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# Polio Eradication in India: A Journey From a Dream to Reality

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The unachievable task of preventing wild poliovirus (WPV) transmission has been achieved and sustained in India already for more than three years.<sup>1</sup> Extensive and exhaustive search for WPVs among children has proved negative since January 13, 2011. On February 25, 2012, the World Health Organization (WHO) removed India from the list of 'polio-endemic' countries.<sup>2</sup> India's success has silenced critics who predicted that polio itself was non-eradicable; or that polio was not eradicable in India with its low standards of sanitation and hygiene; or that wild polioviruses (WPVs) cannot be eradicated using live oral poliovirus vaccine (OPV); or that polio was not worth eradicating as it was a low priority disease but with very high cost of eradication. Each view point had an element of rationale that had been long neglected by India's policy makers, resulting in delays in interruption of WPVs, originally targeted for 2000, but achieved 11 years later.<sup>3</sup>

True polio eradication is zero transmission of not only WPVs but also vaccine polioviruses.<sup>4,5</sup> The elimination of WPVs using OPV is the first phase, and elimination of vaccine polioviruses using inactivated poliovirus vaccine (IPV) is the second phase.<sup>6-8</sup> This concept originated in India and WHO has very recently endorsed it.<sup>9</sup> India will have to implement the second phase in the near future.

During the 1970s, 1980s and continuing into early 1990s, polio was hyperendemic in India, with 200,000 to 400,000 cases annually.<sup>10</sup> Today we are free from WPVs. The earliest attempt to isolate poliovirus was by CG Pandit (Deshpande JM, personal communication, 2012). The second polio research unit in India was the Enterovirus Laboratory, established in 1964, in the Christian Medical College (CMC), Vellore, Tamil Nadu. Studies from both centres showed that the country was hyperendemic for poliovirus infection. In longitudinal community survey the prevalence of subclinical poliovirus infection in Vellore town was 242 per 100 child-years below 5 years.<sup>11</sup> The incidence of paralytic polio in India was 24 cases/100,000

population/year, calculated annual incidence of clinical polio infection was >40/100,000 population.<sup>12</sup> Thus, polio was a huge problem, both humanitarian and economic.<sup>13</sup>

The city corporation introduced polio immunization using imported OPV in Mumbai in 1964 and in Vellore by CMC in 1965. Low vaccine efficacy (VE) was corroborated by counting children developing poliomyelitis in spite of the recommended 3 doses of OPV.<sup>14</sup> WHO launched EPI in 1974 and India adopted it in 1978. Even after introduction of OPV in EPI, the number of polio cases did not fall for about 10 years.<sup>15</sup> In 1981, there was a nation-wide polio epidemic, in the background of already hyperendemic status. The next nation-wide epidemic was in 1987-1988. During this decade, after introduction of OPV in EPI, the estimated annual numbers of cases were 200,000 to 400,000; translated to daily averages, some 500 to 1000 children were developing polio paralysis each day. Assuming annual productivity loss of 50 per cent of per capita gross national product (amounting to INR 50,000), resulting in loss to national economy of INR 15 lakhs per paralyzed child, extended over 30 years of productivity, for 300,000 victims of polio, the total annual loss to the nation was INR 45,000 crore.<sup>13</sup>

Many cases of polio reported during the 1970s and 1980s were in children who had already taken 3 doses of OPV, on account of the low VE of OPV. In a visionary experiment, 'pulse immunization' using OPV was conducted in Vellore, making it the first Indian town to be polio-free; the concept and the name of pulse immunization were created in Vellore.<sup>16</sup> The World Health Assembly (WHA) resolved in 1988 to target polio for global eradication by 2000 and India was a signatory in support of the decision.<sup>17</sup> The four strategic components promoted by WHO were to reach and maintain high routine OPV coverage, to top up immunization with supplementary doses of OPV (Supplementary Immunization Activity, SIA), to establish systematic surveillance of polio with laboratory virological

support, and to use local area mop up OPV campaigns to interrupt any remaining chains of WPV transmission.<sup>18</sup>

By 1990 when 80 per cent 3-dose OPV coverage was achieved, the burden of polio had begun declining in India. The estimated number of polio cases in 1994 was 50,000; that amounted to an average of 137 children getting paralyzed every day.<sup>15</sup> Eventually, the number of reported cases of polio declined to 3,142 in 1995.<sup>19</sup> India's efforts to implement it started on a national level only in 1995-1996. In 1995, the Global Polio Eradication Initiative (GPEI) spearheaded by WHO in partnership with UNICEF, Centers for Disease Control of USA and Rotary International designed a modus operandi for India giving rise to a joint project the National Polio Surveillance Project (NPSP). India had so far not managed to bring polio under control status, but expected to eliminate its transmission within the next 4-5 years. The two factors that stood in the way of control, namely 'failure to vaccinate' and 'failure of vaccine'. However, polio eradication activities were conducted in parallel with UIP, as yet another vertical national project.

Pulse Polio Immunization (PPI) was later expanded nationally in 1995 during which a total of 88 million under-3 children were immunized. This resulted in further decline in number of polio cases to 1005 reported in 1996.<sup>20</sup> Till 1998-1999, PPI consisted of vaccination of children at fixed booths on two National Immunization Days (NIDs), separated by six weeks, during the winter months. After the nation-wide PPI campaigns in 1995-1996, 1996-1997, 1997-1998 and 1998-1999, WPV 2 stopped circulating by October 1999. In view of missing goal of reaching zero incidence of polio by 2000, a plan to further intensify PPI was adopted in 2000. Four nation-wide PPI rounds were conducted in October, November, December of 2000 and January 2001, followed by two sub-national rounds in 8 States (Assam, Bihar, Gujarat, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal) that had continuing polio and had low EPI coverage.<sup>21</sup> It was obvious that as near 100 per cent children as possible had to be vaccinated repeatedly for success. During and since 2000, therefore, another tactic was applied: in addition to booth immunization, a house-to-house search of missed children and vaccinating them on the next 2-3 days following each national and sub-national PPI.<sup>22</sup>

In 2000 and 2001 there were only 265 and 268 cases due to WPV 1 and 3, for more than 99 per cent decline in India from the 1980s. Thus polio was effectively controlled by 2000, but WPV transmission was not interrupted. WHO, in association with NPSP, strengthened several existing virology laboratories and networked them for virological surveillance of polio. Two consecutive-day stool samples were collected from each child with AFP and submitted

to the designated laboratory under cold chain conditions. Each poliovirus isolate was analysed to distinguish vaccine virus from WPV. Only if WPV was detected was the child diagnosed with polio. By 2001, WPV circulation was limited essentially to the two northern States of UP and Bihar. GOI took polio eradication as an issue of national prestige, and declared 2005 as the target year in its National Health Policy. Yet, 2002 saw an outbreak with 1,600 cases, nearly 87 per cent of cases detected globally, mostly of type 1, and 1,363 (85%) cases in UP and Bihar alone.<sup>23</sup> In 2003, the 'under-served strategy' was introduced as part of better communication efforts in Uttar Pradesh to reach out to and get support of marginalized sections of the society especially those living in poor Muslim communities, lacking access to basic sanitary and healthcare services, and were often missed in tOPV rounds, and thus were more likely to receive fewer doses.<sup>24</sup> An improvement in poliovirus surveillance quality was seen in 2004. It became obvious that huge numbers of people migrate for employment, mostly seasonal, and their children by and large missed receiving tOPV doses in EPI and in PPI. So the 'transit vaccination' strategy was launched, with teams stationed at bus stands, railway stations, highways, markets and at congregation sites and provided polio vaccine to eligible children. Beginning in 2005, NPSP and GOI and partners intensified eradication efforts with careful monitoring and implementation of immunization and surveillance activities, with particular attention paid to detailed local level micro planning and by expanding the number of AFP reporting units throughout the country.

Many children got polio in spite of seven or 10 or even 15 doses of tOPV. In 2005, monovalent OPV type 1 (mOPV-1) and type 3 (mOPV-3) were licensed based on an early Indian study showing 2.5 to 3 times higher VE of mOPV-1 and mOPV-3 than that of tOPV.<sup>25</sup> In December 2005, mOPV3 was first used in eradication activities in western UP, after detection of WPV3 in Moradabad district.<sup>26</sup> The second problem was inadequate coverage of under-five children with OPV doses- 'failure to vaccinate'. Routine vaccination coverage with 3 doses of OPV continued to be low in the polio-endemic States. To counter both factors, the number of PPI campaigns was increased to 10 each year from 2005 and the 'under-served' and 'transit vaccination' strategies were sustained. Yet, UP and Bihar remained the sites of ongoing WPV transmission in India. There was a polio outbreak in 2006, with 648 cases of type 1 and 28 of type 3, again most cases occurring in UP and Bihar. Based on recommendations of the Global Advisory Committee on Polio Eradication and IEAG, India prioritized elimination of WPV1 from 2006/2007.<sup>27</sup> Moreover, the next anticipated WPV1 outbreak year was 2010 and IEAG wanted to ensure that such an outbreak would not occur in 2010. That seemed to have worked and

ultimately areas that previously had the highest incidence of WPV1 recorded lowest numbers in subsequent years and finally its transmission ceased in January 2011.

In November 2009, the IEAG declared that 107 blocks in western UP and central Bihar were holding the key to eradication in India. In late 2009, India had planned to conduct additional mOPV3 SIA rounds as needed to prevent further WPV3 outbreaks while continuing to use mOPV1 for most SIAs.<sup>28</sup> Towards the end of 2009, while WPV1 had virtually disappeared, while WPV3 was still causing outbreaks in spite of intensive efforts over many years, repetitive and massive OPV campaigns, improved tactics and large expenditure.<sup>27</sup> GOI proposed a reduction in the tempo of eradication efforts and to accept 'control' of WPVs as the realistic goal that could be achieved.<sup>29</sup> Fortunately, IEAG guided the battle against polio with continued vigor. Only 42 WPV cases were detected in 2010. This emboldened the GOI to recommend responding to each case of polio as a public health emergency.<sup>30</sup> Finally, there was only one case in 2011 and the responsive mop-up immunization was exemplary. The introduction of bOPV in SIAs beginning in January 2010 contributed substantially to the sustainment of simultaneous reduction in WPV1 and WPV3 cases. A clinical trial earlier had demonstrated the superiority of bOPV compared with tOPV and non-inferiority compared with mOPV1 and mOPV3.<sup>31</sup> Thus it can be concluded that India has achieved polio free status in January 2011, and is maintaining it till date, but the battle is still not finished India need to focus on maintain its status as polio free country by implementing strategies for immunizing children through IPV (stage 2 of polio eradication) and treating each case as medical emergency.

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# Knowledge, Attitude and Practices about Contraceptive among Married Reproductive Females

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## Abstract

**Introduction:** Unintended pregnancy, human immunodeficiency virus and other sexually transmitted diseases are an important public health issue because they are associated with maternal, foetal, neonatal and other adverse outcome. Therefore preventing unintended pregnancy is the important concern.

**Objective:** To assess the knowledge, attitude and practices of contraceptive among married reproductive females.

**Material and method:** The present cross sectional study was carried out at urban health training centre of tertiary care hospital from 16th March to 16th May 2013. Total 205 married reproductive females were enrolled in the study.

**Result:** In the study 71.22% females had awareness regarding any method of contraception. Knowledge about emergency contraceptive was quiet low (6.83%). The most common source of information on contraception was media, both printed and electronic. The most common reason for discontinuation of family planning methods was fear of side effects.

**Conclusion:** Effort should be made to educate the public about the safety and convenience of modern, long term, reversible methods of contraception among both in health care professional and public.

**Keywords:** Attitude, Contraceptives, Emergency contraceptives, Knowledge, Practices, Reproductive female

## INTRODUCTION

India is the second most populous country in the world having a rapidly growing population which is currently increasing at the rate of 16 million each year.<sup>1</sup> Uncontrolled population growth is recognised as the single most important impediment to national development. Instead of the fact that India was the first country in the world to implement a national population control programme in 1952, we are still struggling to contain baby boom. A lot of efforts and resources have gone into the national family welfare programme but the returns are not commensurate with the inputs to control the population.<sup>2</sup>

The Indian family programme was initiated more than 50 years ago in 1952 and was adopted as an extension approach in 1996, according to the service statistics of the programme contraceptive prevalence increased from

12% at the end of March 1971 to nearly 50% in March 1991. The rise in contraceptive practices however did not match the significant fall in estimated birth rate.<sup>3</sup> The dynamics of contraceptive use among women in postpartum period i.e. the period of a year after the birth of a child, is of interest at the family planning programme level, since the delay of contraceptive use until the return of menstruation might increase of unwanted pregnancy.<sup>4</sup> Further, unintended pregnancy poses a major challenge to the reproductive health of young adults in developing countries like India. With the age decreasing of menarche and onset of sexual activity, youths are exposed early to unplanned and unprotected sexual intercourse leading to unwanted pregnancies and invariable abortions.<sup>5</sup> The essential aim of family planning is to prevent the unwanted pregnancies. An unwanted pregnancy may lead to an induced abortion. From the point of view of health, abortion outside the medical setting is one of the most dangerous

consequences of unwanted pregnancy.<sup>6</sup> Keeping this in mind one cross sectional study was carried out to assess the knowledge, attitude and practices of contraceptives of married reproductive females attending urban health training centre of Rama medical college hospital and research centre.

## AIM AND OBJECTIVE

- 1) To assess the knowledge, attitude and practices of contraception among married reproductive females.
- 2) Identify factors that are associated with non use of contraception.

## MATERIAL AND METHODS

A cross sectional study was conducted from March 16th to May 16th 2013 in urban health training centre of tertiary care hospitals. Married females between 15-45 years served as inclusion criteria, while unmarried females were excluded. The women interviewed were informed of the study and consent was taken. The participation was on voluntary basis. Questions regarding factors responsible for non use of contraception were also asked.

## RESULT

A total of 205 married females of reproductive age were enrolled in the study. Among the respondents, 62.57% had parity between 3-5, while 37.43% had parity higher than 5. Most of the study subjects had high school and intermediate school education. 61.8% of the study subjects belonged to social class IV i.e. lower middle (Prasad's scale).

Table 1 shows that 71.22% were aware of at least one of family planning methods. Dr. Ambareen Khan<sup>7</sup> et al (2011) mentioned that 81% had awareness regarding any method of contraception. The best known method of contraception was condoms (88.78%) followed by IUCD (77.07%) and OCP (72.19%). When the 71.22% respondents that had knowledge of contraception were asked about their source of information on contraception majority indicated that TV/ radio was their source of information. Tuladhar H et al<sup>8</sup> also observed that the most common source of information on contraception was media (55.5%), and both printed and electronic. In the present study knowledge about emergency contraception was quite low (6.83%).

**Table 1: Awareness and source of knowledge of contraception (n=205)**

Awareness of contraception		
Yes	146	71.22%
No	59	28.78%
*Methods known		
Condoms	182	88.78%
IUCD	158	77.07%
OCP	148	72.19%
Sterilization	106	51.71%
Injectables	62	30.24%
Awareness of emergency contraception		
Yes	14	6.83%
No	191	93.17%
*Source of information on contraceptive		
Health Professional	55	26.82%
TV/Radio/Newspaper etc.		
Brother/Sister/Friend	16	7.80%
Parents	3	1.46%

\*Multiple responses were allowed, so total is not 100%

**Table 2: Attitude towards use of contraception**

Attitude	N=205	%
Used to prevent pregnancy	146	71.22%
Used to prevent AIDS & STDs	64	31.21%
Used to control birth interval	4	1.95%

Multiple responses were allowed so that total is not 100%

Table 2 shows that 71.22% respondent thought that contraceptives were used to prevent pregnancy and about 31.21% thought that they could be used to prevent infections like AIDS. Only 1.95% thought that they could be used to control birth interval.

**Table 3: Contraceptive practice among respondents**

Not practiced any method	99	48.29%
Barrier	105	51.21%
Oral contraceptive pills	93	45.36%
IUDS	75	36.58%
Sterilization	6	2.92%
Injectables	0	0

Total is not 100%, as multiple responses were allowed

Contraceptive usage in our study was 51.71%. The gap between awareness and practices are seen to be prevalent across different reasons, where people are aware but reluctant to practices. The most common reason for non practice of contraception was fear of side effects. Other reasons for non practice were non access to health facility, preference of male child, religious beliefs, cost, and family pressure. Some respondent also felt that the process of acquiring contraceptive is often embarrassing. Sunita Ghike<sup>9</sup> also mentioned various for non-use of contraceptive methods. The main reason 59% were pressure from family that is from husband, in-laws, son preference and physical pressure.

**Table 4: Association between education and awareness of contraception**

Education status	No. of respondent	Awareness present
Illiterate	14	0
Primary	21	12
Middle	25	15
Higher secondary	51	41
Intermediate	58	43
Graduate	20	19
Post graduate	16	16

$\chi^2=11.81$ ,  $p<0.05$  Significant

It has been observed from Table 4 that as the education increased awareness of contraceptive also increased. Statistically it was also significant.

## CONCLUSION

Despite the high rate of sexual activity in the study group, the contraceptive usage rate is low. There is a need for aggressive advocacy about female reproductive health and dissemination of information on family planning methods among the reproductive females. Fear of side effects of contraception is one significant reasons for low compliance. This can be decreased by proper selection of contraception before starting its use and adequate follow up of women using contraception by the family planning services.

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# Patterns of Head Injury at Tertiary Care Hospital

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## Abstract

**Background:** The incidences of head injuries are growing with increasing number of high speed motor vehicle, more movement of the public and mechanization in industry. Head injury is most common causes of mortality in road traffic accidents and fall from Height. This is because of this special anatomical location of the Head in our body. This study is being taken into account to explore and evaluate pattern of Head injuries in victims reporting to the tertiary health care Hospital.

**Methods:** This study was a prospective analysis of head injury reporting to Accident & Emergency Department, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, India, a tertiary care Hospital during the period between 2011 to 2013.

**Results:** Most common cause of Head Injury victims reporting to the tertiary care hospital was Road Traffic Accident. Male victims were commonly getting Head injury due to Road Traffic Accident followed by Occupational Head injury, while Female victims were getting Head injury due to fall from Height followed by Road Traffic Accident. Common age group involved in Head injury was of 21-40 years, winter season (October to February) recorded maximum number of cases. It was clearly reflected that in Head injury, commonest lesion was scalp laceration followed by fractures to the skull (commonest in intra-cranial lesions). However, in the most cases, the skull fractures were found at multiple sites. Sub Dural Haemorrhage was commonest intra cranial hemorrhage followed by Sub Arachnoid haemorrhage in the case sustaining the Head Injury.

**Conclusion:** Road traffic accidents are most common cause involved in Head injury and the males are more prone to get head injury. By establishing good pre-hospital care and provision of efficient and well organized trauma services at Road side can minimize or prevent mortality aroused from road traffic accidents and fall from Height.

**Keywords:** Head Injury, Skull fracture, Road traffic accidents, Fall from Height and Tertiary Care Hospital

## INTRODUCTION

The incidence of head injury is growing with greater mechanization in industry and an increase in high-velocity transport. The injuries could be caused by a penetrating or blunt force either by direct violence or indirectly, such as a fall at the feet or buttocks. There is no clear relation to the severity of injury to skull bones and the extent of cerebral disorder.

Head Injury has been defined as, “morbid state, resulting from gross or subtle structural changes in the scalp, skull, and/ or the contents of the skull, produced by mechanical forces.”<sup>1</sup> It has also been defined as physical damage to the scalp, skull or brain produced by an external force.<sup>2</sup>

However, such force or impact, responsible for the injury, needs not to be applied directly to the head. Depending upon whether the dura-matter was torn or not, head injury may be termed as open or close type.<sup>3</sup> The extent and degree of injury to the skull and its contents is not necessarily proportional to the quantum of force applied to the head. According to Munro<sup>4</sup> “any type of cranio-cerebral injury can be caused by any kind of blow on any sort of head.”

Severe head injury, with or without peripheral trauma, is the commonest cause of death and/or disability up to the age of 45 years in developed countries.<sup>5</sup> This necessitated an in-depth analysis on the pattern of head Injury in road traffic accidents and other factors influencing the Pattern of head injuries.

Head injury is a major public health problem and has already attained epidemic proportions in India. As a result cranio-cerebral trauma places a huge financial and psychological burden upon the society. In India, the problem has become more acute over the last two decades, mainly due to increased vehicular traffic and poor maintenance on the road. The numbers of head injury cases are expected to increase further, due to urbanization, increase vehicular load and high speed bikes. The analysis of prognosis in head injury is crucial depending up on the specialized care team involved in their management.

## MATERIALS & METHODS

This study was a prospective analysis of included 500 patients of head injury reporting at the Emergency Department, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, India, during the period between 2011 to 2013. All the patients of head injury who were reported to Accident & Emergency Department were followed during their stay at the hospital from admission to discharge or death. Information was obtained regarding: Nature of head injury (Scalp, Skull, Intracranial), Mode of injury (Fall From Height, Road Traffic Accident, Assault, Occupational).

Head injury cases brought dead, i.e. death on the spot or died on the way to the hospital, Absconded or L.A.M.A cases from Hospital were not considered (Exclusion criteria).

## RESULTS

Distributions of different types of mode involved in head injury are shown in Table 1. Majority of victims are of Road Traffic Accident 298 (59.60%) cases followed by Fall From Height 101 (20.20%) cases. Assault 21 (4.20%) and Occupational Head injury 79 (15.80%) cases, whereas other like gunshot etc comprised of 1 (0.20%) cases. According to the Table 1 suffering from head injury to male victims were commonly due to Road Traffic Accident 250 (65.27%) cases followed by Occupational Head injury 78 (20.37%) cases, FFH and Assault were 36 & 18 cases (9.40% & 4.70%) respectively. Suffering from head injury to Female victims were commonly due to FFH 65 (55.56%) cases followed by Road Traffic Accident 48 (41.03%) cases, Assault and Occupational Head injury were 3 & 1 cases (2.56% & 0.85%) respectively.

Table 2 shows age and sex distribution in head injury cases. The peak incidence was observed in the age group 21-30 years comprising 45% of the cases. It was also observed that 21% belonged to the age group 31-40 years. Thus 66% of cases comprised of age group of 21-40 years in

the study. Individuals in the age group 0-10 years were the least affected i.e. in 4.2% of total cases. Out of 500 cases 383 (76.6%) were males while 117 (23.4%) were females. Thus a male: female ratio of 3.27:1 was observed.

**Table 1: Circumstance of head injury**

Cause of injury	Male	%	Female	%	No. of cases	%
RTA	250	65.27	48	41.03	298	59.60
FFH	36	9.40	65	55.56	101	20.20
Assault	18	4.70	3	2.56	21	4.20
Occupational	78	20.37	1	0.85	79	15.80
Other	1	0.26	0	0.00	1	0.20
Total	383	100.00	117	100.00	500	100.00

**Table 2: Age-wise & sex-wise distribution of head injury**

Age	Male	%	Female	%	Total	%
0-10	15	3.92	6	5.13	21	4.2
11-20	55	14.36	6	5.13	61	12.2
21-30	176	45.95	49	41.88	225	45
31-40	84	21.93	21	17.95	105	21
41-50	18	4.70	13	11.11	31	6.2
>50	35	9.14	22	18.80	57	11.4
Total	383	100.00	117	100.00	500	100

Effect of seasonal variation leading head injury in relation to number of victims is displayed in Table 3. Winter season (Oct. to Feb.) recorded maximum number 234 cases (46.8%). followed by summer season (March to Jun.) 137 cases (27.4%). in rainy season there were 129 cases (25.8%).

**Table 3: Seasonal variations in head injury cases**

Season	Cases	%
Summer (Mar to June)	137	27.4
Rainy (Jul to Sep)	129	25.8
Winter (Oct to Feb)	234	46.8
Total	500	100

In the Table 4, it is clearly reflected that in Head injury commonest lesion was Scalp laceration i.e. 251 cases (50.2%), followed by fractures of skull 83 cases (16.6%) which is commonest in intra-cranial lesions. SDH (61 cases) was commonest intra-cranial hemorrhage followed by SAH (52 cases).

**Table 4: Frequency of different lesions in head injury**

Lesions	Cases	%
Scalp-laceration	251	50.2
Skull fracture	83	16.6
Contusion	44	8.8
SDH	61	12.2
SAH	52	10.4
EDH	36	7.2

As per the study the Table 5 showed that most commonly involvement of multiple bones if skull fracture in head injury cases. Individually temporal bone was involved in skull fracture i.e 22 cases (26.51%) followed by frontal bone which was 21 cases (25.30%). 24 cases were having involvement of more than one bone (28.92%)

**Table 5: Pattern of skull fracture**

Bone involved	Cases	%
Frontal	21	25.30
Temporal	22	26.51
Parietal	12	14.46
Occipital	4	4.82
Multiple bone	24	28.92
Total case	83	100.00

In this study from Table 6, it is concluded that there was survival of Head injury victim was 94.4% (472 cases) in A tertiary Care Hospital. while 5.6% (28 cases) expired in Hospital due to fatality of Head Injury.

**Table 6: Mortality pattern**

Outcome	Cases	%
Live	472	94.4
Expired	28	5.6
Total	500	100

## DISCUSSION

With exploding population, increasing numbers of automobile vehicle, encroachment of roads, tendency of violating traffic rules and traffic systems have greatly contributed rapid increase in head injury due to the road traffic accident. Head injury is also quite common in assault and Fall from Height injuries and vulnerability of the head is the reason that the fatal injuries are inflicted with intention to kill a person. This results in the double loss for the country. Firstly, expenditure is incurred for the treatment of these victims and secondly being in the most productive age group; it results in huge productive man-days loss. An increased incidence of head injury has the direct repercussions on increased fatalities.

Road traffic accident was the most common mode of head injury in the adult age group. The overall increase in vehicular traffic to the roads is responsible for automobile accidents being the most common mode of fatal injury. In Road Traffic Accidents, head injury is the most common cause of mortality followed by Thoraco-abdominal and the musculo-skeletal injuries in that order.<sup>5-7</sup> In our study, we found out the vice - versa i.e. in head injury the most common cause was Road Traffic accidents followed by fall from height. This is in accordance with the study done by

Chen CL et al<sup>9</sup> which showed 70% road traffic accident, 15.3 % fall from height and assault 8.7% and the result of Kremer C et al<sup>10</sup> also match with this study. The male: Female ratio getting the head injuries was 3.27: 1. In Road Traffic Accidents male: Female victims ratio was 5:1 in the present study, which is in conformity with other workers<sup>5,11-14,15</sup> who have reported the range from 1.7: 1 to 8: 1. However, the proportional changes of male: Female to 0.5:1 in fall from Height victims. The male predominance in our study also fits well with the reporting of another research of a similar nature.<sup>16-18,19,22</sup> This gender bias could be because males work outdoors and therefore, they are more commonly exposed to road traffic accidents, assault and occupational injuries.

The maximum number of victims (45%) belonging to the age group of 21 to 30 years followed by 21% belong to the age group of 31 to 40 years is comparable to the results reported by other Indian workers as Jamebaseer M Farooqui et.al<sup>15</sup> found the highest numbers of deaths (39.79 %) were recorded in the 20-39 years age group due in head injury victims. However, Akang et al<sup>23</sup> and Lai et al,<sup>24</sup> observed that the peak age of such victims was in the fourth decade, with the mean at 33 years. Tripude et al<sup>25</sup> also pointed that commonest age group was 21-30 (39%) and next common was 31-40 (18%). The reason for the above is that young adults are the prime bread earners of the family and remain outdoors during most of the day. Furthermore, young persons are by nature indulge in more violence activity's persons. Persons in extremes of the age usually remain indoors whereas children are confined to the outskirts of the residential premises only.

In this study we found that winter season (Nov. to Feb.) recorded maximum number of 234 cases (46.8%) followed by summer season (March to Jun.) 137 cases (27.4%). The Rainy season recorded the least 129 (25.8%) cases. This is in accordance with Sinha et al<sup>26</sup> and Dhatarwal et al<sup>27</sup> that found maximum fatality in winter season as during winter, there is longer hours of night, poor visibility to vehicle drivers in the darkness and early hours of the day due to foggy weather conditions and slow reaction time due to extreme cold affecting both drivers and road users. This is not in accordance with Eken et al<sup>28</sup> that had reported that 70% of the accidents have occurred in rainy season. The reason for this is that in rainy season. there are poor slippery roads and poor visibility leading to accidents.

Scalp laceration observed in 50.2% cases, Skull fractures, at one or multiple sites, observed in 16.6 % of the victims. In the present study, there were 251 individuals with injuries to the scalp. There were 249 cases with no scalp injury at all. The commonest type of injury was laceration and heamatoma. Study conducted in Delhi by Tyagi et al<sup>29</sup> reported scalp injuries to be present in 76%, while Gupta et al<sup>30</sup> reported 89% of scalp laceration. These findings are consistent with this study.

Cases of head injury with fractures of the skull tend to have more complications and are more often fatal than those without fracture.<sup>7,8</sup> The bones involved in order of frequency, in the study were: Frontal (25.30%), Temporal (26.51%), Parietal (14.46%) and Occipital (4.82%). However, in the most common cases, i.e. 24 cases (28.92%) the fractures were found at multiple sites. Akang et al<sup>23</sup> in their study reported: Frontal (12%), Temporal (9%) and Parietal (9%). Chandra et al<sup>9</sup> reported: Temporal (59%), Occipital (58%) Parietal (50%) and Frontal (49%). Both series, however, have reported the skull fractures at multiple sites as the most common. The commonest intracranial haemorrhage being subdural in our study, followed by subarachnoid is in conformation to the observations made by Akang et al.<sup>23</sup> The findings differ with the observations of Chandra et al<sup>11</sup> who have reported subarachnoid haemorrhage as the commonest.

## CONCLUSION

The study showed that most head injury victims, brought to a tertiary care hospital, were due to road traffic accidents and males are more prone to get Head injury. So it warrants the urgency to establish good pre-hospital care and provision of efficient and prompt trauma services at Road side to prevent mortality aroused from RTA. RTA remains the most common cause for Head injury and demands good neurosurgical care for such patients. By the compiling the records of these traumas at national level or international level can underline risk factors involved in these accidents, will be extremely helpful in the policy building and making the decisions for health promotion and health building at national or international level.

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# Comparing the Oral Health Promoting Role and Knowledge of Government and Private Primary School Teachers in Mathura City

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## Abstract

**Objectives:** To assess and compare the oral health promoting role and knowledge of Government and Private primary school teachers in Mathura city.

**Materials and Methods:** This cross-sectional study was conducted upon 650 primary school teachers who were randomly selected from the 5 zones of Mathura city. Data was collected through a self-administered questionnaire. Oral health knowledge scores were calculated and Chi-Square test was used for statistical analysis using SPSS version 17.0. Statistical significance was set at  $p \leq 0.05$ .

**Results:** Maximum government school teachers i.e 182(56 percent) had fair level of knowledge, while 305 private school teachers i.e. 93.8 percent were having good knowledge regarding oral health. A highly statistically significant difference was found between oral health knowledge of Government and Private school teachers. (p-value is 0.000) Allowing class time for students to get dental care was supported by most of the government school teachers(66.6 percent), while maximum private school teachers (55 percent) disagreed to the above mentioned fact. Resistance to accepting supervisory responsibilities also may be the result of teachers' perceptions among both government and private school teachers.

**Conclusion:** It is concluded from the study that oral health knowledge of government and private school teachers were found to be fair and good respectively. The school teachers wanted to become involved in oral health education. Training of the teachers should aim at improving their level of knowledge on oral health.

**Keywords:** Oral health, Primary school teachers, Health promotion

## INTRODUCTION

Oral health is an essential and integral component of general health<sup>1</sup> representing far more than simply a healthy mouth, a pleasing smile, and freedom from pain and infection.<sup>2</sup> It contributes positively to self esteem and personal success. Oral cavity being an important aspect of the human body, any impairment of oral health can manifest not only in the oral cavity but also elsewhere in the body.<sup>1,2</sup>

We must acknowledge the fact that with respect to health care, children are essentially unable to understand the need and provide themselves with the required health care.

They must have someone with the time, money, desire and means to take them to health care providers. Since many children lack that caregiver, they do not receive preventive and curative health care, even if it is free. Child education begins long time before the dentist meets him directly. The best place for the information is in the schools, combining the good practices in their homes.<sup>3</sup>

Teacher is the keystone of the arch of dental health education.<sup>4</sup> School teachers have traditionally been considered as potentially important primary agents of social activities, with a capability of influencing the future knowledge, attitude and behaviour of school children.<sup>5,6</sup>

Teachers form a group of special interest in the planning and implementation of oral health preventive programs as they have the advantage of getting trained and have the opportunity to influence large numbers of children and their parents.<sup>7</sup> Teachers shape the future of the country and prepare the young generation for facing life and they cannot help in imparting proper information to students, if they themselves remain misinformed. Thus the school teachers need to be made apt for the task in terms of improving and upgrading their deficient knowledge on oral health and relative usefulness of the various measures required in preventing oral health problems.<sup>8</sup>

Inadequate knowledge, skills and motivation for teachers to provide oral health education has shown unfavorable repercussions on pupil's oral health.<sup>9</sup> Surveys conducted in Minnesota, USA, among future school teachers<sup>10</sup> and in Michigan, USA, among elementary school teachers,<sup>11</sup> established that oral health knowledge of these important populations were often inadequate and inaccurate. The subjects were ill-informed and held inconsistent opinions about basic oral health related concepts. Studies in Romania, China and Saudi Arabia have reported positive attitudes among school teachers towards school based dental health education and a willingness to be involved in oral health promotion.<sup>12-14</sup> A higher level of dental knowledge was revealed among Kuwaiti school teachers than among parents, and teachers reported a positive attitude towards the prevention of dental diseases.<sup>15</sup> Among Tanzanian school teachers low levels of oral health knowledge were found, accompanied by a poor attitude towards becoming involved in dental health education.<sup>6,16</sup>

Proper and adequate oral health knowledge and practice is the key to a perfect oral health status. Oral health habits are formed early in life and the school teachers, especially primary school teachers, plays a vital role in inculcating healthy habits in their students, for which the teachers themselves need to have a good knowledge and attitude towards oral health. Thus, the more knowledgeable and conscious the school teachers become about their own oral health maintenance the more they can practice it in their life and can gradually bring a sea change in the oral health status of the society or peer group through positive oral health promotion.<sup>13,14,17</sup>

Schools all over India can be broadly divided in two major categories- Government and Private. The difference between these two can be attributed to the variation in funding and the organization behind the two sectors. The lack of proper teaching aids, time, lack of supervision and the low funding are the main drawbacks in the government schools. Hence the purpose of the study was to assess and compare the oral health promoting role and knowledge of Government and Private primary school teachers in Mathura city.

## MATERIALS AND METHODS

According to the list obtained from Basic Shiksha Adhikaari office there were 167 primary schools in Mathura city of which 125 were Private and 42 were Government. The total strength of primary school teachers in Mathura city was found to be 1700 including both Government and Private schools. Mathura city is divided into 5 geographical zones – central, north, south, east and west. Area representing each zone are - Goverdhan chauraha, Krishna-nagar, Goverdhan road, Dhoulai Pyaou and Vrindavan respectively.

### Inclusion Criterion

- All the available subjects who were in the age range of 15-64 years and willing to participate in the survey.

### Exclusion Criterion

- Subjects not willing to participate in the survey and those who were absent on the day of examination.

## SAMPLE SIZE ESTIMATION

Based upon the pilot study sample size was estimated and it was found to be 600 as the minimum sample size with 5% acceptable margin of error and 95% confidence interval. A slightly higher sample size of 650 was selected to compensate for any kind of permissible error and to increase the accuracy of the study.

## SAMPLING METHODOLOGY

In order to cover the total sample size of 650, 130 primary school teachers from each of the five zones were randomly selected out of which 65 teachers were from Government primary schools and 65 teachers from private primary schools.

## DATA COLLECTION

A pretested proforma containing structured close ended questionnaire including 16 questions was prepared both in English and Hindi for ease and convenience of primary school teachers. Out of the 18 questions 12 questions were regarding oral health knowledge and 6 questions were regarding oral health promoting role of primary school teachers. The questionnaire was handed over to the school teachers and sufficient time was given to them to complete the form. It was later checked by the investigators to confirm that none of the questions were left unattempted.

Each knowledge question had 2 options-Yes/No for which score 1 and 0 was given respectively. The total score was calculated and was divided into three categories. Score 0-5 were categorized as Poor knowledge, 6-8 were categorized as Fair and 9-10 as Good knowledge category.

## Statistical Analysis

All the collected data was entered in the Microsoft Word Excel Sheet 2007 version and processed using the SPSS 17 Version for the descriptive analysis and statistical tests of significance. Chi-Square test was applied for comparison of oral health knowledge among Government and Private primary school teachers.

## RESULTS

The age of the School teachers from both Government and Private schools ranged from 21-55 years, with mean age of Government and Private school teachers were 31 years and 27 years respectively (Table 1). In total 173(53.2%) were males and 152(46.8%) were females among the Government school teachers. Among the Private school teachers 48(14.8%) were males and 277(85.2%) were females.

**Table 1: Distribution of the study subjects according to age among Government and Private school teachers**

Age	Government	Private	Total
20-30yrs	144 (44.3%)	204 (62.8%)	348 (53.5%)
31-40yrs	151 (46.5%)	102 (31.4%)	253 (38.9%)
41-50yrs	29 (8.9%)	16 (4.9%)	45 (6.9%)
51yrs and above	1 (0.3%)	3 (0.9%)	4 (0.6%)
Total	325 (100%)	325 (100%)	650 (100%)

Among the Government school teachers, 212(65.2%) were postgraduate, 107(32.9%) were graduate; and 6(1.8%) were having education up to high school. While the maximum number of Private school teachers i.e. 267(82.2%) were postgraduates and 58(17.8%) were graduate (Table 2).

**Table 2: Distribution of the study subjects according to Level of Education among Government and Private school teachers**

Education	Government	Private	Total
Post graduate and above	212 (65.2%)	267 (82.2%)	479 (73.6%)
Graduate	107 (32.9%)	58 (17.8%)	165 (25.3%)
High school	6 (1.8%)	0	6 (0.9%)
Total	325 (100%)	325 (100%)	650 (100%)

The maximum Government and Private school teachers i.e.52.6% and 65.8% respectively had an experience of 0-5 years (Table 3).

### Distribution of Knowledge Score among School Teachers of Government and Private Schools

Maximum government school teachers i.e 182(56%) had fair level of knowledge, while 305 private school teachers i.e. 93.8% were having good knowledge regarding oral health (Table 4).

**Table 3: Distribution of the study subjects according to teaching experience among Government and Private school teachers**

Teaching experience	Government	Private	Total
0-5 years	171 (52.6%)	214 (65.8%)	385 (59.2%)
5-10 years	104 (32%)	80 (24.6%)	184 (28.3%)
10-15 years	39 (12%)	21 (6.5%)	60 (9.2%)
15-20 years	11 (3.4%)	10 (3.1%)	21 (3.2%)
Total	325 (100%)	325 (100%)	650 (100%)

**Table 4: Distribution of knowledge score among school teachers of Government and Private schools**

Knowledge score	Government	Private	Total
Good	137 (42.1%)	305 (93.8%)	442 (68%)
Fair	182 (56%)	20 (6.2%)	202 (31%)
Poor	6 (1.8%)	0	6 (0.9%)

However, a statistically significant correlation was found between oral health knowledge of Government and Private school teachers as demonstrated in Table 5. (p-value is 0.000) On correlating knowledge with other variables viz. age, sex, education and years of experience, statistically significant result was found between knowledge and education of study subjects of both Government and Private schools.

**Table 5: Correlation between knowledge among Government and Private school teachers**

Knowledge	Government	Private	Total	P value
Good	137	305	442	0.000*
Fair	182	20	202	
Poor	6	0	6	
Total	325	325	650	

\*Significant (p<0.05)

### Role of Teachers in Promoting Oral Health

Respondents were instructed to indicate the extent to which they agree or disagree with the statements regarding the responsibilities that are sometimes expected of school teachers. A scale ranging from strongly agree to strongly disagree and finally narrowing it down to agree/disagree was used to tabulate the results (Table 6).

## DISCUSSION

Frazier has stated that “given an existing body of scientific knowledge about measures for preventing oral diseases..... society has a responsibility to educate its youngsters about these measures”<sup>18</sup>

Good oral health can improve general health and quality of life thereby contributing to improve self confidence and social interaction. School teachers have always been

**Table 6: Perceived role of Government and Private primary school teachers in promoting oral health**

Teachers should	Government school teachers		Private school teachers	
	Agree	Disagree	Agree	Disagree
Should refer students with dental problems to the dentists	71.9%	28.1%	93.6%	6.4%
Advice students regarding advertising of commercial sugar products.	47%	53%	72.9%	17.1%
Instruct students about scientifically valid methods to prevent oral diseases	78%	22%	88.6%	11.4%
Allow class time for students to get dental care.	66.6%	33.4%	45%	55%
Be actively involved in community efforts to improve students' oral health	74%	26%	60%	40%
Supervise daily brushing and flossing in the classroom	7.6%	92.4%	12.1%	87.9%

considered as an important agent of socialization, having the ability to influence the knowledge, attitude and behavior of schoolchildren.<sup>19-20</sup> In Mathura, there were no data available on the comparison of oral health promoting role and knowledge of Government and Private school teachers. Therefore, an epidemiologic survey was conducted to assess and compare the oral health promoting role and knowledge of Government and Private primary school teachers in Mathura city. The final sample consisted of a total of 650 study subjects out of which 325 were from Government primary schools and 325 were from Private primary schools.

#### Distribution of the Study Subjects According to Age among Private and Government School Teachers

In our study, among the Government schools, the maximum number of school teachers i.e. 151(46.5%) were from the age group 31-40 years and 204(62.8%) study subjects from Private school teachers were from 20-30 years of age. In the study conducted by Shodan M Raj et al<sup>5</sup> the school teachers had a mean age of 40.1 years with 69% of them being between the ages of 31-40. According to Harold D et al<sup>6</sup> the average age was 35.2 years and the maximum teachers were of between 36-40 years. In the study conducted by Benley George et al<sup>1</sup> the maximum teachers i.e. 37.5% were of between 30-39 years. According to Syed Yawar Ali Abidi et al<sup>21</sup> the maximum teachers i.e. 82% belongs to the age group of 20-40 years. In the study conducted by Ali Hossein Mes Garzadeh et al<sup>22</sup> the maximum teachers (41.8%) were 41-50 years of age. In the study conducted by Marianna Virtanen et al<sup>23</sup> the maximum teachers were 51-55 years of age. In the study conducted by Nazeer Khan et al<sup>24</sup> the maximum teachers belonged to the age group of less than 30 years.

#### Distribution of the Study Subjects According to Gender among Private and Government School Teachers

In our study among the total study subjects of 650, 221 were males and 429 were females. Among the Government schools maximum school teachers (53.2%) were males while in the Private schools maximum teachers were females (85.2%). In the studies conducted by Syed Yawar Ali Abidi et al<sup>21</sup>, Marianna Virtanen et al<sup>23</sup>, Shodan M Raj

et al,<sup>5</sup> Benley George et al,<sup>1</sup> Harold D et al<sup>6</sup> and Paul Lang et al,<sup>11</sup> most of the school teachers were females. On the contrary, according to Ali Hossein Mes Garzadeh et al<sup>22</sup> the maximum teachers (52%) were males.

#### According to the Education among Private and Government School Teachers

In our study, most of the teachers of the Private schools were found to be post graduates, few graduates but none of the teachers had an education level only up to high school which was similar to the findings of the study conducted by Benley George et al.<sup>1</sup> On the other hand, among the Government school teachers, most of them were post graduates, few graduates and only some had a qualification up to high school. On the contrary, studies conducted by Shodan M Raj et al<sup>5</sup> and Ali Hossein Mes Garzadeh et al<sup>22</sup> showed that most of the study subjects were graduates.

#### According to Years of Experience among Private and Government School Teachers

In our study among the total study subjects of 650, the maximum school teachers from both Government and Private schools had an experience ranging from 0 to 5 years which was in accordance to the study conducted by Syed Yawar Ali Abidi et al.<sup>21</sup> On the other hand according to Harold D et al,<sup>6</sup> in the median of the years of experience was found to be 9.5 years. According to Paul Lang et al,<sup>11</sup> the median years in teaching of most of the school teachers were found to be 19 years while in the study conducted by Ali Hossein Mes Garzadeh et al<sup>22</sup> the years of experience for maximum study subjects (90%) was found to be 10-20 years.

#### Distribution of the Study Subjects According to their Knowledge Score of Government and Private School Teachers

Out of 650 study subjects, 442 (68%) school teachers had good knowledge regarding oral health, of which maximum teachers i.e. 305 (93.8%) were from Private Schools which is in accordance to the studies conducted by Shodan M Raj et al,<sup>5</sup> Paul Lang et al,<sup>11</sup> Bondarik Elena et al,<sup>25</sup> Benley George et al<sup>1</sup> and Petersen P E et al<sup>26</sup> where maximum study subjects had a good knowledge regarding oral health.

Among the total study subjects, maximum number of school teachers i.e. 182 (56%) from Government schools had a fair knowledge regarding oral health. Furthermore, no such study was found where the study subjects were categorized based on the above mentioned three different categories of levels of knowledge as done in our study.

On correlating knowledge with other variables viz. age, sex, education and years of experience, statistically significant result was found between knowledge and education of study subjects of both Government and Private schools. On the contrary, in a study conducted by Shodan M Raj *et al*<sup>5</sup>, no statistically significant difference was found between the knowledge of graduate and post graduate school teachers. This study revealed a statistically highly significant correlation between Government and Private school teachers regarding oral health knowledge.

### Role of Teachers in Promoting Oral Health

Maximum private school teachers were in favour of advising students regarding advertising of commercial sugar products, while contradictory view was found in case of government school teachers. Allowing class time for students to get dental care was supported by most of the government school teachers. On the other hand maximum private school teachers disagreed to the above mentioned fact. Resistance to accepting supervisory responsibilities also may be the result of teachers' perceptions among both government and private school teachers which was in accordance with the previous study conducted by Paul Lang *et al.*<sup>11</sup> Having teachers observe the operation of such programs might allay their apprehensions about supervision.

### SUMMARY AND CONCLUSION

From the results of the study it was concluded that a difference in oral health related knowledge was found between government and private school teachers. This difference in knowledge level might be due to the difference in education level between both types of school teachers.

The teachers responded positively to becoming involved in the oral health education of the children, and they can undoubtedly become the key persons in this activity. However, if the school teachers are provided with proper training, educational materials and support from dentists experienced in public health, they can bring a sea change in the knowledge, attitude and behavior of the students of our country.

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# Diaphyseal Femoral Intramedullary Nailing: Closed or Open Intervention?

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## Abstract

**Background:** Intramedullary nailing is the mainstay of treatment femoral shaft fractures. In this we tried to compare the results of open and closed nailing in the shaft of femur bone.

**Methods:** In three years time 272 femoral shaft fractured patients were admitted out of which 162 were closed type and 110 patients in whom open nailing was tried. The mean age of patients was 35.6 yrs. Statistical analysis was done by using student "t" test.

**Results:** 246 patients healed within six months, while others required axial compression; complete union occurred in 95.6% of cases. Most common complication observed was limited range of mobility. Nonunion was observed more in open method, while closed method showed high rate of malunion.

**Conclusions:** We concluded our study with the fact that concept of alignment should be placed high & open nailing should be tried in those cases where adequate results cannot be achieved by closed methods.

**Keywords:** Open Nailing, Closed Nailing, Nonunion, Malunion

## INTRODUCTION

The femur is the strongest, largest and heaviest long bone in the body. Femoral shaft fractures are the most common injuries which the orthopaedic surgeons come across, which are the result of severe trauma in young age. Patients who have low mineral density got their shaft fractured even by low impact trauma.<sup>1-6</sup>

The treatment of femoral shaft fractures still remains a problem, and a subject of controversy among orthopaedics surgeons. Knowing the advantages and disadvantages of different methods or technique we can reduce the morbidity, disability and period of stay in the hospital.<sup>2,3</sup> Intramedullary fixation has gained wide acceptance, in the treatment of femoral shaft fractures.

Orthopaedics surgeon come across the complications of delayed union or nonunion following intramedullary nailing.<sup>7-15</sup> Orthopaedic Trauma Association (OTA1996)<sup>16</sup> have classified femoral shaft fractures into three main types (simple, wedge, and complex). The femoral shaft fracture

in multiply injured patient can be stabilized temporarily with an external fixation, and later with an intramedullary nailing.<sup>17,18</sup> Today the most common method for femoral nailing is to place a cannulated nail.<sup>19</sup>

The purpose of this study was to assess the results of IMN surgery in adults in the fracture of the femoral shaft by open and closed methods.

## MATERIAL AND METHODS

This study was conducted in the department of Orthopaedics, Government Medical College, Nagpur. During a period of three years we admitted 272 patients out of which (31.2%) had open fractures. AP view of the pelvis and AP and lateral views of the knee and the entire femur was taken to detect longitudinal cracks and non-displaced proximal and distal fragments.

The patients were aged 16-68 years (mean age: 35.8 years). The patients were operated, within two days of admission, except for 12 cases which were not having stable general

condition and operated after 14 to 16 days as per improvement in general condition. Open reduction was done, in 110 cases and closed nailing was performed in 162 cases. Patients who suffered from associated multiple injuries were treated by external fixators followed by nailing. Continuous radiographic assessment using digital x-ray was done. Follow up of patients was done, which ranged from one and half year to two years. On the basis of reduction performed we compared the results of both techniques. Ethical clearance was obtained from the ethical committee of Govt. Medical College, Nagpur. Statistical analysis was performed using student “t” test.

## RESULTS

Out of the total number of patients, 246 healed up their fractures in a time period of six months. Axial compression (dynamization) was required in nine patients, and took approximately one year for complete healing. Mean hospital stay was 12.16 days (5-34 days). Complete union occurred in 262 patients. Range of knee flexion was full in over 90% of cases, 8% showed knee flexion from 0-120 degree and 2% showed 0-30 degrees of knee flexion.

Full weight bearing was earlier and were in more patients in whom closed method was applied as compared to open method ( $p < .005$ ) (Table 1).

**Table 1: Complications associated with closed and open method of intramedullary nailing**

Complication	Closed nailing method	Open nailing method	P value
Nonunion	4 patients	8 patients	<0.005
Rotational deformity	13 patients	1 patient	<0.05
Malunion	8 patients	6 patients	>.005
Duration of union	Less	More	>0.1

## DISCUSSION

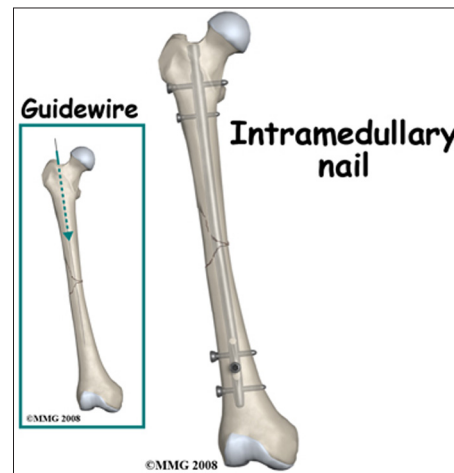
About five decades back, initial treatment of fractures in poly-traumatized patients was conservative, because operative treatment considered being high risk procedure. In the last twenty years there have been some major changes in the surgical management of lower limb long-bone fractures. There are a number of reasons for the alteration in the management of femoral diaphyseal fractures.

Controversy still exists with regard to timing for internal fracture stabilization.<sup>20-24</sup> Early IMN earlier than 24 hours post injury in some studies been associated with reduced pulmonary complications and mortality.<sup>25-29</sup>

The literature has now been clear that reamed nailing is the preferred and successful technique for closed and less severe open lower limb fractures. To nail the femur in fractures below the lesser trochanter is the treatment of choice (Figures 1 & 2).<sup>30-38</sup>



**Figure 1: Femoral Intramedullary nailing**



**Figure 2: Schematic view of femoral shaft intra-medullary nailing**

First generation interlocking nails using oblique or transverse screws are superior to unlocked nails. In lower two third of femur, two cross- locking screws are essential for adequate stability.

In mid-shaft fractures one screw proximally and one distally is adequate. Proximal and distal third fractures of femur are prone for malangulations. IM nailing allows early mobilization with minimal scarring of thigh musculature and early functional recovery; early weight bearing with minimal scarring can be expected with intramedullary nailing. Rapid mobilization leads to economic benefits to the patient. Enormous complications have been cited in the literature for intramedullary nailing.<sup>39</sup>

In a systematic overview by (Bhandari, 2000) 7% non union rate was reported.<sup>18</sup>

But in our study the rate of nonunion was about 4.2%, this is due to better treatment strategy and careful selection of operative procedure and surgeon's experience.

Various authors performed and compared the outcome of their techniques in interlocking femoral nailing (Table 2).

**Table 2: Techniques in interlocking femoral nailing**

Authors with year of study	Number of subjects	Infection %	Malunion %	Nonunion %	Nerve palsy %
Kempf et al. 1985 <sup>41</sup>	52	2.1	21.1	7.6	-
Wiss et al. 1991 <sup>42</sup>	112	0	14	1.8	-
Klemm & Borner. 1986 <sup>43</sup>	266	2.6	3.0	1.5	0.3
Christie et al. 1988 <sup>44</sup>	120	0	2.5	1.6	2.5
O'Brien et al. 1991 <sup>45</sup>	63	4.8	12.7	4.8	-
Grosse et al. 1993 <sup>46</sup>	115	2.6	1.7	3.5	1.7
Nowotarski & Brumback 1994 <sup>30</sup>	39	2.5	0	5.1	5.1

From the above table it is clear that malunion was maximum in the study performed by Kempf et al<sup>40</sup> and while in our study it was found to be 4.6%. Nonunion in our study was 4.2%, while in the studies performed by Kempf et al<sup>40</sup> 7.6%, Wiss et al<sup>41</sup> 1.8% Klemm & Borner<sup>42</sup> 1.5% Christie et al.<sup>43</sup> 1.6% O'Brien et al.<sup>44</sup> 4.8% Grosse et al<sup>45</sup> 3.5% Nowotarski & Brumback<sup>30</sup> 5.1%

## CONCLUSION

Open or closed femoral intramedullary nailing should be based on type of fracture and its pattern of injury, equipments and instruments available and most certainly the experience of surgeon. Closed intramedullary nailing is for treatment of diaphyseal femur fractures in patients with poly-traumatic injuries. Open nailing should be tried in case where an adequate reduction cannot be achieved by closed methods.

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# Clinicopathological Study of Hyperkeratotic Lesions of Palms and Soles: An Observational Study

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## Abstract

**Introduction:** Hyperkeratotic, fissure-prone, infiltrated lesions over the palms and soles is a very common skin condition. These conditions, do not always present with typical manifestations, such as classical skin lesions and nail changes and therefore known clinical features about these diseases might not be helpful in diagnosis. Thus this study was conducted to study the clinical and histopathological features of hyperkeratotic lesions of palms and soles and to correlate them clinically.

**Materials and Methods:** The study was conducted in outpatient Department of Dermatology, Venereology & Leprology, Mahatma Gandhi Medical College & Hospital, Jaipur. 100 consecutive cases of hyperkeratotic lesions of palms and soles presenting from November 2010 to October 2013, were included in the study. The cases included were, psoriasis of palms and soles, Hyperkeratotic eczema and Tinea pedis and tinea manuum (Hyperkeratotic variety).

**Results:** The data was analysed under following categories; age incidence, incidence in relation to sex, incidence of duration of the disease, incidence of seasonal variation of the disease, incidence of presence or absence of itching, symmetry of the disease, incidence of involvement of nails. Histopathological analysis was done on basis of; degree of hyperkeratosis, degree of parakeratosis, degree of acanthosis, degree of spongiosis, presence of Munro's microabscesses, presence of Pustule of Kogoj, presence of supra-papillary thinning in stratum malpighium, degree of elongation of rete ridges, degree of elongation of papillae and clubbing of papillae, degree of exocytosis, type of infiltrate in the dermis, type of infiltrate around blood vessels. Special investigations conducted were positivity of skin lesion for fungus by KOH examination, Positivity of nail for fungus by KOH examination, results of pus for culture and sensitivity, PAS positive fungal cases.

**Conclusion:** Thus from the present study of 100 cases of hyperkeratotic lesions of palms and soles it can be concluded that: classical clinical and histopathological features are seen in most of the cases. Cases in which they are absent, skin biopsy and special investigations has to be done to aid in diagnosis. There is a considerable overlap in clinical and histopathological feature of these conditions and the sensitivity and specificity of special tests is low. Thus a clinicopathological correlation is required for appropriate diagnosis. This would help in a better management of patients.

**Keywords:** hyperkeratotic lesions of palms and soles, clinicopathological correlation, palmoplantar psoriasis, hyperkeratotic eczema, hyperkeratotic tinea pedis, hyperkeratotic tinea manuum

## INTRODUCTION

Hyperkeratotic, fissure-prone, infiltrated lesions over the palms and soles is a very common skin condition. Such cases are frequently encountered by us in our outpatient department. The common skin conditions associated with such lesions are psoriasis, eczematous dermatitis, neurodermatitis, keratodermas, fungal infection, dishidrotic eczema, numular eczema and -id reactions.<sup>1</sup> Out of these, the most commonly encountered are; palmar and plantar psoriasis, hyperkeratotic eczema and hyperkeratotic Tinea pedis and Tinea manuum.

These conditions do not always present with typical manifestations, such as classical skin lesions and nail changes and therefore known clinical features about these diseases might not be helpful in diagnosis. This fact is sustained by many authors, e.g., Matsunaga J. et al (1998),<sup>2</sup> who stated that, the morphology of hand psoriasis is often typical, but sometimes it has eczematous features posing diagnostic problems. In a study of 154 cases by Sujay Khandpur et al (2011),<sup>3</sup> hyperkeratotic eczema has been found challenging to distinguish and may overlap with psoriasis, although it usually does not have the degree of erythema or the well-demarcated

nature of psoriasis. Hyperkeratosis over the knuckles favors psoriasis. Diagnosis can be aided by skin biopsy, patch test, KOH mount or fungal culture. Patch test is a useful diagnostic method to differentiate hyperkeratotic eczema from palmoplantar psoriasis and Tinea manuum and Tinea pedis. The rate of positivity of patch test has ranged from 46.7% to 82%.<sup>4,6</sup> Contact allergy may occur in patients with psoriasis, Angelini et al. (1987)<sup>7</sup> found that 3.2% psoriatic patients had positive patch test results, while Barile et al. (1996)<sup>8</sup> in 24% were positive. Thus patch testing might lead to misdiagnosis of hyperkeratotic lesions alone cannot be used for this purpose. Tinea manuum and Tinea pedis are generally unilateral (Sujoy Khandpur et al, 2011)<sup>3</sup> are easy to diagnose. However, chronic hyperkeratotic contact dermatitis can also be unilateral, while Tinea manuum and Tinea pedis may be bilateral. KOH mount and/or fungal culture can be used to differentiate these conditions. The different sensitivity rates reported for KOH mount have ranged from 32% to 80 %, while the specificity has been reported to be 40%.<sup>9-11</sup> Thus it is not a very useful test for diagnosis of T. manuum and T. pedis due to low specificity. This leaves skin biopsy as an important adjunct in reaching a diagnosis. The histopathology of psoriasis of palms and soles has been described by Vanscott EJ et al,<sup>12</sup> while that of hyperkeratotic tinea by Kligman A M, et al.<sup>13</sup> Hyperkeratotic eczema has been studied by Agrup G,<sup>14</sup> and Hersle & Mobacken.<sup>15</sup> A detailed histopathology might therefore be quite helpful in differentiating these three clinically confusing but discrete conditions. This is likely to have a major impact on the therapeutic approach, and consequently on the prognosis. This study was conducted to try to correlate the clinical findings with the corresponding histopathological features, so as to find out whether histopathology would aid in better diagnosis.

## MATERIALS AND METHODS

The study was conducted in outpatient Department of Dermatology, Venereology & Leprology, Mahatma Gandhi Medical College & Hospital, Jaipur. 100 consecutive cases of hyperkeratotic lesions of palms and soles presenting from November 2010 to October 2013, were included in the study. All the cases having congenital hyperkeratosis were excluded in the study. The cases included were, psoriasis of palms and soles, Hyperkeratotic eczema and Tinea pedis and tinea manuum (Hyperkeratotic variety). Complete clinical history and physical examination were recorded on the attached proforma. The parameters included age, sex, duration, seasonal variation, presence or absence of itching, symmetry of disease and associated nail involvement. Skin scrapings and nail clippings for dermatophyte infection were taken in all cases where scaling

was prominent. Skin scrapings were kept in 10% KOH for 5-10 minutes and nails were kept in 40% KOH for 24 hrs before analysis. Culture was done in KOH negative cases on Sabouraud's dextrose agar medium. Skin biopsy for histopathology was done in all cases after taking the consent of the patient. An elliptical skin biopsy was taken after giving local anesthesia by infiltrating 2% xylocaine. Culture was done in KOH negative cases on Sabouraud's dextrose agar medium. Skin biopsy for histopathology was done in all cases after taking the consent of the patient. An elliptical skin biopsy was taken after giving local anesthesia by infiltrating 2% xylocaine.

## RESULTS AND DISCUSSION

In the present study of 100 cases, 63 (63%) were males and 37 (37%) were females. Out of 100 cases, 37 were of palmar and plantar psoriasis, 15 of Tinea and 48 were of Hyperkeratotic eczema. Out of 37 cases of palmar and plantar psoriasis 21(56.76%) were males and 16(43.24%) were females. In Tinea, out of 15 cases, 9 (60.00%) were males and 6 (40.00%) were females.

### Age Distribution

In palmar and plantar psoriasis 18.92% of cases belonged to the age group 21-30 years and 45.95% of cases belonged to 31-40 years age group. In Tinea pedis and manuum, 46.67% of cases belonged to 21-30 years age group, 26.67% belonged to 31-40 years age group and 20% belonged to 41-50 years age group. In Hyperkeratotic eczema, 43.75% of cases belonged to 31-40 years age group, 29.17% belonged to 41-50 years age group. So, it appears that psoriasis of palms and soles, hyperkeratotic eczema and tinea pedis and manuum, all seem to be more prevalent in middle aged adults.

### Incidence in Relation to Sex

Out of 37 cases of palmar and plantar psoriasis, 21 (56.76%) were males and 16 (43.24%) were females. In Tinea Pedis and manuum, out of 15 cases, 9 (60%) were males and 6 (40%) were females. In Hyperkeratotic eczema, 33 (68.75%) were males and 15 (31.25%) were females out of 48 cases. Thus from the present study it can be seen that in palmar and plantar psoriasis there was predominance of males with M:F of 1.31:1, in Tinea pedis and manuum there was predominance of males with M:F ratio of 1.5:1 and in Hyperkeratotic eczema also there was predominance of males with M:F ratio of 2.2:1.

### Duration of Disease

In Palmar and Plantar psoriasis 24.32% of cases had duration of less than 6 months and 35.14% had duration of disease varying from 1.5-2 years. In Tinea Pedis and manuum 80% of cases had duration of disease less

than 6 months, while remaining had duration less than a year. In Hyperkeratotic eczema 47.92% of cases had duration of less than 1.5 years and 43.75% had duration varying from 3-10 years. So it can be concluded from the above study that in palmar and plantar, either they were of less than 6 month duration or chronic, i.e., 1.5-2 years. Tinea Pedis and manuum present early as maximum cases were of less than 6 months duration. Again in Hyperkeratotic eczema, patient presented both early and late.

### Seasonal Variation of the Disease

Out of 37 cases of palmar and plantar psoriasis 16 (43.24%) had seasonal variations with aggravation in winters. In Tinea Pedis and manuum out of 15 cases, 2 (13.33%) had seasonal variation, with exacerbation in summers and in Hyperkeratotic eczema 27 (56.25%) showed seasonal variation out of 110 cases with 6.25% having in summers and 50% in winters. In Palmar and plantar psoriasis and in Hyperkeratotic eczema there was aggravation of disease in winters, whereas in Tinea Pedis and manuum there was worsening in summer.

### Presence or Absence of Itching

In Palmar and plantar psoriasis 29.73% patients complained of itching, in Tinea pedis and manuum 93.33% had itching and in Hyperkeratotic eczema out of 85.42% complained of itching. Thus it can be concluded that itching, is more common in dermatophyte infection and Hyperkeratotic eczema as compared to psoriasis of palms and soles.

### Symmetry of the Disease

In Palmar and Plantar psoriasis 94.59% cases were bilateral, out of which 80 % were bilaterally symmetrical, while 20% were bilaterally asymmetrical. In Tinea pedis and manuum out of 15 cases, 93.33% were unilateral only 1 case was bilateral. In Hyperkeratotic eczema all the 89.58% cases were bilateral, with 72.09% being bilaterally symmetrical and 27.91% being bilaterally asymmetrical. So it can be concluded that in palmar and plantar psoriasis there is predominantly bilateral symmetry, but, it can be unilateral in few cases and pose diagnostic difficulties. Similar is the case with hyperkeratotic eczema, which can be unilateral, as seen in 11% cases. So it has to be distinguished from T. pedis and T. manuum. Tinea pedis and manuum is usually unilateral but can be bilateral in some.

### Incidence of Involvement of Nails

In Palmar and plantar psoriasis out of 64 cases, 15 (40.54%) had involvement of nails, in Tinea Pedis and manuum 8 (53.33%) had involvement of nails out of 15 cases and in Hyperkeratotic eczema 36 (75%) had involvement out of 48 cases. So it can be concluded there is significant non

involvement of nails in Psoriasis of palms and soles, and nail changes cannot be relied upon for its diagnosis. In Tinea pedis and manuum there is significant involvement of nails, but again it is absent in almost 47% cases. In Hyperkeratotic eczema, though nail involvement was significant, the presence of specific nail changes was not seen.

Thus, looking at the clinical features of palmoplantar psoriasis, T. pedis and T. manuum and hyperkeratotic eczema it can be concluded that there is a considerable overlap in them. Likewise, itching which is reported to be absent in palmoplantar psoriasis has been seen in 29.73% cases. Also, palmoplantar psoriasis has been found to be unilateral in 2 cases and thus can be difficult to differentiate from T. pedis and T. manuum and unilateral hyperkeratotic eczema. Also, nail changes were absent in almost 60% cases of palmoplantar psoriasis. So for diagnosis we need to rely on history, examination and further investigations if needed.

### Histopathology (Table 1)

#### Palmar and Plantar Psoriasis

In 37 cases of psoriasis of palms and soles, hyperkeratosis was a constant feature with variability in degree of hyperkeratosis. Mild hyperkeratosis was present in 8 (21.62%) cases and moderate hyperkeratosis in 20 (54.05%) cases. Parakeratosis in 6 (16.22%) was mild, 25 (67.57%) had moderate parakeratosis while 5 (13.51%) had marked parakeratosis. Acanthosis was prominent feature in all the cases. In 5(13.51%) it was mild acanthosis, moderate in 28(75.68%), while marked in 4(10.81%). Spongiosis was present in 30 (81.08%) cases out of 37. Munro's microabscesses were present in only 3 (8.11%) out of 37 cases. Pustule of Kogoj is an important feature of psoriasis. In our study it was present in only 3/37 (8.10%) cases. Suprapapillary thinning was present in 35(94.59%) cases out of 37. Out of 37 cases, in 3 (8.11%) mild elongation of rete ridges was present, in 21(56.76%) moderate elongation was present, and in 13(35.13%) marked elongation of rete ridges was present. Exocytosis of neutrophils was present in 13 (35.14%) cases. The type of infiltrate around blood vessels varied in many cases. In 6 (16.22%) mononuclear cells were present, neutrophils alone were present in none, while in 31 (83.78%) both neutrophils and mononuclear cells were present.

Thus in present study of 37 cases of psoriasis of palms and soles, hyperkeratosis, parakeratosis and acanthosis was present in all the cases. Spongiosis was observed in much high cases (81.08%), while Munro's microabscess and Pustule of Kogoj were seen in only 3% cases.

**Table 1: Histopathological features**

Histopathological feature	Palmoplantar Psoriasis (in %)	Tinea Pedis and Tinea manuum (in %)	Hyperkeratotic Eczema (in %)
Degree of hyperkeratosis			
Mild	21.62	66.67	14.58
Moderate	54.05	33.33	60.42
Marked	24.32	0	25.00
Degree of parakeratosis <sup>#</sup>			
Mild	16.22	20	22.92
Moderate	67.57	6.67	56.25
Marked	13.51	0	6.25
Degree of acanthosis			
Mild	13.51	86.67	22.92
Moderate	75.68	13.33	66.67
Marked	10.81	0	10.42
Degree of spongiosis <sup>*</sup>			
Mild	51.35	40	14.58
Moderate	29.73	13.33	43.75
Marked	0	0	37.50
Presence of munro's microabscesses			
Present	8.11	0	0
Absent	91.89	100	100
Presence of Pustule of Kogoj			
Present	8.11	0	0
Absent	91.89	100	100
Presence of supra-papillary thinning in stratum malpighium			
Present	72.97	0	0
Absent	27.03	100	100
Degree of elongation of rete ridges			
Mild	8.11	80	14.58
Moderate	56.76	20	35.42
Marked	35.13	0	50
Degree of elongation of papillae and clubbing of papillae			
Mild	5.41	73.33	12.5
Moderate	45.95	26.67	22.92
Marked	48.64	0	64.58
Type of exocytosis <sup>@</sup>			
Neutrophillic	35.14	0	0
Lymphocytic	0	0	93.75
Mixed	51.35	0	6.25
Type of infiltrate in the dermis			
Neutrophillic	0	0	0
Lymphocytic	16.22	100	93.75
Mixed	83.78	0	6.25
Type of infiltrate around blood vessels			
Neutrophillic	0	0	0
Lymphocytic	16.22	100	93.75
Mixed	83.78	0	6.25

<sup>#</sup>parakeratosis was absent in 73.33% cases of Tinea Pedis and Tinea manuum and 14.58% cases of Hyperkeratotic Eczema. <sup>\*</sup>spongiosis was absent in 18.92% cases of Palmoplantar Psoriasis, 46.67% cases of Tinea Pedis and Tinea manuum and 4.17% cases of Hyperkeratotic Eczema. <sup>@</sup>exocytosis was absent in 13.51% cases of Palmoplantar Psoriasis, 100% cases of Tinea Pedis and Tinea manuum

**Tinea Pedis and Manuum**

Hyperkeratosis is a constant feature of the ringworm infections. Out of 15 cases in 10 (66.67%) mild hyperkeratosis was present and in 5 (33.33%) moderate hyperkeratosis was present. Out of 15 cases, in 4(26.67%) parakeratosis was present. Acanthosis was present in all 15 cases. In 13 (86.67%) mild acanthosis was present, in 2 (13.33%) moderate acanthosis was present, marked acanthosis was absent. Spongiosis was present in 8 (53.33%) cases out of 15. No Munro's micro abscesses or pustule of Kogoj were present. In 3 (20%) cases out of 15, suprapapillary thinning of stratum malpighium was found. Out of 15 cases, elongation of rete ridges was mild in 12 (80%), moderate in 3(20%). Papillomatosis was present in all 15 cases. In 11 (73.33%) it was mild and in 4 (26.67%) moderate elongation of papillae was present. Exocytosis was absent in all cases. Dermal infiltrate was present in all 15 cases. The infiltrate was monocytic in all cases. Infiltrate around blood vessels was found in all 15 cases and the infiltrate was monocytic.

So it can be concluded that the histopathology of Hyperkeratotic Tinea pedis and manuum is characterized by mild hyperkeratosis and acanthosis. Mild parakeratosis was seen in few cases. Vesicle formation and spongiosis were noted in epidermis. Also elongation of rete ridges and papillomatosis was seen in all cases but was mild in maximum cases. Absence of Munro's microabscesses and pustule of Kogoj differentiated it from Psoriasis of palms and soles.

**Hyperkeratotic Eczema**

Hyperkeratosis was a constant feature in all the cases. In 7 (14.58%) mild hyperkeratosis was present, in 29 (60.42%) moderate hyperkeratosis was present and in 12 (25%) marked hyperkeratosis was present. Out of 48 cases, parakeratosis was seen in 41 (85.42%) cases. 11 (22.92%) had mild parakeratosis, 27(56.25%) had moderate parakeratosis and 3 (6.25%) had marked parakeratosis. Acanthosis was present in all 48 cases. In 11 (22.92%) mild acanthosis was present, in 32 (66.67%) moderate acanthosis was present and in 5 (10.42%) marked acanthosis was present. Spongiosis was present in 46 (95.83%) cases out of 48 and was absent in 2 (4.17%). No Munro's microabscesses or pustule of Kogoj were found in the epidermis. Suprapapillary thinning of stratum malpighium was absent. Elongation of rete ridges was present in all 48 cases. In 7 (14.58%) mild elongation of rete ridges was present, in 17 (35.42%) moderate elongation was present and in 24 (50%) marked elongation of rete ridges was present. Papillomatosis was seen in all 48 cases of hyperkeratotic eczema. It was mild in 6(12.5%), moderate in 11(22.92%) and marked in 31(64.58%). Exocytosis in epidermis was present in all 48 cases. In 3 (6.25%) cases the infiltrate was mixed, while in 45 (93.75%) exocytosis of mononuclear cells was present with spongiosis in few cases.

Dermal infiltrate was present in all 48 cases. In 3 (6.25%) cases it was mixed i.e. neutrophilic and mononuclear, while it was only mononuclear in 45(93.75%). Infiltrate around blood vessels was also noted in all cases. Out of 48, in 3 (6.25%) cases it was mixed i.e. neutrophilic and mononuclear, while it was only mononuclear in 45(93.75%).

After histological analyses of 48 cases, following inference can be made. Hyperkeratosis, parakeratosis, acanthosis and spongiosis are moderate to marked in hyperkeratotic eczema. Marked elongation of rete ridges and papillomatosis is also a feature of hyperkeratotic eczema. The predominant infiltrate is mononuclear, though neutrophilic infiltrate might be seen in infected eczema. Absence of Munro's microabscesses, pustule of Kogoj and suprapapillary thinning differentiated it from psoriasis of palms and soles.

Thus after histological analysis of these 100 cases it can be inferred that there is a considerable overlap in histological features of these three conditions. Hyperkeratosis, acanthosis and parakeratosis is seen in all cases. In palmoplantar psoriasis, spongiosis, which has been reported to be absent, was seen in 51.35% cases. Munro's microabscess and pustules of Kogoj which are diagnostic of palmoplantar psoriasis are seen only in 8.11% cases. Also, predominant neutrophilic exocytosis has been seen only in 35.14% cases.

## INVESTIGATIONS

### Special Investigations

#### A) Positivity of skin scrapings for dermatophytes

Out of 15 cases of Tinea pedis and manuum in 6 (40%) skin scrapings for fungus were positive on KOH exam.

#### B) Positivity of nail cutting for dermatophytes

Out of 15 cases, nail cutting for fungus were positive in 8 (53.33%) cases on KOH exam.

#### C) PAS positivity

Out of 15 cases, PAS positivity for fungus was detected in 11 (73.33%) cases.

#### D) Pus for culture and sensitivity

In all 100 cases of all three dermatoses, i.e., psoriasis of palms and soles, T. pedis and T. manuum and hyperkeratotic eczema, pus for culture was negative.

#### E) Culture

Culture was done in 7 KOH negative cases on Sabouraud's dextrose agar medium. No growth

was obtained in any culture after 3 weeks. Only contaminants grew in 3 cases.

So it can be concluded that the sensitivity of KOH, PAS and culture is low. KOH negative cases should be subjected to culture in suspected cases. PAS staining should be done to aid in diagnosis.

## CONCLUSION

Thus from the present study of 100 cases of hyperkeratotic lesions of palms and soles it can be concluded that: classical clinical and histopathological features are seen in most of the cases. Cases in which they are absent, skin biopsy and special investigations has to be done to aid in diagnosis. There is a considerable overlap in clinical and histopathological feature of these conditions and the sensitivity and specificity of special tests is low. Thus a clinicopathological correlation is required for appropriate diagnosis. This would help in a better management of patients.

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# A Study of Blood Pressure Profile in Rural School Children of Kolar Taluka

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## Abstract

**Background:** Hypertension (HTN) is the common and potent universal contributor to cardiovascular mortality. There are not many studies done about the prevalence of HTN in rural school children.

**Objectives:** The present study was done in school children to know the occurrence/prevalence of HTN and to study the relation of HTN with age, sex, BMI & family history.

**Study design:** It is a cross sectional study done in randomly selected rural school children in the age group of 10-16 yrs. The study sample includes apparently healthy 1120 children. For each child, BMI was calculated & 3 BP recordings were taken. If BP was found to be > 95<sup>th</sup> percentile again two sets of BP readings done at 4 weeks interval

**Results:** In the present study, prevalence of systolic HTN was 2.6% in males & 1.5% in females with overall 1.9%. HTN is predominant in the age group of 13 yrs (12.2%). Prevalence of obesity was 3.3%. 11.8% obese and 13.4% overweight children are hypertensive. Out of 22 hypertensive children only 5(22.7%) had family history of HTN present.

**Conclusion:** HTN is a major risk factor for cardiovascular & cerebrovascular disease. In the present study prevalence of HTN was 1.9% with male preponderance (2.6:1.5). Obesity is an important risk factor for cardiovascular complications. In the present study prevalence of HTN was 11.8% in obese and 13.4% in over weight school children.

**Keywords:** Obesity, HTN, School children

## INTRODUCTION

Hypertension is one of the major diseases, which is killing majority of population in the entire world. Majority of them is of essential type. In childhood systemic hypertension is a major condition, with estimated population prevalence of 1-2% in the developed countries.<sup>1</sup> Although no such statistics are available for Indian scenario, but there is every reason to believe that the state of affairs is in no way better than any other Western countries.

In the past decade, many workers have confirmed that familial aggregation of blood pressure occurs among adults, and such an aggregation, has been traced to childhood, as early as one year of age and there is some evidence

to believe that such an aggregation begins somewhere between the first week and first month of life.<sup>2</sup> Blood pressure in children is a reliable predictor of adult blood pressure level, therefore it is important to diagnose children and adolescents who are at increased risk of developing essential hypertension as adults.<sup>3</sup>

Ideally hypertension or tendency for hypertension should be detected as early in life as possible. According to Nelson, to increase early detection of hypertension, accurate blood pressure measurements should be part of the routine annual physical examination of all children, three years or older.<sup>4</sup> However it is not possible to record reliable blood pressures by conventional methods in children below 6-7 years of age.<sup>5</sup> Hence the ideal age, would be between

6-15 years, i.e. school children. NIH Task force of USA has even recommended that blood pressure measurements along with weight and height should be recorded in children, at least once a year.<sup>6</sup>

Many studies have been done in Western countries on this subject and normal standards for blood pressure have been established for the children of different ages, in both sex, black and white race, in their countries. At the same time Western standards cannot be applied to Indian children, because of differences in factors such as ethnic, socio-economic, dietetic, environmental and emotional factors between Indian and Western countries. Hence there is strong need to establish the normal blood pressure standards for Indian children and find out the prevalence of hypertension among them.

Many studies in India have been done to know the blood pressure profile in children in varying age groups (varies from 3 to 17 years) and urban affluent children and not in rural areas. Therefore, the present study was undertaken to determine the blood pressure levels in apparently healthy, asymptomatic school children in the age range of 10 to 16 years in rural Kolar taluka and to determine the influence of contributory factors like, age, sex, body mass index (BMI) and parental blood pressure status. So that this can be a reference and guidance for the management of hypertension.

## MATERIALS & METHODS

### Source of Data

It is a cross sectional study done between time period from October 2009 and January 2010 in the age group of 10 to 16 years. Children were selected from Rural schools in Kolar taluka. Three schools Vemagal government high school, Higher primary school and Kembodi Janata High School were selected based on simple random sampling method. Study was approved and ethical clearance was obtained from ethical committee of Sri Devaraj Urs Medical College.

### Method of Collection of Data

#### Sample size

1120 children in the age group of 10-16 years.

#### Inclusion Criteria

- Apparently healthy rural School children aged between 10 to 16 years of rural Kolar taluka

#### Exclusion Criteria

- Children below 10 years and above 16 years.
- Children with known cardiovascular, renal and endocrine diseases.

Data was collected in a pre-tested Performa meeting the objective of the study. Informed consent was obtained

from the parents of all children before measuring blood pressure. Blood pressure was measured in all 10-16 years school children between 8 AM to 11 AM in sitting position after 10 minutes of rest. BP was measured after applying an appropriate sized cuff on the right arm encircling 2/3rd circumference of the arm with lower edge 2.5 cm above the cubital fossa, as per guidelines suggested by WHO guidelines. The age of the school children was obtained from the school records. The name and other particulars were entered in a pretested Performa. Height was measured by making the child to stand upright barefoot, on the ground with heels, buttocks and shoulder touching the wall and head in Frankfurt plane. The height was measured using a sliding stadiometer (Johnson and Johnson) with an accuracy of 0.1 mm.

Weight was recorded using a spring balance (bathroom scale) calibrated to 0.5 Kg accuracy. Blood pressure was also recorded.

Systolic blood pressure was determined as appearance of 1st Korotkoff sounds and diastolic blood pressure was taken at the point of muffling of heart sounds (4th Korotkoff sounds). Three measurements were taken at an interval of five minutes each and mean of these readings were taken as average systolic blood pressure and average diastolic blood pressure.

Blood pressure values were compared to the values given by the update of 1987 task force report of the National high blood pressure Education Programme Co- coordinating committee.<sup>7</sup>

Children were classified into 3 groups as per guidelines of the above committee

- If BP > 95th percentile - Hypertension (HTN)
- 90 – 95th percentile - Pre hypertension (PHTN)
- < 90th percentile - Normal (N)

Blood pressure was compared in relation to age, sex and height percentile in each age group. In those children whose systolic and diastolic Blood Pressure values was found to be more than 95th percentile for age, sex and height. Two sets of Blood Pressure reading were taken at an interval of 4 weeks.

After recording weight and height of the school children, Body mass index (BMI) was also calculated and based on these values children were classified as follows

- If BMI > 95th percentile Obese (OB)
- 85-95th percentile Over weight (OW)
- <85th percentile Normal (N)

### Statistical Methods

Results on continuous measurements were presented on Mean  $\pm$ SD (Min-Max) and results on categorical measurements were presented in Number (%). Significance

is assessed at 5 % level of significance. Prevalence/ Occurrence of overweight/obesity, pre hypertension/ hypertension had been computed according to age and gender. Chi-square test was performed to obtained results. SPSS 15.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

1. Chi-Square Test: Where  $O_i$  is Observed frequency and  $E_i$  is Expected frequency  
Follows chi-distribution  $(r-1) \times (c-1)$  df
2. Significant figures  
+ Suggestive significance ( $P$  value:  $0.05 < P < 0.10$ )  
\* Moderately significant ( $P$  value:  $0.01 < P < 0.05$ )  
\*\* Strongly significant ( $P$  value :  $P < 0.01$ )

## RESULTS

Study group consists of 1120 rural school children from Kolar taluka between 10-16 years, 508 were males and 612 were females. In these children, prevalence of systolic hypertension in males is 2.6% compared to 1.5% in females with over all prevalence of 1.9%. Prevalence of systolic Pre-hypertension in males is 5.9% compared to 0.7% in females with overall prevalence of 3.1%. Prevalence of Diastolic hypertension in males is 0.9% compared 1.6% in females with overall 1.3%, where as prevalence of diastolic Pre-hypertension is more in males(4.9%) compared to females(2.8%) with overall 3.8%.

Systolic hypertension is predominantly seen in the age group of 13 and 14 years in both male and female. Systolic Pre hypertension is predominantly seen in the age group of 10 years in male and 16 years in female (Table 1).

**Table 1: Distribution of Systolic hypertension (SBP) in male and female according to age**

Age in years	Male			Female			Total		
	Total	HTN	Pre HTN	Total	HTN	Pre HTN	Total	HTN	Pre HTN
10	138	2	23	120	0	0	258	2	23
11	97	0	0	103	0	0	200	0	0
12	72	1	1	32	0	0	104	1	1
13	49	3	2	70	3	1	119	6	3
14	83	5	2	118	4	1	201	9	3
15	29	1	1	113	1	1	142	2	2
16	40	1	1	56	1	1	96	2	2
Total	508	13	30	612	9	4	1120	22	34

Diastolic hypertension is predominantly seen in the age group of 15 years in male and 12 years in female. Diastolic pre hypertension is predominantly seen in the age group of 12 years in both male and female (Table 2).

**Table 2: Distribution of diastolic hypertension (DBP) in male and female according to age**

Age in years	Male			Female			Total		
	Total	HTN	Pre HTN	Total	HTN	Pre HTN	Total	HTN	Pre HTN
10	138	2	3	120	3	4	258	5	7
11	97	0	2	103	2	2	200	2	4
12	72	1	7	32	1	3	104	2	10
13	49	1	4	70	1	3	119	2	7
14	83	0	6	118	0	2	201	0	8
15	29	1	1	113	2	1	142	3	2
16	40	0	2	56	1	2	96	1	4
Total	508	5	25	612	10	17	1120	15	42

Prevalence of obesity is 2.4% in male and 0.8 % in female with over all prevalence of 1.5%. Prevalence of over weight is 7.3% in male compared to 4.9 in female with overall prevalence of 6%.

Systolic hypertension seen in 13.4% of overweight and 11.8% of obese children. Systolic pre hypertension seen in 11.9% overweight and 11.8 % obese children. Only 2.3% are pre hypertensive and 1.1% is hypertensive with normal BMI.

Diastolic hypertension seen in 4.5% of overweight and 11.8% obese children. Diastolic pre hypertension seen in 13.4% overweight and 23.5 % obese children. Only 2.8% are pre hypertensive and 0.9% are hypertensive with normal BMI (Table 3).

Out of 22 children with systolic hypertension only 5 children gave definite family history of hypertension in one of the family members. Out of 15 children with diastolic hypertension only 4 gave definite history of hypertension in one of the family members (Table 4).

## DISCUSSION

The present study is a cross sectional study done in three rural schools of Kolar taluka, Karnataka, consists of 1120 children in the age group of 10-16 years.

Prevalence of Systolic hypertension in the present study is 2.6% in males and 1.5% in females with overall prevalence of 1.9%.

A wide range of prevalence of hypertension has been recorded in different studies ranging from 1 to 16.2%. This diversity of prevalence of hypertension is mainly due to varying agegroups taken for study and different criteria adopted for defining hypertension, basic differences between racial sub groups related to geographic, dietary and cultural factors.<sup>7</sup>

**Table 3: Prevalence of pre-hypertension and hypertension in school children studied according to BMI**

BMI	Total number	Systolic pre-hypertension and hypertension (SBP)			Diastolic pre-hypertension and hypertension (DBP)		
		Normal	Pre HTN	HTN	Normal	Pre HTN	HTN
Normal BMI	1036	1001 (96.6%)	24 (2.3%)	11 (1.1%)	997 (96.2%)	29 (2.8%)	10 (0.9%)
Overweight	67	50 (74.6%)	8 (11.9%)	9 (13.4%)	55 (82.1%)	9 (13.4%)	3 (4.5%)
Obesity	17	13 (76.5%)	2 (11.8%)	2 (11.8%)	11 (64.7%)	4 (23.5%)	2 (11.8%)
Total	1120	1064 (95.0%)	34 (3.1%)	22 (1.9%)	1063 (94.9%)	42 (3.8%)	15 (1.3%)
Inference	BMI is significantly associated with pre hypertension and hypertension with $\chi^2=46.692$ ; $P<0.001^{**}$			BMI is significantly associated with pre hypertension and hypertension with $\chi^2=33.332$ ; $P<0.001^{**}$			

**Table 4: Prevalence of hypertension according to family history and gender**

Family history	Total	Male						Female					
		Hypertension (SBP)			Hypertension (DBP)			Hypertension (SBP)			Hypertension (DBP)		
		Normal	Pre HTN	HTN	Normal	Pre HTN	HTN	Normal	Pre HTN	HTN	Normal	Pre HTN	HTN
Absent	360	331 (91.9%)	19 (5.3%)	10 (2.8%)	340 (94.4%)	17 (4.7%)	3 (0.8%)	428 (97.9%)	2 (0.5%)	7 (1.4%)	406 (94.9%)	14 (3.3%)	8 (1.9%)
Present	148	134 (90.5%)	11 (7.4%)	3 (2.1%)	138 (93.2%)	8 (5.4%)	2 (1.4%)	186 (97.3%)	2 (1.1%)	2 (1.1%)	181 (97.3%)	3 (1.6%)	2 (1.1%)
Total	508	465 (91.5%)	30 (5.9%)	13 (2.6%)	478 (94.1%)	25 (4.9%)	5 (0.98%)	612 (97.9%)	4 (0.6%)	9 (1.5%)	585 (95.6%)	17 (2.8%)	10 (1.6%)

In our study prevalence of Systolic hypertension is correlating with the studies done by Kilcoyne et al., Londe and Laroia et al. in which prevalence of Diastolic hypertension is 1.3%.<sup>8</sup>

The hypertension in the present study is distributed over all adolescent age groups with Systolic hypertension is predominant in 13 year age group in both male and female which is similar to other study by Paul Mounter et al.<sup>9</sup> The elevation of blood pressure in adolescents is also observed in various other studies, although exact reasons for the same are not clear.

Present study shows that prevalence of Systolic hypertension is higher in males (2.6%) compared to females (1.5%), which is similar to studies done by Prazny Kardar et al.<sup>10</sup> and Laroia D et al.<sup>8</sup>

Prevalence of Diastolic hypertension is 0.9% in male compared to 1.6% in female whereas diastolic Pre-hypertension is 4.9% in male compared to 2.8% in female which is also nearer to the study done by Laroia D et al.<sup>8</sup>

Present study shows a Systolic HTN of 11.8% in obese school children which is similar to other studies by Jonathan M et al.<sup>11</sup> and J Chatwal et al.<sup>12</sup> Present study also shows Systolic HTN in 13.4% of overweight children whereas systolic Pre-Hypertension in 11.8% of obese and 11.9% of overweight children. It was evident that obesity in children is a risk factor for hypertension.

In the present study, there is no significant association between parental hypertension and blood pressure in their children. Out of 22 children with systolic hypertension only 5 children gave family history of HTN in one of the parents. Similar observation was made by Sachdev, who actually recorded blood pressure of both the parents and their children and compared them.<sup>13</sup>

However, it is an established fact that familial aggregation of blood pressure occurs among adults and it extends through childhood down to the age of one year and in some cases the resemblance seems to start as early as first month of life.<sup>2,14</sup>

In the present study the reason for lack of significant association between parental blood pressure status and blood pressure of their children is not clear. The probabilities are that:

- No attempt was made to measure the blood pressure of parents whose children were labeled as hypertensive due to lack of time, resources and personnel, hence the true state of affairs might have been missed.
- Children were unaware of their parental blood pressure status.
- Parents themselves might not have undergone regular medical checkups which include routine blood pressure recordings.

In cases where any one of the parents was hypertensive but their children blood pressure was within normal limits, the possibilities are:

1. Parents are suffering from one of the secondary types of hypertension, which is unlikely to affect the offsprings.
2. If only any one of the parents is suffering from essential hypertension the chances of affecting the offsprings is only 28%, the particular child included in the study being unaffected.

Further detailed studies which include measurement of parental blood pressure are warranted.

## CONCLUSION

HTN is a major risk factor for cardiovascular & cerebrovascular disease. In the present study prevalence of HTN was 1.9% with male preponderance (2.6:1.5). Obesity is an important risk factor for cardiovascular complications. In the present study prevalence of HTN was 11.8% in obese and 13.4% in over weight school children.

## LIMITATIONS OF THE STUDY

No attempt was made to measure the blood pressure of the parents, whose children were labeled as hypertensive, due to lack of time, resources and personnel. Hence the true state of affairs regarding parental hypertension might have been missed

### What is Already Known ?

Blood pressure in children is a reliable predictor of adult blood pressure level who are at increased risk of developing essential hypertension as adults.

### What this Study Adds to Literature?

Hypertension is more prevalent in adolescent age group even in rural areas especially males with overweight and obesity being the significant risk factors with less significance to family history.

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# Study of Cranial Capacity of Adult North Indian Human Skulls & its Sexual Dimorphism

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## Abstract

**Introduction:** Cranial capacity of skull, like other body dimensions are affected by geographical, racial, gender and age factor. This study intended to know the gender variations of cranial capacities in available human skulls of north India.

**Aims and objectives:** To measure the cranial capacities of available skulls and to know its sexual dimorphism which may be helpful to establish the sex of a person from skeletal remains.

**Materials & Methods:** 200 dry human skulls (112 male & 88 female) were obtained from the anthropology museum of the Dept. of Anatomy, GSVM Medical College, Kanpur (U.P) & HIHT University, Jolly Grant, Dehradun (U.K). Filling and packing method was used to measure cranial capacities in which clay and rye seeds were used considering their smaller size to avoid the error. Adult skulls (above 18 years), intact & undamaged were included and while those which were broken or damaged and having ambiguity of sex, were excluded.

**Results:** The mean cranial capacity of male skulls was observed to be  $1260.48 \pm 75.15$  cc (range 1200-1420 cc) and those of female skulls were observed to be  $1164.52 \pm 89.43$  cc (range 1100-1430cc).

**Conclusion:** The mean cranial capacity of males is higher than that of the females. Measuring the cranial capacity of skull for determination of sex, by filling and packing method is one of the most reliable cranio-metric methods to be used.

**Keywords:** Cranial capacity, Filling & packing method, Sexual dimorphism, Anthropology

## INTRODUCTION

Cranial capacity of skull, like other body dimensions are affected by geographical, racial, gender, and age factor.<sup>1,2</sup> There is close relationship between cranial capacity and the size of the brain. Several studies in different countries to estimate the cranial capacities have been carried out which indirectly reflects the brain volume.<sup>3,4</sup>

The female skull has been found to have a capacity about 1/10<sup>th</sup> less than that of the male of the same race. Studies on cranial capacity has been proved to be a useful tool in the field of Forensic Anthropology and Paediatrics, as an indicator of skull development in both male and female individuals.<sup>5</sup> It is also a good determinant of normal or abnormal skull because living humans have a normal cranial capacity ranging from 950-1800 cc with an average of about 1400cc.<sup>6</sup>

This study intended to know the gender variation of cranial capacities in available human skull, by filling and packing method, using clay & rye seeds (considering their smaller size) to avoid errors.

## MATERIALS AND METHODS

200 dry human skulls (112 male & 88 female) were obtained from the anthropology museum of the Department of Anatomy, GSVM Medical College Kanpur (U.P) & HIHT University, Jolly Grant, Dehradun (U.K).

Adult skulls (above 18 years), intact & undamaged were included and sex determination was done by gross anatomical features. Skulls which were broken or damaged and those having ambiguity of sex were excluded.

Thereafter the following steps were carried out.

1. Orbital fissures and major foramina of skulls were plugged by clay so that the seeds do not slip out.
2. Then rye seeds were poured through foramen magnum to fill the cranial cavity. Vigorous shaking of the skull was done at intervals so that the seeds get settled into the frontal part of the skull.
3. More seeds were added up to the rim of the foramen magnum from time to time while shaking the skull till it was full and no more seeds could be added.
4. Then seeds were poured from the skull into a wide glass jar and from there into the glass cylinder of 1000 cc capacity. The volume of seeds was measured & data was recorded and analyzed statistically by using 'Z' test to measure the level of significance ( $p$  value  $<0.05$ ).

## RESULTS

In the present study on 112 male and 88 female adult skulls, the mean cranial capacity of male skulls was observed to be  $1260.48 \pm 75.15$  cc (range 1200-1420 cc) and those of female skulls was observed to be  $1164.52 \pm 89.43$  cc (range 1100-1430) (Table 1). Results were found to be significant with the  $p$  value = 0.025. The differences between mean cranial capacities of male and female skulls were found to be statistically significant within 95% confidence limits.

**Table 1: Mean, Range and Standard Deviation of cranial capacity in male and female skulls**

Gender	Range (cc)	Mean (cc)	Std. Deviation	Observed p-value	Result
Male (112)	1200-1420	1260.48	75.15	0.025	Highly Significant
Female (88)	1100-1340	1164.52	89.43	(<0.05)	

## DISCUSSION

Several investigators have estimated the cranial capacity in the past. Most of these studies were carried out on the dry skulls using linear dimensions, packing methods or radiological methods (Table 2). Direct measurement by filling the cranial cavity with mustard/rye seeds, etc and then pouring out into measuring cylinder is considered to be the most accurate method.

The cranial capacity in population of Madhya Pradesh was measured as  $1380.52 \pm 94.63$  cc (male) and  $1188.75 \pm 91.16$  cc (in female). The mean cranial volume by Lee Pearson's formula was  $1152.815 \pm 279.16$  cc in males and  $1117.82 \pm 99.09$  cc in females. By using Spheroidal formula, values were  $1169.68 \pm 239.98$  cc in males and  $1081 \pm 111.6$  cc in females<sup>7</sup> (Table 2) which is comparable with the present study. This difference may be because the cranial capacity in the study was derived from the formula based on linear dimensions of the skull.<sup>8</sup> The cranial capacity in the male and female students of the Mugla University, (Turkey). By using linear dimensions of head, the mean cranial capacity and SD in males and females were found to be  $1411.64 \pm 118.9$  cc and  $1306 \pm 162.9$  cc, respectively.<sup>9</sup> They found that there was a significant difference in cranial capacity between the two genders ( $p < 0.05$ ). However in present study this difference was also highly significant (Table 2). The cranial capacity in adults resident in Maiduguri North Eastern Nigeria<sup>10</sup> in 300 (150 males, 150 females) using a random stratified method. The Linear measurements of cranial length, width, and head circumference were undertaken and their cranial capacities were calculated. The Mean ( $\pm$ SD) of cranial capacity was significantly ( $p < 0.0001$ ) higher in males ( $1424.4 \pm 137.9$ ) than that in females ( $1331.3 \pm 201.8$ ). Cranial length and height were found to be significantly high in males than in females, which is similar to present study (Table 2). The cranial capacity in Korean adult skulls<sup>11</sup> by filling with rice seeds and the volume of the seeds were measured in a graduated cylinder. The results were  $1470 \pm 107$  in male and  $1317 \pm 117$  cc in female skull. The mean cranial capacity of 100 male and 60 female skulls and found the value as  $1302.95 \pm 108.8$  C.C. (range 1070-1560 C.C.) in male and those of female skulls as  $1179.92 \pm 97.08$  C.C. (range 1000 – 1420 C.C.)<sup>12</sup>. The sexual dimorphism in cranial capacity of male and female skulls (Graph 1) found to be highly significant as the z test was 7.43 ( $p < 0.01$ ).

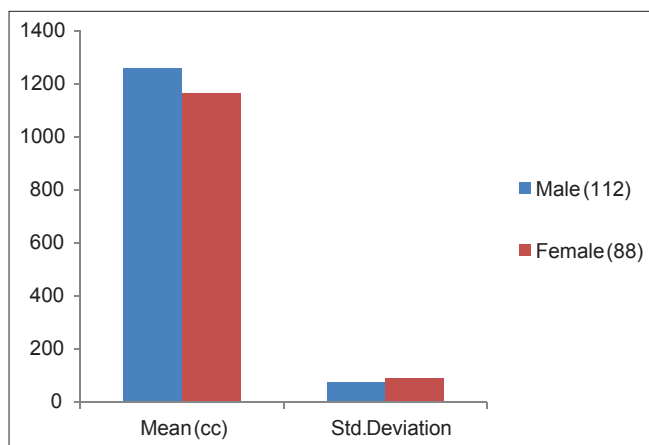
## CONCLUSION

In present study, significant difference was found in the cranial capacities of male and female skulls. The mean cranial capacity of males is higher than that of the females, (Graph 2) that tends to agree with the similar studies conducted earlier. Therefore, estimating cranial

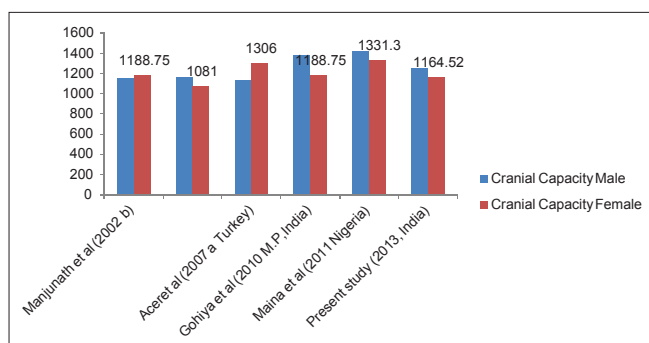
**Table 2: Comparison of studies done by different authors**

Authors	Cranial Capacity		Methods used
	Male (cc)	Female (cc)	
Manjunath et al (2002 b)	$1152.81 \pm 94.63$	$1188.75 \pm 91.16$	Lee- Pearson's Formula
	$1169.68 \pm 239.98$	$1081 \pm 111.6$	Spheroidal Formula
Acer et al (2007 a Turkey)	$1141.64 \pm 118.9$	$1306 \pm 162.9$	Linear Dimensions Measurement
Gohiya et al (2010 M.P, India)	$1380.52 \pm 94.63$	$1188.75 \pm 91.16$	Filling & Packing Method
Maina et al (2011 Nigeria)	$1424.4 \pm 137.9$	$1331.3 \pm 201.8$	Linear Dimensions Measurement
Present study (2013, India)	$1260.48 \pm 75.15$	$1164.52 \pm 89.43$	Filling & Packing Method

capacity of skull is an undisputable criterion for sex determination from skeletal remains and filling & packing method is one of the most reliable cranio-metric methods been used.



Graph 1: Cranial capacity of male and female skulls



Graph 2: Comparison of mean cranial capacity observed by different authors

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# Hospital Based Study of Dengue Hemorrhagic Fever in Western Uttar Pradesh Region

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## Abstract

**Background:** Dengue hemorrhagic fever is Arbo virus mediated outbreak, hitting different geographic areas with typical and atypical manifestations. Dengue hemorrhagic fever emerged as major health problem in India. Here in this study we have tried to find out the trend of DHF in western Uttar Pradesh region.

**Material & Methods:** In this study we retrospectively studied the case files of 196 patients who were admitted as the case of Dengue/ Dengue haemorrhagic fever, but we included only those cases in this study, which fulfilled the World Health Organization case definitions for DHF. Blood samples from suspected cases were collected and tested for Dengue by ELISA.

**Results:** Among all cases fever was present in all the cases and other noticeable symptoms were, headache, Rash, Pleural effusion, Bleeding, Neurological deficits & Ascites. Various biochemical parameters showed different values.

**Conclusions:** We concluded our study with the fact that while keeping in mind the common symptoms of DHF, we should keep an eye on atypical symptoms and manifestations also, so that no case should go unnoticed and proper treatment modality should be applied on the patients.

**Keywords:** ELISA, WHO, Dengue Virus Infection, Fever

## INTRODUCTION

Dengue is the most rapidly spreading mosquito-borne viral disease in the world. Dengue fever (DF) and Dengue hemorrhagic fever (DHF) is endemic Western Pacific region.

DHF is defined as an acute febrile illness with hemorrhagic, a platelet count  $<100,000/\text{mm}^3$  and objective evidence of plasma leakage due to increased vascular permeability, shown by either a fluctuation in hematocrit  $\geq 20\%$  during the course of illness and recovery or clinical signs of plasma leakage, such as ascites, pleural effusion, or hypoproteinemia.<sup>1</sup> (WHO, 1997).

The first virologically confirmed epidemic in India occurred at Kolkata and in the eastern coast of India in 1963-1964.<sup>2</sup>

According to (Bharaj et al, 2008)<sup>3</sup> four serotypes of the virus are circulating in India.

In 1996 another major widespread epidemic of dengue hemorrhagic fever (DHF) occurred involving areas around Delhi and Lucknow.<sup>4,5</sup> After there has been resurgence of the infection in north Indian plains including Uttar Pradesh.

DHF occurs throughout the year with a peak during monsoon and post-monsoon season due to high vector density. Major outbreaks have occurred in north India.<sup>6</sup>

In the last 50 years, incidence has increased 30-fold with increasing geographic expansion to new countries beyond national borders.<sup>7</sup>

The objective of present retrospective study was to determine the number of DHF cases admitted to the

TMMC for the year 2012-2013 and note their clinical presentations and epidemiology.

## MATERIAL & METHODS

This being a retrospective study, the patients were selected from outpatient department and indoor of Teerthankar Mahaveer Medical College and Hospital, Moradabad, Uttar Pradesh, a tertiary care centre in the state. The study was approved by the ethical and research committee of the hospital. Consent was taken from Medical superintendent of the hospital to go through the files and medical record section. We included 148 patients in the study as per definition of DHF by World health organization, and final decision regarding selection of cases was made as per reports of ELISA for IgM.

## RESULTS

**Table 1: Clinical features as seen in descending order in Dengue Hemorrhagic Fever**

Clinical features in descending order	Number of patients
Fever	148
Headache	80
Rash	56
Pleural effusion	28
Bleeding	20
Neurological features	16
Ascites	12

In the present study, total 148 dengue positive patients are included and analyzed. The different clinical features and symptoms of these patients are shown in Table 1. It was seen that fever was present in all (n =148) patients. Next symptom noted was headache (n= 80) followed by rash. Bleeding was noted from different sites of the body in 20 patients. Among these 20 patients with bleeding manifestations, four patients had both gum bleeding and gastrointestinal bleeding in the form of melena, eight patients had bleeding from the gums and 8 patients had only melena. Among the 56 patients with rash, 24 patients had an erythematous outlook of the skin and the rest had purpuric spots. Eight patients also had subconjunctival hemorrhage. Out of 148 patients, 56 had platelet count below fifty thousand/cumm of blood and the rest 92 patients had more than fifty thousand /cumm of blood. And among these 56 patients with below fifty thousand platelet count, 16 patients had both rash and bleeding, 12 had rash only and 4 had bleeding episode only without any rash irrespective of having a low platelet count while other 24 had neither rash nor bleeding. Considering the rest 92 patients, only 14 patients had rash but none had bleeding episodes.16 patients had neurological manifestations.

Patients with encephalopathy presented with disorientation, confusion and rash with fever. MRI was done in the patients was normal. CSF Study in 4 patients revealed - cell-14/10, glucose-56/63 mg/dl, protein-65/56 gm/d. Tests for Japanese encephalitis, Herpes simplex were negative. Serology was negative for HIV antibodies, ANCA and ANA levels were within normal limits. Two patients developed weakness six days after admitted with fever with rash. Patient admitted with history of fever, rash and weakness of both the lower limbs and positive ELISA. These patients improved spontaneously with conservative management without requiring any plasmapheresis. Two patients presented with fever with erythematous hue. Magnetic resonance imaging (MRI) of brain did not reveal any abnormality. Weakness improved completely within next 10 days. Among the 6 lateral rectus palsy patients 4 were females and 2 were male. Two female patients had papilloedema while others four had no other neurological features. MRI of the two female patients was absolutely normal. Out of 148 patients, 58 patients had PCV less than 45 and 32 patients had more than 45. Among those 32 patients 20 had features of serositis. 8 patients had both ascites and pleural effusion and 12 patient's only pleural effusion. Among those 116 patients, 12 had serositis; 4 had ascites and 8 had pleural effusion.

Various biochemical parameters were depicted in Table 2.

**Table 2 : Mean value of different biochemical parameters as obtained in 148 patients**

Biochemical parameters	Values±SD	Unit
Total count	4998±1516	Cubic mm
Platelet count	99000±62563	Cubic mm
Hemoglobin	11.9±1.98	(gm/dl)
PCV	41.2±4.8	-
Creatinine	1.05±0.38	(mg/dl)
Bile (Total)	0.99±0.33	(mg/dl)
Bile (Direct)	0.47±0.28	(mg/dl)
Bile (Indirect)	0.52±0.20	(mg/dl)
Total Protein	6.68±0.56	(gm/dl)
Albumin	3.68±0.48	(gm/dl)
Globulin	2.71±0.33	(gm/dl)

## DISCUSSION

Dengue has emerged as one of major health problem in western Uttar Pradesh region. In India, different circulating serotypes have been reported during different outbreaks. During 2012, DV-1, became the dominant serotype.<sup>3</sup> During conduction of this study we found that manifestations of DF/DHF have ranged from known clinical presentations to some atypical presentations. In western Uttar Pradesh India, post-monsoon period is the most affected period. In DF, cutaneous manifestations can vary from maculopapular rash, petechiae, flushing to even desquamation. In our study

we found rash in 56 cases. In a study conducted by Nadia et al,<sup>8</sup> cutaneous manifestations were present in flushing was present in 72% cases. In a study of patients in Japan, by Itoda et al,<sup>9</sup> rash was more frequent in 82% cases. Rahim & Sikdar,<sup>10</sup> also found rash in high frequency of 78.5% in a Bangladesh based study. Bleeding diathesis is also one of known feature of DF because of low platelet count and leakage from blood vessels. In our study, we found 20 patients had bleeding episodes in the form of gum bleeding and melena while 56 patients had platelet count below 50,000/cmm. In a north Indian study by Seema et al,<sup>11</sup> only 8% patients had bleeding episodes while 26% patients had platelet count below 20,000/cmm. On the other hand, in a study by Tripathy et al,<sup>12</sup> hematemesis, melena and epistaxis were found in 28.28%, 26.78% and 14.28% respectively but only 12.85% cases had platelet count < 70,000/cmm. In north India a study was done by Mittal et al,<sup>13</sup> which revealed thrombocytopenia in 92.6% while bleeding was there in 48.8% cases. In this study only 29% cases had leukocyte count below 4000/cmm. But in study of Itoda et al,<sup>9</sup> leucopenia was detected in 71% cases, while Ageep et al,<sup>14</sup> reported leucopenia in 90%. Mittal et al,<sup>13</sup> found leucopenia in 19.2% cases and in Bangladesh based study by Rahim & sikdar<sup>10</sup> detected it in only 4.1% cases. In our study we found 80 patients presented with headache that is similar (61.6%) to the study by Singh NP et al.<sup>15</sup> Itoda I et al,<sup>9</sup> in Japan, headache was present in 90%cases. On the other hand the north Indian study by Seema et al<sup>11</sup> reported headache in only 9% of cases. In this study we noticed ascites and pleural effusion in 28 and 12 of cases. In the study by Singh et al,<sup>15</sup> ascites was in 1.08% and pleural effusion was also in 1.08% cases. In a study by Mia et al,<sup>16</sup> 41% patients developed ascites and 42% had pleural effusion. Like, in the study by Kamath et al<sup>17</sup> neurological manifestations were noticed in 20% of the patients and Mendez et al<sup>18</sup> reported 25% patients with neurological manifestations. We found them in 16 of our patients. This study is totally based on patients who attended hospital OPD and may not give the exact picture of community as only highly suspected or confirmed cases are reported here. Increase in awareness, better diagnostic facilities, availability of more sensitive and specific diagnostic tests can influence reporting pattern to some extent.

## CONCLUSION

In last few years, varied clinical presentation of the Dengue hemorrhagic fever is noted in the different parts of the world and more so over varied clinical manifestations at different

times in same geographical area. Along with some typical manifestations some atypical features are also noted, which makes the treatment more complicated and motivates the researchers to go deeper in the etiopathogenesis of different atypical features of dengure hemorrhagic fever. Continuous surveillance and timely interventions are required, so that its complications, outbreak and mortality can be minimized.

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# Accelerated Orthodontics – A Review

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## Abstract

The duration of orthodontic treatment is the primary concern of most patients. Unfortunately, long orthodontic treatment time poses several disadvantages like higher predisposition to dental caries, gingival recession and root resorption. Therefore this increases the demand to find the best method to increase rate of tooth movement with the least possible disadvantages. Orthodontic treatment is based on the premise that when force is delivered to a tooth and thereby transmitted to the adjacent investing tissues, certain mechanical, chemical, and cellular events take place within these tissues, which allow for structural alterations and contribute to the movement of that tooth. Conventionally, this process is slow and orthodontic treatment times can range anywhere between 12-48 months. By enhancing the body's response to these forces, tooth movement can be accelerated. Many methods are available to accelerate tooth movement, such as surgical methods (corticotomy, piezosurgery etc), mechanical/physical stimulation methods (vibration, lasers), drugs, magnets etc. These methods have been successfully proven to reduce treatment times by up to 70%. Hence, this article aims to review the latest methods to accelerate orthodontic tooth movement.

**Keywords:** Accelerated orthodontic tooth movement, Corticotomy, Microosteoperforations, Lasers, Piezosurgery, Vibration

## INTRODUCTION

Orthodontic force induces a cellular response in the periodontal ligament, which brings about bone resorption on the pressure side and bone deposition on the tension side. This happens via induction of osteoclasts via the RANK-RANKL pathway and presence of various inflammatory mediators such as IL-1, IL-8, TNF-alpha etc.<sup>1-4</sup> Surgical methods have been used since long to accelerate tooth movement. These methods were based on the principle that when the bone is irritated surgically, an inflammation cascade is initiated which caused increased osteoclastogenesis, hence causing faster tooth movement (Regional Acceleratory Phenomenon or Periodontally Accelerated Osteogenic Orthodontics).<sup>5</sup> However, these were invasive and not well accepted by the patients. Hence, newer surgical methods have arrived with the help of piezosurgery, fiberotomy, microosteoperforations etc. which achieve the same results as achieved by

conventional corticotomy, but with reduced invasiveness and morbidity.

Mechanical or physical stimulation of the periodontal ligament has also been shown to increase the speed of bone remodelling. Many methods have been used for this purpose, out of which lasers and vibration seem to show most promise. They have been proven to act by inducing osteoclastogenesis by inducing the RANK/RANKL pathway and induction of signalling molecules such as MAPK (Mitogen Activated Protein Kinase), c-fos, and nitric oxide.<sup>6,7</sup> These modalities have also been shown to reduce relapse, and pain and root resorption caused due to orthodontic forces.

Methods to accelerate orthodontic tooth movement can be broadly studied under the following categories:

1. Drugs.
2. Surgical Methods.
3. Physical/ Mechanical stimulation methods.

## I. Drugs

Various drugs have been used since long to accelerate orthodontic tooth movement, and have achieved successful results.<sup>8-10</sup> These include vitamin D, prostaglandin, interleukins, parathyroid hormone, misoprostol etc. But, all of these drugs have some or the other unwanted adverse effect. For example, vitamin D when injected in the PDL increases the levels of LDH and CPK enzymes; prostaglandin causes a generalized increase in the inflammatory state and causes root resorption. Hence, as of today, no drug exists that can safely accelerate orthodontic tooth movement.

## II. Surgical Methods

- In 1931, Bichlmayr introduced a surgical technique for rapid correction of severe maxillary protrusion with orthodontic appliances. Wedges of bone were first removed to reduce the volume of bone through which the roots of the maxillary anterior teeth would need to be retracted. In 1959, Kole expanded on this philosophy by addressing additional movements, including space closure and crossbite correction. They suggested that bony blocks (bone-teeth unit) were created as a result of the corticotomy, hence causing faster tooth movement. This concept prevailed till 2001, when Wilcko et al showed a transient demineralization-remineralization process taking place after corticotomy.<sup>11</sup> This was termed as PAOO (Periodontally Accelerated Osteogenic Orthodontics). This concept was earlier described by Frost in 1983, and was called as RAP (Regional Acceleratory Phenomenon).<sup>5</sup>

### What is RAP or PAOO? How does it work?

- Regional Acceleratory Phenomena (RAP) is local response to a noxious stimulus, which describes a process by which tissue forms faster than the normal regional regeneration process. By enhancing the various healing stages, this phenomenon makes healing occur 2–10 times faster than normal physiologic healing (Frost, 1983).<sup>5</sup>
- Many studies have reported an increase in the activity of inflammatory markers such as chemokines and cytokines in response to orthodontic forces. Chemokines play an important role in the recruitment of osteoclast precursor cells, and cytokines, directly or indirectly, through the prostaglandin E2 pathway and the RANK/RANKL pathway, leading to the differentiation of osteoclasts from their precursors cells into mature osteoclasts. Therefore, it is logical to assume that increasing the expression of these factors, by surgically irritating the bone should accelerate tooth movement.<sup>1-4</sup>
- A histological study showed that selective alveolar decortication induced increased turnover of alveolar

spongiosa (Sebaoun et al 2008). Surgery results in a substantial increase in alveolar demineralization, a transient and reversible condition. This will result in osteopenia (temporary decrease in bone mineral density). The osteopenia enables rapid tooth movement because teeth are supported by and moved through trabecular bone. As long as tooth movement continues, there is prolongation of RAP. When RAP dissipates, the osteopenia disappears and the radiographic image of normal spongiosa reappears. Then when orthodontic tooth movement is completed, an environment is created that favors alveolar re-mineralization

- Simply stated, when bone is surgically irritated, a wound is created. This wound initiates a localised inflammatory response. Due to the presence of the inflammatory markers, osteoclasts migrate to the area and cause bone resorption.

This effect, however, is temporary, and lasts for about 4 months,<sup>12</sup> and the procedure needs to be repeated, in case faster tooth movement is still required.

The various surgical methods available are:

### 1. Corticotomy

The conventional corticotomy procedure involves elevation of full thickness mucoperiosteal flaps, buccally and/or lingually, followed by placing the corticotomy cuts using either micromotor under irrigation, or piezosurgical instruments. This can be followed by placement of a graft material, wherever required, to augment thickness of bone. In 2001, Wilcko et al reported that a surface-computed tomographic evaluation of corticotomized patients clearly showed a transient localized demineralization-remineralization process consistent with the accelerated wound-healing pattern of the regional acceleratory phenomenon.<sup>11</sup>

### Advantages

- a. It has been proven successfully by many authors, to accelerate tooth movement.
- b. Bone can be augmented, thereby preventing periodontal defects, which might arise, as a result of thin alveolar bone.

### Disadvantages<sup>13</sup>

- a. High morbidity associated with the procedure.
  - b. Invasive procedure.
  - c. Chances of damage to adjacent vital structures.
  - d. Post-operative pain, swelling, chances of infection, avascular necrosis.
  - e. Low acceptance by the patient.
- Park et al in 2006, and Kim et al in 2009, introduced the corticison technique, as a minimally invasive alternative to surgically injure the bone without flap elevation.

They used a reinforced scalpel and mallet to go through the gingiva and cortical bone. This technique did induce RAP effect, but had drawbacks such as; inability to place grafts, and the malleting procedure was shown to cause dizziness after surgery.<sup>14</sup>

## 2. Piezocision

- To reduce the morbidity associated with conventional corticotomy, Dibart et al in 2009, introduced a flapless method of corticotomy, using piezosurgery.<sup>13</sup>
- In the technique described by them, the surgery was performed 1 week after placement of orthodontic appliance, under local anaesthesia. Gingival vertical incisions, only buccally, were made below the interdental papilla, as far as possible, in the attached gingiva using a No.15 scalpel. These incisions need to be deep enough so as to pass through the periosteum, and contact the cortical bone. Next, using ultrasonic instrumentation (they used a BS1 insert Piezotome), to perform the corticotomy cuts to a depth of 3 mm through the previously made incisions. At the areas requiring bone augmentation, tunnelling is performed using an elevator inserted between the incisions, to create sufficient space to accept a graft material. No suturing is required, except for the areas, where the graft material needs to be stabilized. Patient is placed on an antibiotic, mouthwash regimen.

### Advantages

- a. Minimally invasive.
- b. Better patient acceptance.

### Disadvantages

- a. Risk of root damage, as incisions and corticotomies are “blindly” done.
- To reduce the risk of root damage, however, Jorge et al in 2013,<sup>14</sup> suggested a method, called MIRO (Minimally Invasive Rapid Orthodontic procedure) by using metal wire as a guide to placement of the incisions, and subsequently the corticotomy cuts. He placed metal guides in between each tooth, perpendicular to the main arch wire, and took digital radiographs, to ensure that the metal guides did not project over the tooth roots. Once this was confirmed, incisions and piezoelectric corticotomy was done using the pins as a guide.

## 3. Micro-Osteoperforations (MOP)

- To further reduce the invasive nature of surgical irritation of bone, a device called Propel, was introduced by Propel Orthodontics. They called this process as Alveocentesis, which literally translates to puncturing bone.<sup>15</sup>

- This device comes as ready-to-use sterile disposable device. The device has an adjustable depth dial and indicating arrow on the driver body. The adjustable depth dial can be positioned to 0 mm, 3 mm, 5 mm, and 7 mm of tip depth, depending on the area of operation. Previous animal studies have shown that performing micro-osteoperforations (MOPs) on alveolar bone during orthodontic tooth movement can stimulate the expression of inflammatory markers, leading to increases in osteoclast activity and the rate of tooth movement.
- Mani Alikhani et al (2013)<sup>15</sup>, performed a single center single blinded study to investigate this procedure on humans. They used a Ni-Ti closed coil spring, delivering a constant force of 100 g to distalize the maxillary canine after first premolar extraction. The spring was anchored to a TAD distal to the second premolar, and attached to the canine using a power arm through the vertical slot of the canine bracket. Gingival crevicular fluid (GCF) samples were collected from each subject to evaluate the level of inflammatory response. GCF was collected before orthodontic treatment, immediately before the start of canine retraction, and at each subsequent visit, between 10 AM and 12 noon. These samples were taken from the distobuccal crevices of the maxillary canine. GCF samples were collected with filter-paper strips (Oraflow, Smithtown, NY) inserted 1 mm below the gingival margin into the distobuccal crevices of the canine for 10 seconds. Cytokine levels were measured using a custom protein array for the following cytokines: CCL-2 (MCP1), CCL-3, CCL-5(RANTES), IL-8 (CXCL8), IL-1a, IL-1b, IL-6, and TNF-a (Raybiotech, Norcross, Ga) according to the manufacturer’s instructions.
- Alginate impressions were taken at the beginning of the study, immediately before canine retraction, and 28 days after canine retraction began to monitor the rate of tooth movement. The impressions were immediately poured up with plaster (calcium sulfate). Vertical lines were drawn on the cast over the palatal surface of the canine and lateral incisor from the middle of the incisal edge to the middle of the cervical line. The distance between the canine and the lateral incisor was assessed before and after canine retraction at 3 points: incisal, middle, and cervical thirds of the crowns. All cast measurements were made using an electric digital caliper (Orthopli Corp, Philadelphia, Pa) with an accuracy of 0.01 mm. They concluded their study by stating that:
  - MOPs significantly increased the expression of cytokines and chemokines known to recruit osteoclast precursors and stimulate osteoclast differentiation.

- MOPs increased the rate of canine retraction 2.3-fold compared with the control group.
- Patients reported only mild discomfort locally at the spot of the MOPs. At days 14 and 28, little to no pain was experienced.
- MOPs are an effective, comfortable, and safe procedure to accelerate tooth movement during orthodontic treatment.
- MOPs could reduce orthodontic treatment time by 62%.
- However, this was the first study investigating this method, and certain issues were not addressed, such as, effect on root resorption, number of perforations required, long term effects (this study had a duration of only 28 days).

### III. Physical/Mechanical Stimulation

- Surgical methods, regardless of technique, are still invasive to some degree, and hence have their associated complications. Hence, non-invasive methods have come to the fore. These modalities include lasers, vibration, direct electric current etc.

#### Laser

- Saito and Shimizu found that low intensity laser therapy can accelerate bone regeneration in the midpalatal suture during rapid palatal expansion and stimulate the synthesis of collagen, which is major matrix protein in bone. In the last decade, many histologic studies have attempted to determine the effect of low-intensity laser therapy on the histochemical pathways directly associated with orthodontic tooth movement. Increased osteoblastic and osteoclastic activity after low-level laser therapy was observed in vivo and in vitro. The mechanism involved in the acceleration of tooth movement is by the production of ATP and activation of cytochrome C, as shown in that low-energy laser irradiation enhanced the velocity of tooth movement via RANK/RANKL and the macrophage colony-stimulating factor and its receptor expression.<sup>6</sup>
- In 2004, Cruz et al was the first to carry out a human study on the effect of low-intensity laser therapy on orthodontic tooth movement. They showed that the irradiated canines were retracted at a rate 34% greater than the control canines over 60 days.<sup>16</sup>
- Gauri Doshi Mehta et al in 2013<sup>16</sup>, in a split mouth design, used a laser at 800 nm for 10 sec on the canine, both buccally and lingually, which had to be distalized after first premolar extraction. They used a Ni-Ti closed coil spring delivering a constant force of 150 g from the first molar tube hook to the power arm of the canine bracket and also secured with a ligature tie to the bracket. The laser type used was a semiconductor (aluminium gallium arsenide) diode

(model LA3D0001.1; LAMBDA S.p.A., Vicenza, Italy) emitting infrared radiation with a wavelength of  $808 \pm 10$  nm operated according to the manufacturer's recommendations. They also aimed to study the analgesic properties of laser therapy. For analgesic purposes, the settings were adjusted to a wavelength of 800 nm, a continuous wave mode, an output power of 0.7 mW, and an exposure time of 30 seconds. For bio-stimulation, the parameters were set at a wavelength of 800 nm, a continuous wave mode, an output power of 0.25 mW, and an exposure time of 10 seconds. The total energy density (dose) at each application was 8 J ( $2 \times 40 \text{ s} \times 100 \text{ mW}$ ). After 6 months, the laser side (experimental) and the control side canines were examined with periapical radiographs, which showed no undesirable changes in the adjacent periodontal ligaments and alveolar bones. Vitality tests of the retracted canines were also positive.

Three models were made for each patient. On the models, the mesial cusp tips of first molar and the canine were the reference points. The distance between the first molar and the canine was measured on all 3 models for each patient with a digital caliper accurate to 0.02 mm. These distances were recorded at T0 (after completion of alignment and leveling: day 1 of canine retraction), T1 (at the end of 3 months of canine retraction), and T2 (on completion of canine retraction on the experimental side).

There was a highly significant positive difference in the rates of tooth movement on the experimental side compared with the control side. The mean increase in the rates of tooth movement at 3 months was 54% in the maxillary arch and 58% in the mandibular arch. Mean increase in the rate of tooth movement after canine retraction was 29% in the maxillary arch and 31% in the mandibular arch. There was a significant decrease in the pain score recorded, using a Visual Analog Scale.

In this study, they used the semiconductor with a wavelength of 800 nm, a continuous wave mode, an output power of 0.25 mW, and an exposure time of 10 seconds because the results of Takeda and Bradley et al had indicated significant bio-stimulatory effects on bone metabolism around this dosage, whereas higher dosages had bio-inhibitory effects, and lower dosage showed nonsignificant results.<sup>16</sup>

- Limpanichkul et al in 2006, however obtained a result that low level laser had no additive effect on orthodontic tooth movement. The reason could be the higher energy density of 25 J per square centimeter that they used.<sup>(16)</sup>
- Various studies on low level laser therapy, have shown orthodontic tooth movement to be increased by

30-60%. The variations amongst the studies seems to arise from variations in frequency of application of laser, intensity of laser, and method of force application on the tooth.

### Vibration

- Nishimura et al in 2008, used a Ni-Ti expansion spring on the 1<sup>st</sup> molar of Wistar rats, and applied a vibration of 60 Hz, 1 m/s<sup>2</sup>. They stated that the rats that received the vibration showed increased orthodontic tooth movement. In the sectioned samples, they showed increased RANKL expression in the fibroblasts and osteoclasts of the periodontal ligament of the rats that received vibration.<sup>17</sup>
- Liu et al in 2009 conducted a study on thirty mice, in which they used an omega shaped Ni-Ti expander to deliver a force of 20 g on the 1<sup>st</sup> molar. Mechanical vibration (4 Hz for 20 min/day) was applied perpendicular to the occlusal surface of the first molar. This regimen was repeated seven times, every 3 days. Upon micro-CT examination of the jaws of the killed mice, it showed that the mice that received vibration showed 40% more tooth movement.<sup>18</sup>
- Recently, a product by the name Acceledent has arrived at the market, which makes use of this technology. This device consists of an activator, which is the active part of the appliance that delivers the vibration impulses with a USB interface through which it can be connected to a computer to review the patient usage of the appliance, a mouthpiece that contacts the teeth. It is a portable device that can be charged similar to any other electronic device, and has to be worn for 20 minutes a day. Various case studies using this device have shown the treatment times to be reduced by up to 30-40%.

### CONCLUSION

Since long, orthodontic patients have been asking for shorter treatment times, and today, we do have methods that can accelerate orthodontic tooth movement safely. The current methods such as piezocision, microosteoperforations, lasers and vibration have reduced or eliminated the invasive nature of previous procedures used to achieve the Regional Acceleratory Phenomenon. Also, they come with additional advantages such as reduced rates of relapse, reduced orthodontic pain and reduced root resorption.

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# A Case of Diffuse Gingival Enlargement in Acute Myeloblastic Leukemia (AML M1)

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## Abstract

Acute myeloid leukemia (AML) is characterized by arrest in maturation of myeloid cells leading to increase in number of myeloblasts in the bone marrow, hemopoietic insufficiency (with or without leukocytosis) and infiltration of bone marrow and other tissues by blast cells. Acute leukemia is the commonest childhood cancer. Children with AML in general may present with a broad variety of (atypical) symptoms, which may range from minor symptoms to life-threatening conditions. Gingival hyperplasia is most commonly seen with the AML subtypes acute monocytic leukemia (M5) and acute myelomonocytic leukemia (M4). Here, we report an unusual case of diffuse gingival hypertrophy in a 15 year old Asian female which led to laboratory studies, which in turn led to a rapid and relatively early diagnosis of acute myeloblastic leukemia (AML M1). This case emphasizes that dentist should be well acquainted with the oral manifestations of systemic diseases and stresses the role of gingival enlargement as a diagnostic indicator in leukemia.

**Keywords:** Leukemia, Myeloblastic, Gingival enlargement, Signs and symptoms, Acute, Diffuse

## INTRODUCTION

Leukemia is a heterogenous group of hematological disorders that arises from a hematopoietic stem cell characterised by a disordered differentiation and proliferation of neoplastic cells.<sup>1</sup> Acute leukemias result from malignant transformation of immature hematopoietic cells followed by clonal proliferation and accumulation of the transformed cells. This neoplastic proliferation in marrow may result in pancytopenia leading to symptoms of anemia, granulocytopenia and thrombocytopenia. Also, the leukemic cell proliferation may be observed in organs such as lymph nodes, spleen, gingiva, central nervous system and skin.<sup>2</sup>

Leukemia is categorised into acute or chronic forms, based on its clinical behavior, and into lymphocytic and myelocytic, based on its histogenetic origin. Acute myelocytic leukemia (AML), which is also known as; acute granulocytic leukemia, acute myeloblastic leukemia or acute non-lymphocytic leukemia, is commonly classified under 8 subgroups according to the French-American-British

(FAB) classification system including M0 (undifferentiated leukemia), M1 (acute myeloblastic leukemia), M2 (acute myeloblastic leukemia with maturation), M3 (acute promyelocytic leukemia), M4 (acute myelomonocytic leukemia), M5 (acute monocytic leukemia), M6 (acute erythroblastic leukemia), and M7 (acute megakaryoblastic leukemia).<sup>3</sup> However in 1997, the World Health Organization proposed 4 groups in the AML category 1) AML with recurrent cytogenetic translocations; 2) AML with myelodysplasia-related features; 3) therapy-related AML and myelodysplastic syndromes; and 4) AML not otherwise specified (NOS).<sup>4</sup>

Leukemias occur in all human races, but are more common in Caucasians. Leukemia is the most common childhood cancer in India with relative proportion varying between 25 and 40%. Sixty to 85% of all leukemias reported are acute lymphoblastic leukemia (ALL).<sup>5</sup> Oral lesions associated with leukemia have been well documented.<sup>6</sup> Signs and local symptoms of leukemia in the oral cavity include paleness of the oral mucosa with gingival bleeding, gingival enlargement, and ulcerative necrotic lesions.<sup>7</sup> Here, we

report an unusual case of diffuse gingival hypertrophy in a 15 year old Asian female which led to laboratory studies, which in turn led to a rapid and relatively early diagnosis of acute myeloblastic leukemia (AML M1).

## CASE DESCRIPTION

A 15-year old girl reported on 19th July 2012 to Department of Periodontology and Oral Implantology, Government Dental College and Hospital, Jaipur with the complaint of swollen gums in 10-15 days time and associated pain. Her clinical examination revealed fever and signs of anemia. Her medical history was non-contributory and she was not on medication for any chronic illness.

Oral examination of the patient demonstrated generalized diffuse enlargement of maxillary and mandibular gingiva covering about 2/3rd of the crown structure involving buccal, lingual and palatal aspects. Color of gingiva appeared reddish blue with loss of stippling. Further intraoral examination revealed an ulcer on dorsal and ventral aspect of tongue. Palatal petechiae were also noted. Palpation and probing was avoided due to unusual history and clinical findings. The same day, blood investigations were advised.

## INVESTIGATIONS

Complete blood count revealed a marked increase of white blood cells, a decrease in red blood cells with lowered hematocrit and haemoglobin levels and a low platelet count indicative of leukocytosis, anemia and thrombocytopenia. An abnormal leukocyte differential displayed 03% segmented neutrophils, 95% blasts, 0% monocytes, 02% lymphocytes and 00% eosinophils. Peripheral blood smear displayed leukocytosis with numerous blasts having irregular nuclear margins, prominent nucleoli and immature chromatin, reduced platelets in number and anisopoikilocytotic, microcytic RBCs suggestive of an acute leukemia. Subsequent bone marrow biopsy demonstrated 90% hypercellularity, predominated by sheets of blast cells. Therefore the diagnosis of acute myeloid leukemia M1 was established and the patient was referred to Department of Pediatrics, SMS Medical College and Hospital, Jaipur.

## TREATMENT

Oral hygiene instructions were given to the patient and 0.2% chlorhexidine was prescribed. Scaling and root planing was postponed since the treatment needs a minimum platelet count of 60000 in this condition. She was hospitalised with a diagnosis of AML M1 type. After 7 days her hematologic profile was as presented in Table 2. After a period of 12

days while receiving therapy, she succumbed to the disease due to respiratory arrest.

**Table 1: Initial hematologic profile**

	Patient Values	Normal Values
Total Leukocyte count	107.69 × 10 <sup>3</sup> /mm <sup>3</sup>	4.5–11.0 × 10 <sup>3</sup> /mm <sup>3</sup>
	95% blasts	
Erythrocyte Count	1.67 × 10 <sup>6</sup> /mm <sup>3</sup>	3.8–4.8 × 10 <sup>6</sup> /mm <sup>3</sup>
Hemoglobin	7.3 g/dl	12–15 g/dl
Hematocrit	17.74%	36–46%
Platelet count	0.16 × 10 <sup>3</sup> /mm <sup>3</sup>	1.5–4.5 × 10 <sup>3</sup> /mm <sup>3</sup>

**Table 2: Hematologic profile at second visit**

	Patient Values	Normal Values
Total Leukocyte count	227 × 10 <sup>3</sup> /mm <sup>3</sup>	4.5–11.0 × 10 <sup>3</sup> /mm <sup>3</sup>
	95% blasts	
	Neutrophils-10%	
	Lymphocytes-90%	
	Eosinophils-0%	
	Monocytes-0%	
Erythrocyte Count	1.46 × 10 <sup>6</sup> /mm <sup>3</sup>	3.8–4.8 × 10 <sup>6</sup> /mm <sup>3</sup>
Hemoglobin	5.2 (g/dl)	12–15 g/dl
Platelet count	0.16 × 10 <sup>3</sup> /mm <sup>3</sup>	1.5–4.5 × 10 <sup>3</sup> /mm <sup>3</sup>

## DISCUSSION

The differential diagnosis of a patient presenting with gingival enlargement would include chronic gingivitis, drug-induced hyperplasia, idiopathic gingival enlargement or neoplastic processes.<sup>1</sup> Hyperplastic gingivitis secondary to local factors such as periodontal infection or trauma tends to demonstrate erythematous and boggy gingiva localized to a focal area. Drug-induced hyperplasia can be caused by calcium channel blockers such as nifedipine and verapamil hydrochloride; the anticonvulsant such as phenytoin sodium; or the immunosuppressant cyclosporin. Gorlin et al. described several genetic syndromes involving gingival fibromatosis presenting as generalized gingival enlargement, such as Cross syndrome, Ramon syndrome, Rutherford syndrome, and others. However, the enlargement typically occurs before the age of 20 and often correlates with tooth eruption and mental retardation.<sup>8</sup> Gingival swellings may manifest as a localized metastatic deposit or haematological disorder such as lymphoma or a leukemic infiltrate.

Dentists in clinical practice have become increasingly interested in leukemia as the oral complications are common throughout the clinical course of the disease, dental management is complex, and the oral cavity is a potential source of morbidity and mortality. Because oral signs and symptoms are common, the dentist may be the first clinician to diagnose the disease. Head and neck signs such as cervical lymphadenopathy, oral bleeding,

gingival enlargement, infections, and oral ulcers result from leukemic cell infiltration. In the most extensive review of the topic by Driezen *et al*, gingival hyperplasia was observed in acute myelogenous leukemia (AML) with a frequency of 3% to 5% among 1,076 patients receiving anti-leukemia chemotherapy at a referral centre.

Gingival hyperplasia is most commonly seen with the AML subtypes acute monocytic leukemia (M5) (66.7%), acute myelomonocytic leukemia (M4) (18.5%), and acute myelocytic leukemia (M1, M2) (3.7%).<sup>9</sup> In this case report, rapid gingival hyperplasia was the main reason of the patient to seek dentist consultation. The examining dentist suspected a systemic disease such as one of the hematologic disorders based on the duration of gingival hyperplasia and history of spontaneous gingival bleeding, without prominent dental plaque or calculus accumulation. A hematological investigation was asked and it revealed an elevated leukocyte count. Stafford *et al.* evaluated 500 leukemic patients and found 65% had some oral manifestation that caused them to seek care, contributed to their reason for seeking care, or was noted at the initial physical examination.<sup>10</sup>

Oral manifestations have been observed in 15% to 80% of his patients with leukemia and are more commonly seen in acute (65%) rather than in chronic leukemia (30%). Lynch and Ship found that petechiae or bleeding (56%), ulceration (53%), and gingival hyperplasia (36%) were the most common initial diagnostic and postdiagnostic manifestations of leukemia in a 10-year retrospective study of 155 patients.<sup>11</sup> Other findings include pallor, infection, pain, lymphadenopathy, and pharyngitis. Extreme pallor of the oral mucosa, resulting from acute anemia, may be the only oral manifestation of acute leukemia in patients maintaining excellent plaque control.

Gordon MR reported a case of acute myelogenous leukemia diagnosed following laboratory studies initiated due to extreme gingival pallor.<sup>12</sup> Gingival infiltration represents a 5% frequency as the initial presenting complication of AML.<sup>13</sup> However, the development of gingival infiltration in any patient is uncertain with respect to gender and age. Leukemia cell infiltration in gingiva is not observed in edentulous patients, which implies that local irritation and trauma associated with the presence of teeth may have a role in the pathogenesis of this abnormality. However, gingival hyperplasia occurs in patients with excellent oral hygiene, indicating that adverse local conditions are not necessary requirements to promote or induce leukemic infiltration of oral tissues. Poor oral hygiene may predispose the patient to develop infections, bleeding, ulceration, and

pain. Osgood noted that swelling of gingiva was one of the most constant feature in monocytic leukemias, occurring in 80% cases of his 58 cases.<sup>14</sup> It is more common in monocytic than in other cases of acute leukemias and a significant number of patients consulted a dentist before going to a physician.

Pogrel MA reported a case of acute myeloblastic leukemia in which the mode of presentation was marked hypertrophy in the mandibular incisor region only, the remainder the gingivae and oral cavity being completely normal.<sup>15</sup> A definite diagnosis was not made until the patient was in a final stage similar to that of present case. Vural F reported a case of CD56+ chronic myelomonocytic leukemia (CMML) who developed gingival hypertrophy simultaneously when the leukocyte count elevated. It is hypothesized that, M4–M5 monoblasts which have the capability of early maturation and migration from bone marrow could demonstrate extramedullary tissue invasion.<sup>16</sup> This CD56+ leukemic cells invasion and proliferation in extramedullary tissues, results in development of myeloblastoma.<sup>17</sup> Since flow cytometric analysis of bone marrow cells was not performed in our case, similar mechanism of extramedullary tissue involvement cannot be extrapolated.

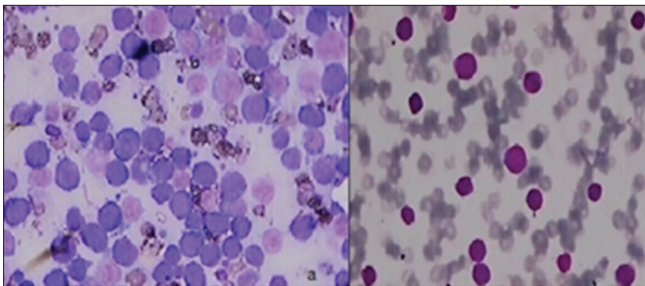
Since oral manifestations in all types of acute leukemias occur early in the course of disease, it must be emphasized that unnecessary dental intervention may aggravate the situation and give rise to exacerbation of acute symptoms. Hence, any dental therapy was avoided in our case and was referred immediately to physician. In the course of medical treatment, the patient succumbed to the disease in 12 days. The rapid and extensive enlargement in both the arches was more interesting in this case.



**Figure 1: Clinical photographs of labial (a), palatal (b) and lingual (c) view at first visit. Ulcer seen on dorsal aspect of tongue in c**



**Figure 2: Clinical photographs of labial (a), palatal (b) and lingual (c) view at second visit (7 days after the first visit)**



**Figure 3: (a) Bone marrow aspirate showing myeloblasts without maturation (M1) having pale basophilic cytoplasm with open nuclear chromatin and prominent nucleolus (b) Peripheral blood film showing predominantly myeloblasts**

## CONCLUSION

This case emphasizes that dentist should be well acquainted with the oral manifestations of systemic diseases and stresses the role of gingival enlargement as a diagnostic indicator of leukemia. Medical consultation must be essential in dental therapy in such cases. An accurate history is critical for diagnosis and subsequent management in all patients.

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# Intraoral Lipoma in a Young Male Patient: A Case Report

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## Abstract

Lipomas are benign tumours of mesenchymal origin (mature adipocytes) that are comparatively uncommon in the oral cavity corresponding to less than 4.4% of all benign oral soft tissue tumors. Clinically, they present as slow growing, soft, asymptomatic masses that are usually less than 25 mm in size. Histopathologically, they appear as thinly encapsulated lesion composed of mature adipocytes with inconspicuous vascularity. The pathogenetic mechanisms of oral lipomas are still unclear. Their diagnostic importance lies in the distinction from cysts, other mesenchymal and salivary gland neoplasms in this region. They are usually treated by surgical excision and bear excellent prognosis. Here we report a case of intraoral lipoma in an 18 year old male patient in the buccal mucosa that was treated by surgical excision without any postsurgical complication or recurrence after 2 years of follow up.

**Keywords:** Lipoma, Adipocytes, Buccal mucosa

## INTRODUCTION

Lipomas are the most common benign mesenchymal tumors in the body. They are benign mesenchymal neoplasms composed of fat cells usually surrounded by a thin fibrous capsule.<sup>1</sup> It mainly affects the region of the trunk, shoulders, neck and axilla with only about 15-20% of cases occurring in the head and neck region.<sup>2</sup> Oral lipomas represent only 1-4% of all benign oral soft tissue tumors.<sup>3</sup> The most common intraoral site for lipoma is buccal mucosa and buccal vestibule.<sup>4</sup> The unusual intraoral sites include the lips, gingiva and palate.<sup>2</sup> Lipomas of the oral and maxillofacial region have shown equal predilection for involvement of men and women.<sup>4</sup> Lipoma is uncommon in younger age group and affects patients mostly above 40 years of age with peak occurrence in the fifth or sixth decades of life.<sup>2</sup> The size of tumor depends on the location but rarely exceeds 25 mm in diameter. Lipomas are usually asymptomatic until they grow to large size and may interfere with speaking and mastication.<sup>5</sup> The diagnosis is mainly based on clinical findings with histopathology to rule out other lesions in the same site. The accepted classification of benign lipomas includes: classic lipoma; lipoma variants (e.g. angiolipoma, chondroid lipoma, myolipoma, spindle cell lipoma); hamartomatous lesions; diffuse lipomatous proliferations; and hibernoma.<sup>6</sup>

Here we report a case of intraoral lipoma occurring in the buccal mucosa of a young male patient and treated by surgical excision with no recurrence and complications.

## CASE REPORT

An 18 year old patient reported with a chief complaint of painless swelling in the right cheek region which had increased in size for the past three months to the present size (Figure 1). The swelling was not associated with other symptoms like paresthesia, ulceration or discharge. On extra oral examination, a solitary swelling was seen in the right side of the mandible in the body region extending 3 cm from the angle of the mouth to the angle of the mandible anteroposteriorly and extending 1 cm below from a line joining the corner of the mouth to the tragus to the inferior border of the mandible superoinferiorly. On intraoral examination, solitary, soft, sessile, lobulated swelling is seen in the right buccal mucosa, round in shape, 2x2 cm in size located opposite to second premolar and first molar, non-tender, mobile and fluctuant (Figure 2). A provisional diagnosis of lipoma was made. An excisional biopsy was carried out under local anesthesia. Longitudinal incision was made over the buccal mucosa and the lesion was removed through blunt dissection to avoid

rupture of any feeder vessels and the specimen was submitted for histopathological examination. The gross specimen showed the tumour mass measuring 4x2.5x2.5 cm in size, yellowish-white in colour, soft in consistency with surface lobulations. The specimen was observed to be floating in the container with formalin thus indicating its lipomatous nature. On microscopic examination, the excised tissue mass showed well circumscribed, lobular proliferation of mature adipocytes with clear cytoplasm and flattened, eccentrically placed nuclei separated by connective tissue septae. The section showed lack of cellular atypia or metaplasia with minimal vascularity (Figure 3). A final diagnosis of lipoma was made.



**Figure 1: Extraoral photograph with swelling on the right side of the mandible**

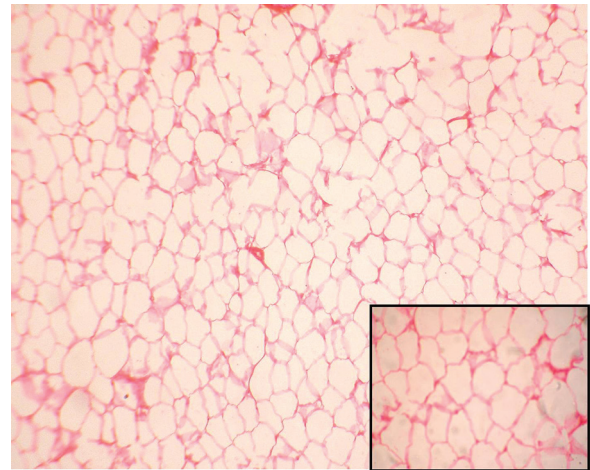


**Figure 2: Excisional biopsy of the intraoral tumour mass**

## DISCUSSION

Lipoma is the most common neoplasm arising from fat tissue. Lipomas presenting as intraoral masses is an uncommon intraoral finding. They are usually slow growing, soft and silent masses.<sup>7</sup> The buccal mucosa is the most affected site (53.7%), followed by the buccal

sulcus (14.6%) and tongue (9.8%). The tumor can present as a swelling upto 10 cm in size.<sup>8</sup> The majority remain unulcerated but ulceration leads to difficulty in diagnosis. Some deep lipomatous lesions produce only slight elevation of the surface while others can cause changes in function.<sup>9</sup> The first description of oral lipoma was provided in 1848 by Roux in a review of alveolar masses which he referred it as a “yellow epulis”.<sup>10</sup>



**Figure 3: Histopathology (H and E stain) of the lesion showing mature adipocytes with inconspicuous vascularity(10x). Inset: Histopathology at 40x**

The pathogenesis of lipoma is still not clearly understood. They do not decrease in size if the caloric intake is reduced which suggests that its behaviour is independent of whole body metabolism.<sup>11</sup> Earlier view regarding aetiology was that it may originate from embryonic rests of lipoblasts and proliferating embryonic mesoderm or fatty degeneration of other cells or metaplasia of muscle cells. Heredity, fatty degeneration, endocrine disturbances and trauma are probable etiologic agents for lipomas.<sup>12</sup>

Cytogenetic analysis of adipose tissue tumors has shown that the various histopathologic subtypes are characterized by distinctive clonal chromosomal abnormalities. It has been shown that while classic lipomas typically harbour abnormalities involving 12q13-15 or 6p or 13q, spindle cell and pleomorphic lipomas typically display complete or partial loss of 13q and chromosome 16. The molecular genetic changes associated with karyotype anomalies in lipoma pointed to the generation of fusion products capable of inducing proliferation but not malignant transformation. Translocations with and rearrangements affecting the 12q13-q15 region are the most common. The most frequent translocation is t(3;12)(q27-q28;q13-q15), seen in almost 25% of lipomas.<sup>13</sup>

Though diagnostic imaging may have a limited role as the diagnosis is usually made clinically, modalities such as CT,

MRI and ultrasound may be performed in certain cases to know the extent, location and delimitation of the margins of the mass. Lipomas have a characteristic homogeneous appearance with the same density as subcutaneous fat in CT examination. On MRI examination, they show a strikingly high intensity signal, equal to that of the subcutaneous adipose tissue on both T1- and T2-weighted images. Ultrasound findings suggest hypoechoic masses in majority of the cases with small echogenic lines.<sup>14</sup>

Clinical diagnosis of superficial lesion seldom poses a problem due to the ease of palpation and the yellow colour of the lesion.<sup>2</sup> However, deep seated lesions like in our case, warrants differential diagnosis from other lesions in this site such as granular cell tumor, neurofibroma, traumatic fibroma, lymphoepithelial cysts, dermoid and epidermoid cysts, minor salivary gland tumours and malignant lipomatous tumours which has to be confirmed histopathologically.<sup>5</sup>

Histologically, oral lipomas are composed of mature fat cells arranged in lobular fashion simulating extraoral subcutaneous lipoma and the normal surrounding fat. Typically, they are encapsulated or well circumscribed with rare exceptions.<sup>15</sup> Based on microscopy, it is not possible to distinguish these lipomas from normal adipose tissue.<sup>2</sup>

Immunohistochemically, adipose cells in lipomas are positive for S-100 $\alpha$  and S-100 $\beta$ .<sup>16</sup> Fregnani *et al.* studied immunohistochemical expression of PCNA and Ki-67 in the different histological variants of lipoma. The proliferative rate of fibrolipomas was greater than common lipomas, but no differences in clinical behaviour were noticed after surgical treatment.<sup>1</sup> It has been shown that the white fat in lipoma can be distinguished from brown fat in hibernoma immunohistochemically. Tumour cells in hibernoma show intense positive staining for CD31 in the cell membrane and membranes of intracytoplasmic vacuoles whereas it is negative in neoplastic cells of lipoma. CD31 characterizes the vascular network distinctive in brown fat.<sup>17</sup>

History of trauma should help in distinguishing it from the herniated buccal fat pad.<sup>15</sup> Differential diagnosis should also be done between lipoma and dermoid and lymphoepithelial cysts, epidermoid cysts, ranula, mucocele, pleomorphic adenoma and mucoepidermoid carcinoma. Mesenchymal neoplasm should be also included in the differential diagnosis. Oral lymphoepithelial cyst differs from oral lipoma due to smaller nodules and it usually occurs between the first and third decade of life. A majority of these cysts in oral cavity is found in soft palate, pharynx mucosa and lymph nodes. Dermoid and epidermoid cysts are also found as submucous nodules which usually occur

in the midline of mouth floor, in different locations on the oral mucosa.<sup>18</sup>

The treatment is conservative local excision with rare cases of recurrence. The histologic variants have no bearing on the prognosis except the intramuscular lipomas due to their infiltrating nature, but this variant is seen rarely in the oral cavity.<sup>4</sup> Accurate clinical and surgical details are necessary as the histopathological features are not different from normal mature fat tissue.<sup>11</sup>

## CONCLUSION

Lipomas are common benign tumours of mature adipocytes, however their intraoral occurrence is relatively rare. Although they are common in buccal mucosa among the various intra oral sites, their diagnosis warrants exclusion of other connective tissue, salivary gland neoplasms and malignant adipocytic neoplasms occurring in this location. The histopathologic features should lead to a confirmatory diagnosis of lipoma. MRI and CT scan may be used as adjunctive diagnostic aids in cases of infiltrating lipomas to gauge the extent of infiltration. Treatment by careful and complete surgical excision is the treatment of choice and recurrence is reported rarely.

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# Rare Case of Double Dens Invaginatus in a Supernumerary Tooth - An Unusual Case Report

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## Abstract

Dens invaginatus is a rare developmental malformation resulting from an alteration in the normal growth pattern of the dental papilla. Teeth in both maxillary and mandibular arches may be affected, but the permanent maxillary lateral incisors are the most frequently involved teeth. The invagination ranges from slight accentuation of a lingual pit to an anomaly occupying most of the crown and root. Many etiological factors have been determined regarding its pathogenesis. Only few cases have been reported where dens invaginatus was found to be associated with a supernumerary tooth. This paper reports an unusual case of simultaneous presence of mesiodens and supernumerary tooth with double Dens Invaginatus and its management.

**Keywords:** Double dens invaginatus, Supernumerary tooth, Mesiodens

## INTRODUCTION

Dens invaginatus is a rare developmental malformation of tooth displaying wide range of morphological alterations. It is also known as dens in dente, gestant odontome, dilated composite odontoma or deep foramen caecum. It results from an invagination in the surface of a tooth crown before its calcification.<sup>1</sup>

Teeth in both maxillary and mandibular dentition can be involved, with the permanent maxillary lateral incisors being the most commonly affected ones.<sup>2</sup> Cases of dental invaginations in supernumerary tooth have been reported.<sup>3</sup> The invagination ranges from a slight pitting to an anomaly occupying most of the crown and root. Various forms encountered are coronal and radicular variety and usually single invagination is seen in both forms; though infrequently double and triple forms have been reported.<sup>4</sup>

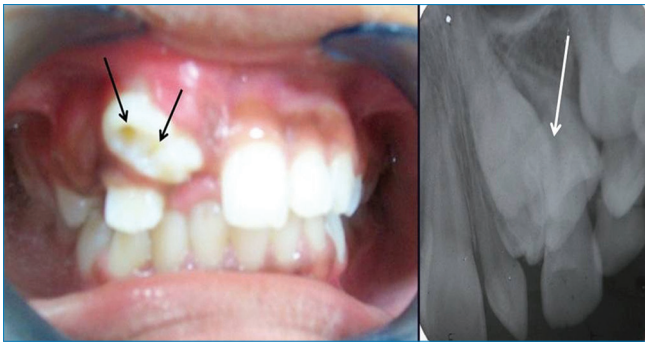
A rare case of a mesiodens and double dens invaginatus occurring in a supernumerary tooth, which prevented the eruption of the maxillary permanent central incisor, is presented.

## CASE REPORT

A 12-year-old girl reported to the Department of Pedodontics and Preventive Dentistry with the complaint of unerupted upper anterior tooth. Medical and dental histories were non-contributory and there was no previous trauma to the teeth or jaws.

Intraoral examination revealed the presence of unerupted maxillary right central incisor i.e 11 and an ectopic, bulbous, unusual looking supernumerary tooth (Figure 1) located in anatomical position of the permanent central incisor, high in the vestibule. There were developmental grooves on the facial surface of the supernumerary tooth. The lateral incisors had normal shape and position. Patient gave a history of extraction of mesiodens 1 month back. Radiographic investigation revealed a mesiodens and a calcified tooth like structure i.e supernumerary tooth in relation to the impacted 11 (Figure 1).

Since it was preventing the eruption of 11, the treatment option determined was to extract the supernumerary tooth. Informed consent was obtained for surgical extraction of supernumerary tooth. Routine haematological investigations were carried out and were found to be within normal limits.



**Figure 1: Clinical photograph showing the supernumerary tooth with two deep pits and unerupted permanent right maxillary central incisor. Radiograph revealing the presence of a mesiodens and a supernumerary tooth preventing the eruption of 11**

The procedure was performed under local anesthesia. Buccal flap was reflected and the supernumerary tooth was surgically exposed in order to allow for its gradual eruption in position. After 1 month follow up, 8 mm of crown was clinically seen (Figure 2). Patient is subjected for further orthodontic evaluation.



**Figure 2: Follow up after 1 month showing 8 mm of clinical crown**

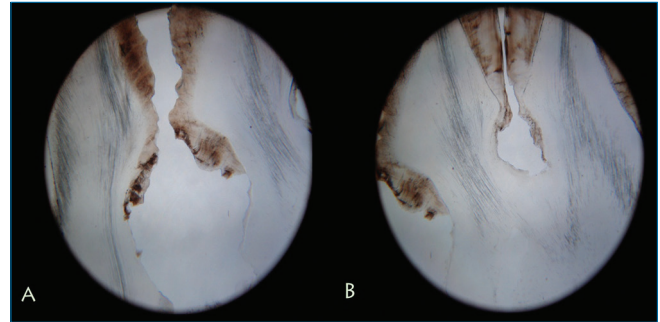
On gross examination the supernumerary tooth resembled a molar tooth with cuspal pattern. Presence of two deep pits on the occlusal surface of the tooth was seen (Figure 1). It had a single short and stunt root with incompletely formed apex.

#### Ground section features of the tooth (Figure 3)

It showed two cusps lined by enamel of variable thickness. Deep invagination lined by enamel is seen from the surface till CEJ in one cusp and the other cusp shows superficial invagination. Base was deficient of enamel.

Enamel showed irregular thickness and presence of gnarled enamel. Few enamel lamellae were present. Dentin was tubular in nature with DEJ scalloped and flat in some areas. There was loss of DEJ in focal areas. Fusion of dentin

was seen. Uniform thickness of cementum was present and CEJ was not distinct. Pulp chamber and pulp canals were not seen.



**Figure 3: Ground section showing A. Deep invagination from surface till CEJ seen in one cusp. B. Superficial invagination seen in other cusp**

## DISCUSSION

Dens invaginatus is a rare developmental malformation characterized by deep enamel lined pit that extends to varying depths into the underlying dentin, displacing the pulp chamber.<sup>5</sup>

Dens invaginatus can occur in all dentitions with a prevalence ranging from 0.25% to 7.74%.<sup>6</sup> It has been reported in maxillary central and lateral incisors, canines and bicuspid, and mandibular incisors and bicuspid. Maxillary lateral incisors are most frequently involved and the occurrence of dens invaginatus in supernumerary teeth is comparatively rare.<sup>7</sup> As per the literature available, only 11 cases of dens invaginatus involving supernumerary teeth have been reported.<sup>8</sup> In the present case, radiographically there were 2 supernumerary teeth, a mesiodens and a supernumerary tooth associated with double dens invaginatus.

The invaginations may vary from a slightly accentuated cingulum (foramen caecum) to deep foldings reaching the apical foramen.<sup>7</sup> Several classifications have been proposed.<sup>9</sup>

The invaginations presented in this case belonged to type 1 of Oehler's classification which is the most commonly used classification system for Dens Invaginatus.<sup>3</sup>

In the present case there was presence of conical mesiodens and a supernumerary tooth associated with double Dens invaginatus which appears to be unusually rare.

Although several theories have been proposed to explain the etiology of this malformation, it is controversial and remains unclear. Most probably the invagination has its origin in a deep folding of the foramen caecum during

tooth development, which in some cases may even result in a second apical foramen. It may be caused by increased localized external pressure, focal growth retardation or focal growth stimulation in certain areas of the tooth bud.<sup>10</sup>

The invagination allows entry of irritants into an area separated from pulpal tissue by a thin layer of enamel and dentin and presents a predisposition for the development of dental caries. Channels may also exist between the invagination and the pulp. Hence, pulp necrosis often occurs early, within a few years of eruption, sometimes even before root end closure. The invagination may also present a predisposing site for apical periodontitis, cyst formation, abscess formation and internal resorption. Other complications include malformation resulting in delayed eruption of the involved tooth as it was observed in the present case.

Various treatment options have been suggested. This includes preventive and restorative treatment, root canal therapy, surgical treatment or extraction.<sup>3</sup> The choice of treatment depends upon various factors which include the type of invagination, configuration of the root canal system, prosthetic requirements, function and esthetics, economic and psychological considerations. Extraction is indicated as a last choice of treatment only in teeth with severe anatomical irregularities and in supernumerary tooth that cannot be treated non-surgically or with apical surgery.<sup>3</sup> In this case, extraction was considered in order to facilitate the eruption of the central incisor.

## CONCLUSION

This case report highlights the simultaneous occurrence of mesiodens and supernumerary tooth with double Dens invaginatus and its associated complications. Close observation of radiographs is a must prior to establishing a treatment plan. Since it affects the path of eruption of permanent teeth, extraction of mesiodens and orthodontic treatment is a recommended treatment option in treating such cases.

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# Splenic Tuberculosis in an Immunocompetent Individual – A Case Report

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## Abstract

Splenic tuberculosis is common in severely immunocompromised individuals and delays in diagnosis are frequent. It presents as Pyrexia of Unknown origin. Patients all over the world are given antibiotics with necessary lab investigations as prophylaxis till the diagnosis is confirmed but when patients do not respond to it, the possibility of splenic tuberculosis should always be sought. Diagnosis is a challenging task because of non-specific symptoms. CT scan is an important investigation which shows hypoechoic lesions suggestive of granuloma. Patients usually present with low-grade fever, weight loss, anemia and rarely splenomegaly. Here is a case of a 62-year-old man who presented with vomiting and intermittent left hypochondrium pain since four months. We report this case of tuberculosis spleen in an individual who is a type 2 diabetic with a good glycemic control and no signs of immunocompromise.

**Keywords:** Splenic tuberculosis, Pyrexia of unknown origin, CT scan, Left hypochondriac pain

## INTRODUCTION

Tuberculosis is one of the most common and most suspected diseases in India. The average prevalence of tuberculosis is estimated to be 5.05 per thousand with a prevalence of 2.27 per thousand smear-positive cases and average annual incidence of 84 per 1,00,000 smear-positive cases annually in India.<sup>1</sup>

The various immunodeficiency conditions identified in these patients include hematologic abnormalities, HIV infection, diabetes mellitus, chronic steroid therapy and organ transplantation.<sup>2</sup> It most commonly presents as primary pulmonary Tuberculosis.

It can also present in other forms as extrapulmonary tuberculosis- miliary Tuberculosis. Spleen is the third most common organ becoming involved in miliary T.B. (lung 100%, liver 82%, spleen 75%, lymph nodes 55%, bone marrow 41%).<sup>3</sup> Virtually all organ systems may be affected. Due to hematogenous dissemination in HIV-infected individuals, extrapulmonary tuberculosis is seen more commonly today than in the past.

There are many modalities of investigations still the diagnosis is usually delayed. Ultrasonography, CT Scan and MRI are sensitive investigations but CT scan is preferred for the abdomen. The characteristic

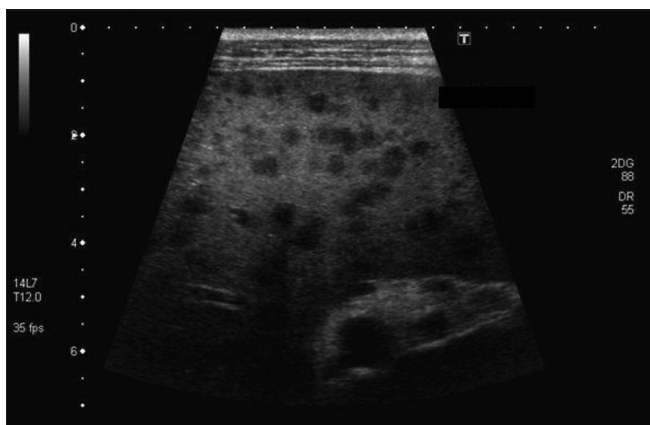
CT features of splenic tuberculosis include solitary / multiple nodular or saccular foci or hypodense areas in the spleen.<sup>4</sup> It also has a lot of differential diagnosis because of which diagnosis is often delayed. Moreover typical nodules on the splenic capsule are usually too small to be detected.<sup>5</sup> In differential diagnosis of CT findings, lymphoma, hydatid disease and metastases must be considered.<sup>6</sup>

## CASE DISCUSSION

A 62-year-old male patient complained of intermittent left hypochondrium aching type of pain, occurring after vomiting since the past 4 months. He has no weight loss. He did not complain of fever, cough or any other respiratory complaints. He did not complain of Tuberculosis or being in contact with a Tuberculosis patient in the recent past. He was diagnosed to have Type 2 Diabetes Mellitus one year back. His bowel and bladder habits were normal. On examination, the patient had mild pallor but currently afebrile 37.5 recorded at the time of admission. Per abdomen there was no organomegaly and no other abnormalities were detected. Hemoglobin was 11.8. No primary focus was found. X-ray findings were normal. FNAC report came as granulomatous inflammation and USG ABDOMEN AND PELVIS showed: Splenomegaly with Multiple Hypoechoic Areas suggestive of granuloma as seen in Figure-1. Para-aortic lymphadenopathy and bilateral

renal parenchymal changes were detected. Urine protein was present in traces. Serum uric acid (8.2 mg/dl) and calcium were high. Liver function tests were normal. CT SCAN revealed hypointensities in the spleen as seen in Figure 2. Nephrology consultation was done. Person was not advised splenectomy as he was diabetic and removal of spleen would increase the chances of infections later. Patient was started on Anti Tubercular Treatment. Since then Patient had shown good improvement.

Capsule R-Cinex	300/600 mg
Tablet Pyzina	500 mg
Tablet Combutil	600 mg
Tablet Rabekind Plus	Rabeprazole 20 mg Levosulpiride 75 mg
Tablet Benadon	40 mg
Capsule Cobadex	Pyridoxine Hydrochloride 3 Mg,
CZS	Nicotinamide 100 Mcg, Folic Acid 1500 Mcg, Cyanocobalamin 15 Mcg, etc



**Figure 1: Splenomegaly with Multiple Hypoechoic Areas suggestive of granuloma**



**Figure 2: CT SCAN - Hypointensities in the spleen**

## CONCLUSION

Tuberculosis is a multi-system disease, 90% of which locates primarily in lung, unlike isolated splenic tuberculosis, a rare form of extrapulmonary TB.<sup>1</sup> Patients with AIDS or who are otherwise immunocompetent have been reported to be at a high risk for splenic TB.<sup>6</sup> Some scholars insist that all patients with splenic TB are secondary to the previous infection of tubercle bacillus in other organs.<sup>7</sup>

In this case, the patient denied having a previous history of tuberculosis or contact with tuberculosis.

The patient presented with intermittent left hypochondriac aching type of pain and vomiting after food. No other complaints. The appropriate investigations that need to be done in this case are haemoglobin, Chest X-ray to rule out a primary of the lung, FNAC concluded it to be a granulomatous disease. Ultrasound narrowed the lesion to be confined in the spleen and involvement of para-aortic lymph nodes. Due to Renal involvement, sarcoidosis had to be ruled out. The patient is diabetic so further investigations for nephropathy was to be done.

The patient was started on Anti Tubercular Treatment and the patient has improved since then. Abdominal Tuberculosis should be kept in mind if a patient comes with such a presentation. Splenectomy has been advocated as the treatment of choice for splenic tuberculosis in the preantibiotic era. Splenectomy resulted in a recovery rate of approximately 60%.<sup>8</sup> In a case of Isolated Splenic Tuberculosis in an immunocompetent individual, six months treatment of the above mentioned drugs need to be given.

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# Congenital teeth: Superstition and Reality – A Case Report and Review of Literature

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## Abstract

Tooth eruption follows a chronology and is subject to small variations depending on hereditary, endocrine and environmental features. At times, however, the chronology of tooth eruption suffers a more significant alteration in terms of onset. Natal and Neonatal teeth are associated with some superstitions so proper management of these teeth are essential both from social and clinical point of view. Here we present two such interesting cases. Hence, both the paediatrician and paediatric dental specialists should be involved in the supervision or treatment of patients with natal and neonatal teeth.

**Keywords:** Natal teeth, Congenital teeth, Neonatal teeth, Superstition, Folklore

## INTRODUCTION

Eruption of the first tooth at about 6 months of age is a milestone both in terms of functional and psychological changes in the child's life and in emotional terms for the parents. The expectations about the eruption of the first teeth are great and are greater when the teeth appear early in the oral cavity. These precociously and prematurely erupted teeth lead to the interest, curiosity, and concerns of clinicians as well as of the parents. These teeth are termed as Natal and Neonatal teeth. Natal teeth are teeth that are already present at the time of birth. These teeth are different from neonatal teeth, which grow and are visible during the first 30 days after birth.<sup>1</sup> The teeth that erupt before the normal time, are also designate as congenital teeth, fetal teeth, predeciduous teeth, precocious dentition, dens caninialis and dentitia praecox in the literature.<sup>2</sup>

## CASE REPORT

### Case-1

A 4-day-old male infant was referred from S.M.S Medical College and Hospital, Jaipur to the department of Paediatric and Preventive dentistry Govt. Dental College and hospital, Jaipur with the chief complain of small mass on the front region of lower jaw since

birth. On intraoral examination the swelling was firm on palpation (Figure 1). No other abnormality was detected. Medical and family history was non-contributory. The infant had no problem in breast-feeding. Cyst of dental lamina, Bohn nodules and Natal teeth were suspected. Radiographic examination was done to confirm the diagnosis. In radiograph natal teeth of normal dentition series were detected (Figure 2). As there was no difficulty in breastfeed decision to maintain the teeth was made. A proper counselling of the parents was done and recall for periodic check-up.



**Figure 1: Clinical picture**



Figure 2: Clinical picture

### Case-2

A 20 days old female neonate came to the department of Paediatric and Preventive dentistry Govt. Dental College and hospital, Jaipur with the chief complaint of difficulty of feeding and suckling, and also mother experienced pain and discomfort during feeding. On examination two neonatal teeth were detected with grade 3 mobility, her mother told that these teeth were erupted 15 days after her birth. The teeth were normal in shape, size and colour but immature (Figure 3). As the teeth were immature they may be aspirated and produce difficulty in breast feeding so the teeth were extracted and patient was recalled for periodic check-up.



Figure 3: Extracted neonatal teeth

## LITERATURE REVIEW

### Superstition and Folklore

Tooth eruption follows a chronology and is subject to small variations depending on endocrine, hereditary and environmental features. At times, however, the chronology of tooth eruption suffers a more significant alteration in terms of onset. This condition has been the subject of

curiosity and study since the beginning of time, being surrounded by beliefs and assumptions. The occurrence of natal and neonatal teeth has been associated with diverse superstitions among many different ethnic groups and cultures. Shakespeare contributed his thoughts on natal teeth in “King Henry the Sixth” when he refers to Richard the Third in his quotation, “teeth hadst thou in thy head when thou wast born to riguity thou camest to bite the word”.<sup>3</sup> In some cultures like Malaysian communities, a natal tooth is believed to herald good fortune. Chinese community considers presence of these teeth as a bad omen and the affected children are considered to be monsters and beavers of misfortune. In Poland, India, and Africa, superstition prevailed for a long time, and in many African tribes children born with teeth were murdered soon after birth because they were believed to bring misfortune to all they would contact. In England, the belief was that babies born with teeth would grow to be famous soldiers, whereas in France and Italy the belief was that this condition would guarantee the conquest of the world.<sup>4</sup>

### Incidence and Prevalence

The incidence of natal and neonatal teeth has been estimated to be 1:1000 and 1:30,000. Incidence of natal and neonatal teeth reported in literature was highly varied and depends on the different ethnic groups studied. The incidence of occurrence of natal and neonatal teeth is 85% in mandibular incisors, 11% in maxillary incisors, 3% in mandibular canines and molars and only 1% in maxillary posterior regions. More than 90% of natal and neonatal teeth are prematurely erupted whereas less than 10% are supernumerary. There was no difference in prevalence between males and females. However Kates et al in 1984 reporting a 66% proportion for females against a 31% proportion for males.<sup>4-6</sup>

### Clinical Presentation

Morphologically, the natal/neonatal teeth are poorly developed and are small and cone shaped. They have a yellowish-brown or whitish opaque color and have a hypoplastic enamel or dentin.<sup>7</sup> Occasionally they may be of normal size and shape. Spouge and Feasby in 1966 clinically classified natal/neonatal in:

**Mature:** When they are fully developed in shape and comparable in morphology to the primary teeth.

**Immature:** When their structure and development are incomplete.<sup>8</sup>

The term mature may suggest that the tooth is well-developed compared to the remainder of the primary dentition and that its prognosis is relatively good. In contrast, the term immature assumes the presence of an

incomplete structure and implies a poorer prognosis for the tooth in question.<sup>9</sup> Recently in 1997 Hebling classified natal teeth into 4 clinical categories.<sup>10</sup>

1. Shell-shaped crown poorly fixed to the alveolus by gingival tissue and absence of a root;
2. Solid crown poorly fixed to the alveolus by gingival tissue and little or no root;
3. Eruption of the incisal margin of the crown through gingival tissue;
4. Edema of gingival tissue with an unerupted but palpable tooth.

If the degree of tooth mobility is more than 2 mm, the natal teeth of category (1) or (2) usually need extraction.

### Etiology

Etiology of natal and neonatal teeth is still unknown due to disturbance of biological chronology. A number of factors favouring the occurrence of these teeth have been described in the literature. These factors are:

- Hereditary transmission of a dominant autosomal gene.<sup>7,11</sup>
- Endocrine disturbances: May be because of excessive secretion of pituitary, thyroid, or gonads.<sup>12</sup>
- Natal and neonatal teeth could be erupt due to osteoblastic activity within the area of the tooth germ.<sup>5</sup>
- Most commonly superficial positioning of tooth germ.<sup>13</sup>
- Poor maternal health, endocrine disturbances, febrile episodes during pregnancy and congenital syphilis.<sup>12</sup>
- Infection or Malnutrition.<sup>14</sup>
- Nutritional deficiency, e.g., Hypovitaminosis.<sup>15</sup>
- Environmental factors such as Polychlorinated biphenyls (PCBs), polychlorinated dibenzo-dioxins (PCDDs), and dibenzofurans (PCDFs) seem to cause the eruption of natal teeth.<sup>16</sup>
- Few syndromes are reported to be associated with natal teeth and neonatal teeth.<sup>4</sup>
- Ellis-VanCreveld (Chondroectodermal Dysplasia),
- Pachyonychia
- Congenital (Jadassohn-Lewandowsky),
- Hallermann-Streiff (Oculomandibulodyscephaly with Hypotrichosis),
- Rubinstein-Taybi, Steatocystoma Multiplex,
- Pierre-Robin,
- Cyclopia, Pallister-Hall,
- Short Rib-Polydactyly (type II),
- Wiedemann-Rautenstrauch (Neonatal Progeria),
- Cleft Lip and Palate,
- Pfeiffer,
- Ectodermal Dysplasia,
- Craniofacial Dysostosis,

- Multiple Steatocystoma,
- Sotos syndrome.

### Histological Presentation

Histological investigations have demonstrated that most of the crowns of natal and neonatal teeth are covered with hypoplastic enamel with varying degrees of severity,<sup>16</sup> absence of root formation, ample and vascularized pulp, irregular dentin formation, and lack of cementum formation.<sup>4,11</sup>

### Diagnosis

Natal teeth are usually diagnosed based on a complete history and physical examination of infant. A radiographic verification of the relationship between a natal and/or neonatal tooth and adjacent structures, nearby teeth, and the presence or absence of a germ in the primary tooth area would determine whether it belongs to the normal dentition or supernumerary, so that indiscriminate extractions would be performed. Bohn nodules and cysts of the dental lamina differentiated from natal and neonatal teeth by radiographic examination. The maintenance of natal and neonatal teeth of the normal dentition is important, since the premature loss of a primary tooth may cause a loss of space and collapse of the developing mandibular arch,<sup>10</sup> with consequent malocclusion in permanent dentition.

### Complications

1. Ulceration to the nipple of the mother and interference with breast feeding.
2. Potential risk of the infant inhaling the tooth into his/her airway and lungs if the tooth becomes dislodged due to its great mobility.
3. Ulceration to ventral surface of the tongue: this condition was first described by Caldarelli in 1857 in association with general organ failure in a child, followed by death. Riga and Fede histologically described the lesion, which then started to be called Riga-Fededisease.<sup>17</sup>
4. Difficulty in feeding or refusal to feed due to pain.

## TREATMENT AND MANAGEMENT

Natal and Neonatal teeth are associated with some superstitions so proper management of these teeth are essential both from social and clinical point of view. Most of the time these are ignored by the paediatricians due to lack of awareness, as they are associated with negative culture attitudes good parental counselling and vigilant management is required in relation to child protection. So both the paediatrician and paediatric dental specialists should be involved in the supervision or treatment of patients with natal and neonatal teeth.

In confronting a typical variation in the newborn's oral cavity, pediatric dentist must decide between "early treatment" and the other extreme "should never be treated." Before you are taking decision of maintaining or extraction of these teeth some factors should be considered, such as implantation and degree of mobility, interference with breast feeding, inconveniences during suckling, possibility of traumatic injury, and whether the tooth is part of the normal dentition or is supernumerary. If the erupted tooth is diagnosed as normal dentition tooth, the maintenance of these teeth in the mouth is the first treatment option, unless this would cause injury to the infant or breastfeeding mother.<sup>9,18</sup> If these teeth are not well implanted and highly mobile with increases risk of aspiration they should be extracted. Although many investigators have mentioned the possibility of aspiration of these teeth, this risk, in reality, is an unlikely possibility since there are no reports in the literature of the actual occurrence of aspiration. Bigeard et al in 1996 suspected that this tooth was swallowed, indicating the possibility of aspiration. On the basis of the report by the parents of a 28-day old baby of the sudden disappearance of a natal tooth.<sup>12</sup> Smoothing or grinding of the incisal edges of the teeth was advocated by Allwright in 1996 and Martins et al. in 1998<sup>19,20</sup> to prevent wounding of the maternal breast during breast feeding. To prevent the injury to the maternal breast, feeding splint was the option reported by Bjuggren in 1973.<sup>21</sup> Goho in 1996 treated natal teeth by covering the incisal margin with composite resin.<sup>22</sup> Tomizawa et al in 1989 reported two cases of treatment of Riga-Fede disease by covering the incisal margin with photopolymerizable resin, which aided rapid healing of the ulcers.<sup>23</sup> Extraction of these teeth can be done with a forceps or even with the fingers without any difficulties. The prophylactic administration of vitamin K (0.5-1.0 mg i.m.) is advocated because of the risk of hemorrhage as the commensal flora of the intestine might not have been established until the child is 10 days old and since vitamin K is essential for the production of prothrombin in the liver.<sup>24</sup> If extraction is carried out, it is important and necessary to ensure that the underlying dental papilla and Hertwig's epithelial root sheath are removed by gentle curettage as root development can continue if these structures are left in situ.

## CONCLUSION

Paediatric dentists should make every effort to educate the parents and the paediatrician on the preferred treatment for the natal teeth. A proper clinical and radiographic examination is necessary for differential diagnosis of either the teeth are of normal dentition or supernumerary and bhon nodules and cyst of dental lamina. Teeth of the normal

dentition, when supposed to be matured, they should be preserved and maintained in healthy conditions in the baby's mouth using all possible clinical resources and when the teeth are supernumerary, they should be extracted. Extraction should be done only by the paediatric dentist to avoid any undue trauma to the underlying tissue. Periodic follow-up by a paediatric dentist to ensure preventive oral health is very essential. Hence, to avoid any further complication, early diagnosis and adequate treatment should be a prime concern in the management of natal and neonatal teeth.

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# Rare Adverse Drug Reactions to Injection Neostigmine – A Report of Three Cases

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## Abstract

Neostigmine Methylsulfate is an anticholinesterase drug administered by anesthesiologists to facilitate speed of recovery from the skeletal muscle effects produced by nondepolarizing neuromuscular blocking drugs. We report three cases posted for elective surgery who underwent uneventful surgeries following thorough preoperative checkup, and developed reactions on receiving Injection Neostigmine in the form of ventricular tachycardia and ventricular fibrillation. All three patients survived and were later discharged due to timely diagnosis and prompt management.

**Keywords:** Neostigmine Methylsulphate, Acetylcholinesterase, Ventricular Tachycardia, Ventricular Fibrillation

## INTRODUCTION

Neostigmine is a synthetic quaternary ammonium parasympathomimetic agent. It is an anticholinesterase used to reverse neuromuscular blockade. Anticholinesterases exert their effect primarily by inhibiting acetylcholinesterase and thus increasing the concentration of acetylcholine at the motor end plate. Neostigmine transfers a carbamate group to acetylcholinesterase and at the esteratic site covalent bond is formed. In addition, anticholinesterases may increase the release of acetylcholine from presynaptic nerve terminals.<sup>1,2</sup> As there is increase in acetylcholine which is caused by Cholinesterase inhibitors, it affects more than the nicotinic receptors of skeletal muscle. Predominant Muscarinic effect on the heart is a vagal like bradycardia that can progress to sinus arrest. Other muscarinic side-effects include dysrhythmias, bronchospasm, bronchial secretions, intestinal spasm, increased salivation, increased bladder tone and pupillary constriction.<sup>3</sup>

## CASE REPORT

We report 3 cases posted for elective surgery after thorough preoperative checkup who suffered from ventricular tachycardia and ventricular fibrillation leading to cardiac arrest during reversal of residual effect of non-depolarising

muscle relaxant with Neostigmine, on the same day and in the same institute, requiring critical care management.

### Case Number 1

A 60 years old male patient was admitted for recurrence of verrucous carcinoma of the hard palate and posted for excision of the carcinoma under general anaesthesia. He was previously operated thrice for the same under general anaesthesia and all the three surgeries had been uneventful. Preoperative work-up was normal and patient underwent routine induction of anaesthesia. The intraoperative course was uneventful. For reversal of muscle relaxation, patient was given Injection Neostigmine 2.5 mg and Injection Glycopyrrolate 0.4 mg slowly IV. Patient was then extubated and oxygenated on Ventimask. Vitals of the patient were stable during extubation. The patient developed sudden tachycardia progressing to SVT on ECG with pulse rate 160-180/min.

100% O<sub>2</sub> was given using Bainscircuit with mask, followed by carotid massage. Injection Amiodarone 150 mg IV bolus given slowly. The ECG showed SVT progressing to ventricular fibrillation. CPR was immediately instituted. 2 DC shocks of 200 J were given stat. ECG showed sinus rhythm. The blood pressure then dropped suddenly to 70 mmHg systolic. Injection Dopamine drip (800 mg in 500 ml D5) was started @ 24µdrops/min. Patient was re-intubated with an endotracheal tube and 100% O<sub>2</sub> was

given. Patients heart rate and blood pressure stabilized. ECG started showing occasional ectopics. Injection Amiodarone 900 mg in 500 cc of 5% was started @ 30  $\mu$ drops/min. Patient was then shifted to CCU in intubated and paralyzed condition and put on CMV mode of ventilation. Patient was gradually weaned off the ventilator. Amiodarone and Dopamine drips were tapered and stopped. Vitals of the patient were maintained, ECG was normal. Patient was then extubated and transferred to ward.

### Case Number 2

A 35 years old male patient was admitted with diagnosis of hereditary spherocytosis with splenomegaly with cholelithiasis. He was posted for splenectomy with cholecystectomy. On physical examination, patient was having icterus and pallor. The serum indirect bilirubin levels were elevated (Indirect 4.4 mg/dl, Direct 0.1 mg/dl). USG Abdomen revealed gross splenomegaly and cholelithiasis. Intraoperative course of the patient was uneventful. For reversal, Injection Neostigmine 2.5 mg + Injection Glycopyrrolate 0.4 mg diluted to 20 cc with normal saline was given slowly IV. After injecting 5 ml (0.625 mg of Neostigmine) patient developed ventricular tachycardia and sudden rise in BP followed by hypotension. Reversal was stopped and resuscitation was started immediately. Injection Lignocaine 60 mg was given stat. There was no change in rhythm. 1<sup>st</sup> D.C. shock of 360 J was given  $\rightarrow$  Injection Adrenaline 1 mg IV given stat  $\rightarrow$  2<sup>nd</sup> D.C. Shock of 360 J given  $\rightarrow$  Injection Adrenaline 1 mg IV repeated  $\rightarrow$  Total 8 D.C. Shocks – 360J given. Call was sent for cardiologist. Injection Amiodarone 150 mg IV bolus given slowly. ECG – sinus rhythm returned. BP was still 60 mm Hg systolic. Injection Dopamine 800 mg + Injection Adrenaline 2 mg in 500 ml normal saline drip started @ 80 ml/hr Injection Amiodarone 300 mg in 250cc NS drip started @ 20 ml/hr. Blood was sent for serum electrolytes. Sr.Na<sup>+</sup> – 138 mEq/lit, Sr.K<sup>+</sup> – 3.3 mEq/litre. Urine output was 250 ml. Patients spontaneous activity returned, started responding to verbal commands, opening eyes, and moving extremities. Patient was then re-paralysed with Inj. Atracurium 25 mg and ventilated with Bains circuit with 100%O<sub>2</sub>. Patient was observed in O.T. for 45 min. Pulse rate – 134/minutes regular rhythm, BP – 100 mmHg systolic. Patient was then shifted to CCU in intubated and paralyzed condition and put on CMV mode of ventilation with 100%FiO<sub>2</sub>. Patient was monitored in the CCU  $\rightarrow$  one episode of hypotension observed. BP – 74 mm Hg systolic. 1 pint Blood given, 1 pint colloid (hydroxyethylstarch) started. Dopamine + Adrenaline drip @ 80 ml/hr and Amiodarone drip @ 25 ml/hr continued. Patient suffered from 4 episodes of ventricular tachycardia requiring defibrillation between 2:45 a.m. to 6:45 a.m. Next day, vitals were stable, weaning from Dopamine and Amiodarone drips started. Weaning from ventilator started. Troponin T

done as advised by cardiologist was negative. No further irregular rhythm observed. Both drips were tapered and stopped. Patient was extubated two days later after gradual weaning from the ventilator and then transferred to ward after 4 days stay in CCU for monitoring and observation.

### Case Number 3

A 75 yrs old female patient diagnosed with cholelithiasis was posted for open cholecystectomy. Intraoperative course was uneventful. For reversal of muscle relaxation, Injection Neostigmine 2.5 mg + Injection Glycopyrrolate 0.4 mg diluted to 20cc with normal saline was given slowly IV. After good respiratory efforts returned, patient was obeying commands, opening eyes, reflexes present, head lift present. Thorough oral suctioning was done and the patient was extubated. 5 minutes after extubation patient had an episode of sudden bradycardia and hypotension P – 54-55/min. BP – 90 mmHg systolic. Injection Atropine 0.6 mg iv given stat IV, colloid(hydroxyethylstarch) started. P – 90/min, BP – 120 mmHg systolic, ECG showed ST elevation. Patient was observed for 2 hrs in O.T. P – 70-80/min, BP – 110/70 mmHg, SpO<sub>2</sub> – 96% on ventimask ECG – changes reverted to Normal, U/O – 150 ml. Patient was shifted to ward for further monitoring and management. At 4:35 a.m. patient developed sudden breathlessness and was shifted to MICU. ECG showed T wave inversion in leads I, aVI and V<sub>4-6</sub>, Troponin T test – positive, CPK – MB – 11.8 ng/ml (Normal: 0-5 ng/ml). Impression given by cardiologist was Non-ST segment elevation myocardial infarction (Subendocardial infarct). 2D-ECHO was essentially normal. Patient was observed and monitored in MICU. She was at a later date diagnosed to have developed drug induced chemical myocarditis.

## DISCUSSION

Neostigmine Methylsulfate is an anticholinesterase agent used to reverse the residual muscle relaxation following administration of non depolarizing muscle relaxants during anesthesia. The known cardiovascular adverse effects includes syncope and hypotension, cardiac arrhythmias (including bradycardia, tachycardia, A-V block and nodal rhythm) & as cardiac arrest. In all the three cases we have reported, the patients posted for elective surgery underwent uneventful operations following thorough preoperative checkup but developed adverse reactions on receiving Injection Neostigmine in the form of ventricular tachycardia and cardiac arrest on the same day. Two of these patients were shifted to CCU for ventilator and critical care management and one patient was treated and shifted to ward and then to MICU for further management. All these 3 patients were saved by timely diagnosis and intervention

and were subsequently discharged. After this incident, a meeting took place between Anesthesiologists, Physicians and Pharmacologists. ADR was submitted following which routine procedure was followed, viz stop use, withdrawal of stocks and dissemination of information to all other Government centers in the state of Maharashtra and also to DMER, DEHS, ESIS, Assistant Director of Rate Contract Cell, DMER, Mumbai. Then said defective batch of Injection Neostigmine was sent to FDA for analysis on 25/12/2007. Their report stated the batch of Injection Neostigmine was substandard.

Bradycardia leading to sinus arrest is a known complication of Neostigmine. In 2005, Zeidan A and Baraka reported a case of ventricular fibrillation following atropine-neostigmine mixture in a patient with undiagnosed mitral valve prolapsed.<sup>4</sup> In 1995, J Rodríguez, J Cortiñas et al reported bradycardia and asystole following atropine-neostigmine administration after caesarean section in a parturient receiving methyldopa for pregnancy-induced hypertension attribute this adverse reaction to the treatment of pregnancy-induced hypertension with methyldopa, perhaps facilitated by other drugs employed.<sup>5</sup> In 1956, Lawson described successful resuscitation of a patient with sudden cardiac arrest following administration of Neostigmine.<sup>6</sup> In 2004, Liaquat Ali, Mahmood Akhtar described a case of cardiac arrest following the

administration of neostigmine and atropine which was detected in time and managed successfully.<sup>7</sup>

Thus, the three case reports presented emphasize the need on the part of anesthesiologists to be vigilant while using drugs, promptness to manage any undue complications, and communication between them so as to prevent potentially fatal complications resulting from the use of substandard drugs.

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