *Anesth Analg* 1999;88:573-6.
- Chiari A, Lorber C, Eisenach JC, Wildling E, Krenn C, Zavrsky A, *et al.* Analgesic and hemodynamic effects of intrathecal clonidine as the sole analgesic agent during first stage of labor. *Anesthesiology* 1999;91:388-96.
- Sia AT. Optimal dose of intrathecal clonidine added to sufentanil plus bupivacaine for labour analgesia. *Can J Anaesth* 2000;47:875-80.
- Yanagitate F, Hamaya Y, Dohi S. Clonidine premedication reduces maternal requirement for intravenous morphine after cesarean delivery without affecting newborn's outcome. *Reg Anesth Pain Med* 2001;26:461-7.
- Gautier PE, de Kock M, Fanard L, van Steenberge A, Hody JL. Intrathecal clonidine combined with sufentanil for labor analgesia. *Anesthesiology* 1998;88:651-6.
- Moher D, Schulz KF, Altman DG. The CONSORT statement: Revised recommendations for improving the quality of reports of parallel group randomized trials. *BMC Med Res Methodol* 2001;1:2.
- Elia N, Culebras X, Mazza C, Schiffer E, Tramer MR. Clonidine as an adjuvant to intrathecal local anesthetics for surgery: Systematic review of randomized trials. *Reg Anesth Pain Med* 2008;33:159-67.
- Wiles MD, Nathanson MH. Local anaesthetics and adjuvants-future developments. *Anaesthesia* 2010;65:22-37.
- Eisenach JC, Hood DD, Curry R. Intrathecal, but not intravenous, clonidine reduces experimental thermal or capsaicin-induced pain and hyperalgesia in normal volunteers. *Anesth Analg* 1998;87:591-6.
- Rochette A, Troncin R, Raux O, Dadure C, Lubrano JF, Barbotte E, *et al.* Clonidine added to bupivacaine in neonatal spinal anesthesia: A prospective comparison in 124 preterm and term infants. *Paediatr Anaesth* 2005;15:1072-7.
- Bajwa SJ, Bajwa SK, Kaur J, Singh A, Singh A, Parmar SS. Prevention of hypotension and prolongation of postoperative analgesia in emergency cesarean sections: A randomized study with intrathecal clonidine. *Int J Crit Illn Inj Sci* 2012;2:63-9.
- Murphy DB, McCartney CJ, Chan VW. Novel analgesic adjuncts for brachial plexus block: A systematic review. *Anesth Analg* 2000;90:1122-8.
- Pitkanen M, Rosenberg PH. Local anaesthetics and additives for spinal anaesthesia-characteristics and factors influencing the spread and duration of the block. *Best Pract Res Clin Anaesthesiol* 2003;17:305-22.
- Gaumann DM, Brunet PC, Jirounek P. Clonidine enhances the effects of lidocaine on C-fiber action potential. *Anesth Analg* 1992;74:719-25.
- Erne-Brand F, Jirounek P, Drewe J, Hampel K, Schneider MC. Mechanism of antinociceptive action of clonidine in nonmyelinated nerve fibres. *Eur J Pharmacol* 1999;383:1-8.
- Dobrydnjov I, Axelsson K, Gupta A, Lundin A, Holmstrom B, Granath B. Improved analgesia with clonidine when added to local anesthetic during combined spinal-epidural anesthesia for hip arthroplasty: A double-blind, randomized and placebo-controlled study. *Acta Anaesthesiol Scand* 2005;49:538-45.
- Merivirta R, Kuusniemi K, Jaakkola P, Pihlajamaki K, Pitkanen M. Unilateral spinal anaesthesia for outpatient surgery: A comparison between hyperbaric bupivacaine and bupivacaine-clonidine combination. *Acta Anaesthesiol Scand* 2009;53:788-93.
- Strebel S, Gutzler JA, Schneider MC, Aeschbach A, Kindler CH. Small-dose intrathecal clonidine and isobaric bupivacaine for orthopedic surgery: A dose-response study. *Anesth Analg* 2004;99:1231-8.
- Capogna G, Celleno D. IV Clonidine for post-extradural shivering in parturients: A preliminary study. *Br J Anaesth* 1993;71:294-5.
- Horn EP, Werner C, Sessler DI, Steinfath M, Esch JS. Late intraoperative clonidine administration prevents postanesthetic shivering after total intravenous or volatile anesthesia. *Anesth Analg* 1997;84:613-7.
- Jeon YT, Jeon YS, Kim YC, Bahk JH, Do SH, Lim YJ. Intrathecal clonidine does not reduce post-spinal shivering. *Acta Anaesthesiol Scand* 2005;49:1509-13.

**How to cite this article:** Dwivedi G. Post-operative Analgesic Effect of Intrathecal Clonidine versus Fentanyl Added to Bupivacaine in Patients Undergoing Cesarean Section: A Prospective comparative Study. *International Journal of Scientific Study*. 2014;1(4):67-72.

**Source of Support:** Nil, **Conflicts of Interest:** None declared.