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## Medical Jousting

The definition of jousting according to the “Oxford Dictionary” is a sporting contest in which two opponents on a horseback, typically knights, fight with lances.

Medical jousting is when a medical professional makes derogatory comments about another medical professional’s work or treatment, either intentionally or unintentionally. It can be verbal, written or conveyed through body language. It is usually done due to jealousy against a fellow colleague. Jealousy can be in terms of knowledge, number of patients that is seen by a fellow colleague and in today’s time especially in surgical practice, whether the procedure done is minimally invasive or open surgical. The common ways of medical jousting is by passing comments like did the doctor examine the patient thoroughly, why this treatment was done why not other, if you have come to me first, I would have done like this, who gave you this scar, I would have avoided and so on.

Medical jousting has both ethical and legal implications. It leads to reduction in the trust towards the medical professional and stimulates the patient to file a case on a ground of malpractice or the patient is forced to do “Doctors Shopping” and end up in confusion and in worst situation it can provoke physical attack on a medical professional.

Difference in opinion about the treatment of many diseases between two doctors or a critical review of an article by a reviewer is well accepted. There are many controversies in the diagnostic and therapeutic procedures of diseases around the world.

To prevent medical jousting, medical professionals should have no feeling of jealousy or opposition among the colleagues. If any incompetency is found in the treatment by the primary physician, the second should better not mention it to the patient or his/her relatives and if it is very important to mention it can be discussed by himself personally.

**Prof. Dr. Anup Sharma**

**MS (General Surgery), Fellowship (GI Onco-Surgery)**

**Editor- In-Chief**

# MRI Assessment of Lumbar Intervertebral Disc Degeneration and its Association with Modic Changes

Jha A, Ghimire P, Paudel N, Jha S

## ABSTRACT

**Introduction:** Low Back Pain is a very common disability affecting millions of people worldwide. Magnetic Resonance Imaging is the preferred tool of investigation in these patients in which commonly encountered findings include lumbar disc degeneration and endplate changes. However, there are few studies exploring a potential relationship between these two findings. **Aims:** To evaluate whether endplate changes, as described by Modic, are associated with the Pfirrmann grades of disc degeneration. **Methods:** Magnetic Resonance Imaging scans of the lumbar spine were performed on a consecutive group of 200 patients experiencing low back pain. Disc degeneration was assessed using the Pfirrmann grading system, while endplate changes were categorized according to Modic types. This comprehensive evaluation aimed to identify the relationships between disc degeneration and Modic changes in this patient population. **Results:** The most commonly affected age groups were those between 40 and 60 years, with a higher prevalence in females. Among 200 patients with disc degeneration, 74 (37%) exhibited Modic changes. The most common type of disc degeneration was Pfirrmann grade III and most common type of Modic change was type II. Non-Modic, Type 1 and Type 2 changes showed significant differences in Pfirrmann grade ( $p < 0.01$ ). **Conclusion:** Significant correlation was observed between endplate changes and intervertebral disc degeneration, as demonstrated by imaging findings. This relationship indicates that as disc degeneration worsens, the association between the Pfirrmann and Modic classifications becomes statistically stronger.

**Keywords:** Disc degeneration, Endplate, Magnetic Resonance Imaging, Modic, Spine

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## INTRODUCTION

Low back pain (LBP) is one of the primary contributors of diminished health-related quality of life and disability affecting approximately 619 million people globally.<sup>1,2</sup> People from any age group and gender can present with the symptoms of low back pain but its prevalence increases with age and is seen more commonly in females. By the time girls reach 18 and boys reach 20, half of them have already encountered at least one episode of back pain.<sup>3</sup> While multiple factors contribute to LBP, disc degeneration (DD) stands out as a notable risk factor.<sup>4-7</sup> Other degenerative changes in the spine seen with advancing age include High Intensity Zone (HIZ) lesions, disc herniation and endplate changes such as Schmorl's node and Modic changes (MC).<sup>8-11</sup> Grade of disc degeneration was first described by Pfirrmann in 2001 based on Magnetic Resonance Imaging (MRI) criteria to assess disc morphology, including signal intensity, disc height and differentiation between nucleus and annulus.<sup>12</sup> This classification demonstrates effective utility

in distinguishing various levels of disc degeneration.<sup>13</sup> There seems to be a strong connection between disc degeneration and Modic changes.<sup>14</sup> Modic changes (MC) are subchondral vertebral marrow lesions first described by Assheuer et al.<sup>15</sup> and further classified by Roos and Modic et al.<sup>16-18</sup> The objective of this study is to enhance comprehension regarding the different stages of lumbar disc degeneration and its correlation with established Modic changes.

## METHODS

This cross-sectional, population-based study was performed on consecutive patients with low back pain sent for MRI Lumbar spine from April 2024 to September 2024 in the Department of Radiology, Nepalgunj Medical College. The study consisted of 200 patients. Institutional review committee approval and written informed consent were obtained. The patients were selected based on the following inclusion and exclusion criteria.

### Inclusion criteria

Consecutive adult patients sent for MRI of lumbar spine having lumbar disc degeneration with/ without Modic changes.

### Exclusion criteria

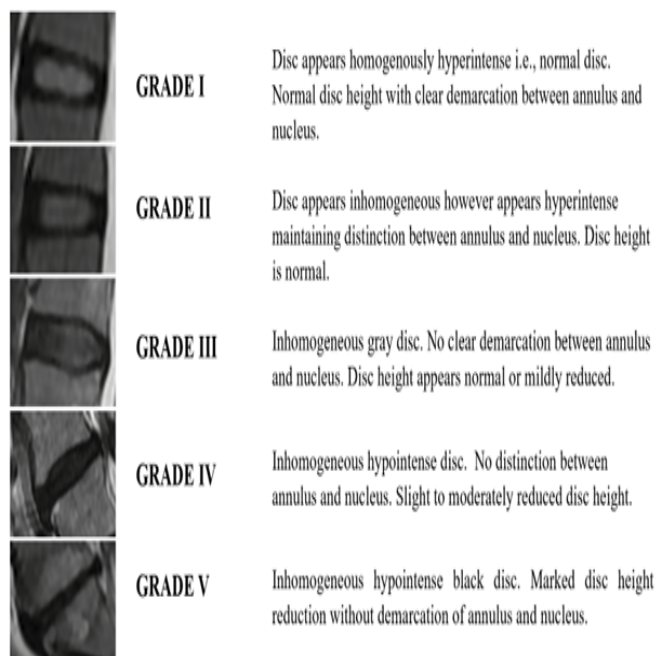
1. Patients presented with trauma.
2. Previous history of spinal surgery.
3. Patients with suspicion of infection, malignancy.
4. Patient refusing to give consent.

### Imaging assessment

The MRI examination was performed using General Electronics (GE) 1.5 Tesla MRI of model Signa Creator (Illinois, USA). Standard imaging sequences included sagittal T1 and T2-weighted turbo spin-echo (TSE), and axial T2 TSE of lumbar segmental levels from L1-S1. Imaging parameters for sagittal T1: Repetition time (TR)- 700 ms (milliseconds), Echo time (TE)- 10 ms, matrix- 352x224; for sagittal T2: TR- 3000 ms, TE- 100 ms, matrix- 384x256. Field of view was 35x35 mm and slice thickness was 5 mm for sagittal T1 and T2 and 4 mm for axial T2. Lumbar disc degeneration for each level was assessed and classified according to Pfirrmann grading. Similarly, Modic changes was evaluated and classified according to type.

For determining grade of lumbar disc degeneration:

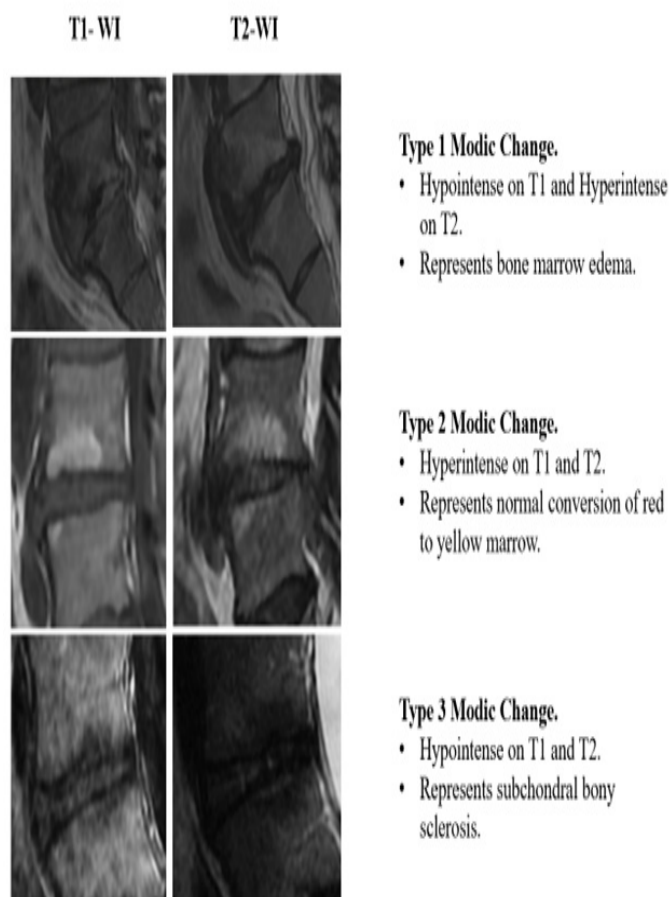
There are five grades of lumbar disc degeneration as described by Pfirrmann. (Figure 1)



**Figure 1: Grades of lumbar disc degeneration**

### For determining different Modic Types:

**Modic described three different types of vertebral endplate changes. (Figure 2)**



**Figure 2: T1 weighted image (T1- WI) and T2 weighted image (T2- WI) showing different types of Modic Changes**

### Considerations:

1. As disc degeneration and Modic changes is less pronounced at L1-L2 and L2-L3, the assessment focused on levels L3-L4, L4-L5, and L5-S1. Additionally, in cases where degeneration was present at multiple levels, the grading was determined based on the more affected level.

2. In instances of mixed types of Modic changes, the type that holds greater clinical significance was mentioned, following the order of Modic I, Modic II and Modic III.

### Statistical analysis

The results were tabulated in Microsoft Excel. The statistical analysis was done using IBM Statistical Package for the Social Sciences (SPSS) version 26 (Armonk, New York). Descriptive and frequencies statistics were carried out to all variables of interest as necessary. Comparison between the sexes was done using Mann-Whitney tests and for different age groups

Kruskal-Wallis tests was used. Existence of relation between Pfirrmann and Modic measurements was verified using Spearman correlations and a threshold for statistical significance was established at  $p \leq 0.05$ .

## RESULTS

### Patient Demographics

A total of 200 patients who met the inclusion and exclusion criteria were enrolled in the study which included 108 females (54%) and 92 males (46%). The age of the patients ranged from 20 years to 80 years with mean age of  $45.56 \pm 14.13$  years. Age was divided into three groups; less than 40 years, 40 to 60 years and more than 60 years. (Table I)

| Variable       | N   | %    |
|----------------|-----|------|
| Sex            |     |      |
| Male           | 92  | 46   |
| Female         | 108 | 54   |
| Age Group      |     |      |
| <40 years      | 74  | 37   |
| 40 to 60 years | 87  | 43.5 |
| >60 years      | 39  | 19.5 |
| Total          | 200 | 100  |

**Table I: Description of sex and age group of the patients evaluated**

### Lumbar Disc Degeneration and Modic changes

Most common type of disc degeneration observed was grade III (37%), followed by grade IV (31.5%), II (15.5%), I (8.5%) and V (7.5%). Modic changes were detected in 74 individuals, representing 37% of the cohort. Modic 2 was the most frequently observed type (73%), followed by Modic 1 (27%); Modic 3 was not identified in any of the cases examined. The relationship between different grades of disc degeneration and Modic changes is illustrated in Table II.

|              | I  | II | III | IV | V  | Total |
|--------------|----|----|-----|----|----|-------|
| Non-Modic    | 17 | 31 | 40  | 38 | 0  | 126   |
| Type 1 Modic | 0  | 0  | 11  | 6  | 3  | 20    |
| Type 2 Modic | 0  | 0  | 23  | 19 | 12 | 54    |
| Type 3 Modic | 0  | 0  | 0   | 0  | 0  | 0     |
| Total        | 17 | 31 | 74  | 63 | 15 | 200   |

**Table II: Relationship between Modic changes and the severity of vertebral disc degeneration assessed by Pfirrmann grading**

In Non-Modic patients that constituted 63 % of the study, the

average Pfirrmann grade was  $2.78 \pm 1.02$ . Pfirrmann grade of  $3.6 \pm 0.75$  was seen in type 1 Modic patients and in Modic type 2 changes Pfirrmann grade was  $3.79 \pm 0.76$ . Non-Modic, Type 1 and Type 2 changes showed significant differences in Pfirrmann grade ( $p < 0.01$ ). The Pfirrmann grade demonstrated a statistically significant rise across all assessed discs as age groups advanced.

While Modic changes were more frequently observed among males in our study, no statistically significant difference was detected. Similarly, type 2 Modic changes were more prevalent in older age groups, whereas type 1 Modic changes were observed across all age groups.

## DISCUSSION

Low back pain (LBP) is among the leading causes of disability globally, particularly affecting older adults. MRI is the preferred diagnostic tool for assessing patients with low back pain, as it is highly effective at identifying degenerative changes in the spine. Many earlier studies, including those by Jensen et al.<sup>19</sup> and Kokkonen et al.,<sup>20</sup> have established the connection between Modic changes and disc degeneration. However, only a few studies have investigated the relationship between Pfirrmann grading of lumbar disc degeneration and the types of Modic endplate changes.

In our study, 74 patients (37%) exhibited associated endplate changes, with Modic type 2 being the most prevalent (73%), a finding previously encountered by Modic et al.<sup>16,17</sup> These endplate changes were typically observed at the L4-L5 and L5-S1 levels. This can be attributed to the greater mobility of the L4-L5 level, which may lead to more significant disc degeneration compared to other intervertebral segments.<sup>21,22</sup> Several past studies, including one by Yu LP et al.<sup>23</sup> reported Pfirrmann grade IV as the most prevalent grade. However, in our analysis of disc degeneration grading, grade III was the most common, found in 37% of cases, followed by grade IV at 31.5% and grade V at 7.5%. Notably, there were no cases of grade I or II discs identified. When the two classifications were compared, the data revealed a strong correlation, indicating that higher Pfirrmann grades are associated with more significant Modic changes ( $p < 0.05$ ). Patients with Modic type 1 changes had a mean Pfirrmann grade of 3.6, while those with Modic type 2 changes had a Pfirrmann grade of 3.79. These findings are in line with other studies by Yu LP<sup>23</sup> and Rodrigues, L.M.R. et al.<sup>24</sup>

## LIMITATIONS

As with other studies, this research has several limitations. First, the sample size is limited, which impacts the overall incidence of Modic changes. Second, the study focuses solely on the original Pfirrmann grading and does not consider the newly modified Pfirrmann grade. Finally, including additional clinical parameters, such as pain scores, would have provided a more comprehensive analysis.

## CONCLUSION

Our study highlights a clear link between intervertebral disc degeneration and changes in endplates as seen on MRI. It suggests that early detection of these changes could allow for timely

intervention to prevent further disc degeneration. More advanced disc degeneration is associated with greater endplate alterations, emphasizing the relationship between these two processes in maintaining spinal health.

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# Bacteriological Profile and Antibiotic Susceptibility Patterns of Chronic Non-healing Wound Infections in a Tertiary Care Hospital from North India

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## ABSTRACT

**Introduction:** Chronic wounds are becoming increasingly common as a result of an increase in the ageing population and a rising population with diabetes and obesity. These have been associated with significant financial burdens on society, directly (medical and healthcare expenditures) and indirectly. Factors like infection by multi-drug resistant microorganisms, biofilm formation, inflammatory mediators, hypoxia, poor nutrition, and recurrent trauma may make the wounds chronic. **Aims:** To assess the bacteriological profile of chronic wound infections and their antibiotic susceptibility pattern. **Methods:** Two swabs were collected to isolate aerobic and facultative anaerobic bacteria. The isolates were then subjected to antimicrobial testing by a modified Kirby Bauer disc diffusion method, and the multi-drug resistant strain was identified to be resistant to at least three different antibiotic classes. The strain of *Staphylococcus aureus* was screened for methicillin resistance using a ceftioxin disc (30 µg). **Results:** 100% of the samples collected from chronic wounds yielded bacterial growth. *S. aureus* was the most prevalent isolate at 29.2%, followed by *Klebsiella pneumoniae* at 22.5% and *Pseudomonas aeruginosa* at 17.5%. Monobacterial infection was the most frequent in 51.7% of wounds. 88.6% of the strains of *S. aureus* were methicillin-resistant (MRSA). MDR bacteria accounted for 95.83% of all bacterial isolates. **Conclusion:** High levels of resistance to one or more antibiotic agents have been reported, and a substantial number of them exhibited multidrug resistance, indicating limited therapeutic options for managing chronic non-healing wounds. Therefore, to contain antibiotic resistance, periodic surveillance of the bacteriological profile and antibiotic sensitivity pattern in the study region is of the utmost importance in ensuring successful wound infection care with appropriate antibiotics.

**Keywords:** Antibiogram, bacteriological profile, chronic wound, MDR

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## INTRODUCTION

Chronic wounds (hard-to-heal or difficult-to-heal ulcers) do not heal within a normal healing timeframe, i.e., longer than six weeks, even after the best possible treatment.<sup>1,2</sup> Chronic wounds are becoming increasingly common as a result of an increase in the ageing population and a rising population with diabetes and obesity. These ailments prevent wound healing and retain them in a low-level inflammatory state.<sup>3</sup> These have been associated with significant financial burdens on society,

directly (medical and healthcare expenditures) and indirectly (productivity losses, such as daily wages and often early retirement).<sup>2</sup> It is estimated that cost may fall between 1% and 3% of all healthcare expenditures in developed countries.<sup>4</sup> Factors like infection by multi-drug resistance (MDR) microorganisms, biofilm formation, inflammatory mediators, hypoxia, poor nutrition, and also recurrent trauma because of neurological deficiency or anatomical location may make the wounds to become chronic.<sup>5</sup>

Wound infections are typically caused by various microorganisms, including facultative, anaerobic, aerobic bacteria, fungi, and viruses.<sup>6</sup> The most frequent causes of infection include methicillin-resistant *Staphylococcus aureus*, which accounts for 20–40% of all infections. *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterococcus sp.*, *Proteus sp.*, and *Klebsiella* species are other common bacteria implicated in the infection.<sup>7</sup>

Considering the concerns regarding wound infections caused by antibiotic-resistant bacteria, it is paramount to adhere to the protocol of promptly testing microorganisms for culture and sensitivity to offer appropriate treatment. To fill such a gap, this study was carried out to assess the bacteriological profile of chronic wound infections and their antibiotic susceptibility.

## METHODS

This single-centered, prospective study was conducted in the Wound Clinic of the Departments of General Surgery and Microbiology, Institute of Medical Sciences, Banaras Hindu University, from December 2021 to July 2023. All the eligible patients in the study received thorough information about the study and its procedures before obtaining written informed consent. The institutional review board and ethics committee of BHU approved the study protocol [Dean/2022/EC/3329]. A total of 60 cases were included from the patients visiting the wound clinic of the university hospital. The selection criteria were >12 years of age and had at least one eligible full-thickness chronic wound not healing for a 6-week with conventional therapy. Patients suffering from systemic diseases, burns, malignancy, dermatological disorders, and ulcers with leprosy or tuberculosis, vascular diseases (like venous and arterial ulcers) were excluded.

## Isolation of bacterial pathogen

The wound surface was cleaned gently with sterile gauze soaked in sterile saline (0.9% NaCl) thrice. Two swabs/tissue biopsies were collected to isolate aerobic and facultative anaerobic bacteria. All these swabs were put in a tube containing 1 mL of sterile normal saline. The tube with the swab was vortexed for 5 min to release entrapped bacteria in the swab. A hundred microliters of the above suspension were inoculated on MacConkey (MA) and blood agar (BA) plates and incubated overnight at 37°C. The next day, the plates were examined for bacterial colonies. If colonies did not appear, broth subcultures were made on the fresh solid media, and the old plates were further incubated for 24 h. The colonies were purified and identified by colony morphology, Gram's staining characteristics, and performing a battery of different biochemical tests. The isolates were then subjected to antimicrobial testing by a modified Kirby Bauer disc diffusion method following the guideline of CLSI 2019(8), and the MDR strain has been identified to be resistant to at least three different antibiotic classes. Using a cefoxitin disc (30 µg), the strain of *S. aureus* was screened for methicillin resistance following the guidelines of CLSI (2019).<sup>8</sup> A zone of inhibition ≤21 mm is considered a positive result for MRSA strain. The lawn culture on MHA was prepared after matching the turbidity of the test inoculum

with 0.5 Mac Farland standard.<sup>9</sup> Software SPSS Windows version 25.0 was used for the statistical analysis.

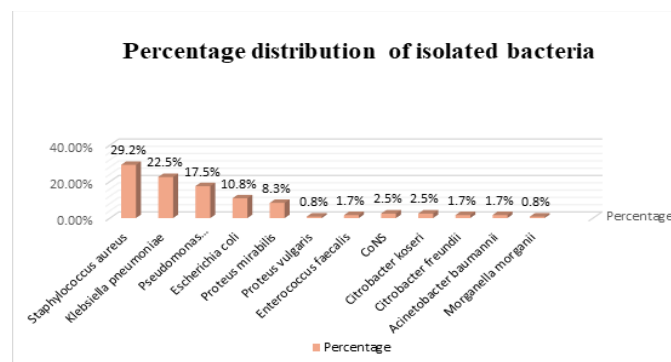
## RESULTS

The study population (60) ranged in age from 20 to 65 years, with a mean of 48.9 (SD ±13.13) years. There were 75% male, and 25% were female. The incidence of chronic wound infections was higher in the age group 41-60 y (48.3%), followed by the age group 60 years old or more (26.7%) and 21-40 (23.3%). The patient demography (age, T2DM, HTN, gender, distribution by age group, and comorbidities are summarized in Table I.

| Characteristics           | Total            |
|---------------------------|------------------|
| <b>Age (Years)</b>        | <b>Mean</b> 48.9 |
|                           | SD 13.1          |
| <b>Gender</b>             | Male 45          |
|                           | Female 15        |
| <b>T2DM</b>               | 30               |
| <b>HTN</b>                | 18               |
| <b>Age groups (years)</b> | <20 1            |
|                           | 21-40 14         |
|                           | 41-60 29         |
|                           | >60 16           |

**Table I: Representation of patient's demographic data and comorbidities**

Among 120 bacterial isolates, gram-negative bacteria were predominant, with 80 (66.7%) isolates, while gram-positive bacteria contributed to 40 (33.3%) of total isolates. *S. aureus* was the most prevalent isolate 35 (29.2%), followed by *K. pneumoniae* 27 (22.5%), *P. aeruginosa* 21 (17.5%), *E. coli* 13 (10.8%), *Proteus* species 11 (9.2%), *Citrobacter* species 5 (4.2%) Coagulase negative Staphylococci 3 (2.5%), *A. baumannii* and *E. faecalis*, each with 2 (1.67%). *M. morganii* 1(0.8%) was the least isolated bacteria (Figure 1).



**Figure 1: Distribution of bacterial species isolated from wound**

Monobacterial infection was the most frequent in 31 (51.7%) wounds. Bi-bacterial infection was found in 24 (40%) cases,

whereas 5 (5.3 %) had poly-bacterial infection. *P. aeruginosa*, *P. mirabilis*, and *S. aureus* were the most common species detected in poly-bacterial infections (Figure 2).

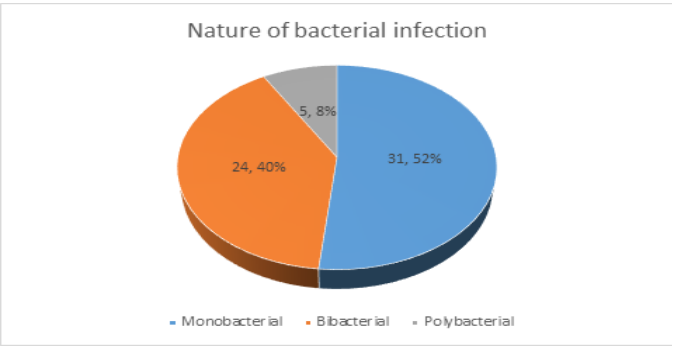


Figure 2: Status of mono/mixed bacterial infections of chronic wound

Antimicrobial profile:

Analysis of species-specific resistance rates indicated that most *S. aureus* isolates were resistant to penicillin G (100%), followed by ampicillin and erythromycin, each with 34 (97.1%) resistance. On the other hand, *S. aureus* was susceptible to vancomycin, linezolid, ciprofloxacin, and clindamycin, with resistance rates of 5.7%, 34.3%, 54.3%, and 85.7%, respectively. Of the 35 *S. aureus* isolates, 31(88.6%) were methicillin-resistant. Overall, 29 (72.5%) gram-positive isolates were resistant to both Penicillin G and cefixime, 27 (67.5%) to ampicillin sulbactam, 26 (65%) to amikacin, 23 (57.5%) to ciprofloxacin and 14 (35%) to linezolid respectively. With 2 (5%) resistance, vancomycin was most effective in all the gram-positive isolates (Table II).

| Bacteria                                | Number and percentage of resistance to various antibiotics, N (%) |              |              |              |              |              |              |              |             |              |             |
|-----------------------------------------|-------------------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|-------------|
|                                         | VA                                                                | LZ           | E            | CD           | AMP          | COT          | CX           | GEN          | AK          | CIP          | P           |
| Staphylococcus aureus (n=35)            | 2<br>(5.7)                                                        | 12<br>(34.3) | 34<br>(97.1) | 30<br>(85.7) | 34<br>(97.1) | 26<br>(74.3) | 31<br>(88.6) | 25<br>(71.4) | 28<br>(80)  | 19<br>(54.3) | 35<br>(100) |
| Enterococcus faecalis (n=2)             | 0<br>(0)                                                          | 0<br>(0)     | 1<br>(50)    | 1<br>(50)    | 1<br>(50)    | 1<br>(50)    | Nt           | 1<br>(50)    | 1<br>(50)   | 2<br>(100)   | 1<br>(50)   |
| Coagulase-negative Staphylococci (n= 3) | 0<br>(0)                                                          | 2<br>(66.7)  | 3<br>(100)   | 3<br>(100)   | 3<br>(100)   | 3<br>(100)   | 3<br>(100)   | 3<br>(100)   | 1<br>(33.3) | 2<br>(66.7)  | 3<br>(100)  |

|              |     |      |      |      |      |      |      |        |      |        |        |
|--------------|-----|------|------|------|------|------|------|--------|------|--------|--------|
| Total (n=40) | 2   | 14   | 38   | 34   | 38   | 30   | 34   | 29     | 30   | 23     | 39     |
|              | (5) | (35) | (95) | (85) | (95) | (75) | (85) | (72.5) | (75) | (57.5) | (97.5) |

VA- Vancomycin, LZ- Linezolid, E- Erythromycin, CD- Clindamycin, AMP- Ampicillin, COT- Co-Trimoxazole (Trimethoprim/Suphamethoxazole), CX-Cefoxitin, GEN- Gentamicin, AK- Amikacin, CFM-Cefixime, CIP- Ciprofloxacin, P- Penicillin-G, NT- Not Tested

Table II: Antibiotic resistance pattern of gram-positive bacteria

Likewise, the least effective antibiotics against gram-negative isolates were ampicillin (100%), ceftazidime (96.2%), cefepime (95%), piperacillin 90%, and Co-Trimoxazole (Trimethoprim/Suphamethoxazole) 83.7%. In contrast, among all the gram-negative strains, low levels of resistance were found to Polymyxin B with 7 (8.7%) resistance, followed by Piperacillin-tazobactam with 24 (30%) resistance and meropenem with 35 (43.7%) resistance. *K. pneumoniae* showed the highest resistance to ampicillin (100%), piperacillin and ceftazidime, each with 96.3% resistance, while polymyxin B and piperacillin-tazobactam were relatively effective antibiotics with a resistance rate of 14.8% and 33.3%, respectively. *P. aeruginosa*, *E. coli*, and *Proteus* species showed the highest resistance rates to ampicillin (100%), cefepime (93.3%), co-trimoxazole and amoxicillin/clavulanic acid, each with 84.44% resistance (Table III).

Bacterial isolates resistant to more than one antimicrobial agent of three or more antimicrobial classes are known as multidrug-resistant isolates. The overall MDR rate among gram-positive isolates was 99%. Out of 35 *S. aureus* isolates tested, 34 (97.1%) were resistant to 3 or more classes of antibiotics, while all isolates (100%) of CoNS and *Enterococcus* species were resistant to 3 or more classes of antibiotics. The overall MDR rates among gram-negative bacteria were 91.4%. High rates of MDR were seen among *K. pneumoniae* and *P. aeruginosa* (100%) each. In contrast, *Proteus* species, *E. coli*, *Citrobacter* species, and *A. baumannii* showed overall MDR rates of 92.6%, 95.67%, and 66.5%, respectively (Table IV).

| Bacteria                      | MRP       | IPM       | ERT       | GEN       | AK        | COT       | PI        | PIT      | AMC       | CPM       | CAZ       | PB       | AMP      | AS        | CIP       |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|----------|----------|-----------|-----------|
| Klebsiella pneumoniae (n=27)  | 15 (55.6) | 19 (70.4) | 21 (77.8) | 18 (66.7) | 19 (70.4) | 22 (81.5) | 26 (96.3) | 9 (33.3) | 25 (92.6) | 26 (96.3) | 26 (96.3) | 4 (14.8) | 27 (100) | 19 (70.4) | 23 (85.2) |
| Pseudomonas aeruginosa (n=21) | 9 (42.8)  | 11 (52.4) | 12 (57.1) | 13 (38.1) | 14 (61.9) | 20 (95.2) | 19 (90.5) | 5 (23.8) | 21 (100)  | 20 (95.2) | 21 (100)  | 2 (9.5)  | 21 (100) | 14 (66.7) | 17 (80.9) |
| Escherichia coli (n=13)       | 4 (30.8)  | 6 (46.1)  | 7 (53.8)  | 5 (38.5)  | 6 (46.1)  | 8 (61.5)  | 13 (100)  | 4 (30.8) | 10 (76.9) | 12 (57.1) | 12 (92.3) | 0 (0)    | 13 (100) | 8 (61.5)  | 8 (61.5)  |

| Total<br>(n=80) | M. morganii<br>(n=1) | A. baumannii<br>(n=2) | Citrobacter<br>freundii<br>(n=2) | Citrobacter<br>koseri<br>(n=3) | Proteus<br>vulgaris<br>(n=1) | Proteus<br>mirabilis<br>(n=10) |
|-----------------|----------------------|-----------------------|----------------------------------|--------------------------------|------------------------------|--------------------------------|
| 35 (43.8)       | 0 (0)                | 1 (50)                | 1 (50)                           | 0 (0)                          | 1 (100)                      | 4 (40)                         |
| 46 (57.5)       | 0 (0)                | 2 (100)               | 1 (50)                           | 1 (33.3)                       | 1 (100)                      | 5 (50)                         |
| 49 (61.2)       | 0 (0)                | 1 (50)                | 1 (50)                           | 1 (33.3)                       | 0 (0)                        | 6 (60)                         |
| 45 (56.2)       | 0 (0)                | 2 (100)               | 1 (50)                           | 0 (0)                          | 0 (0)                        | 6 (60)                         |
| 51 (63.7)       | 0 (0)                | 2 (100)               | 2 (100)                          | 1 (33.3)                       | 1 (100)                      | 6 (60)                         |
| 67 (83.7)       | 1 (100)              | 2 (100)               | 2 (100)                          | 2 (66.7)                       | 1 (100)                      | 9 (90)                         |
| 72 (90)         | 1 (100)              | 2 (100)               | 0 (0)                            | 3 (100)                        | 1 (100)                      | 7 (70)                         |
| 24 (30)         | 1 (100)              | 0 (0)                 | 1 (50)                           | 2 (66.7)                       | 1 (100)                      | 1 (10)                         |
| 59 (73.7)       | 1 (100)              | 1 (50)                | 2 (100)                          | 2 (66.7)                       | 1 (100)                      | 6 (60)                         |
| 76 (95)         | 1 (100)              | 2 (100)               | 2 (100)                          | 3 (100)                        | 1 (100)                      | 9 (90)                         |
| 77 (96.2)       | 1 (100)              | 2 (100)               | 2 (100)                          | 3 (100)                        | 1 (100)                      | 9 (90)                         |
| 7 (8.7)         | 0 (0)                | 0 (0)                 | 0 (0)                            | 1 (33.3)                       | 0 (0)                        | 0 (0)                          |
| 80 (100)        | 1 (100)              | 2 (100)               | 2 (100)                          | 3 (100)                        | 1 (100)                      | 10 (100)                       |
| 54 (67.5)       | 1 (100)              | 2 (100)               | 1 (50)                           | 3 (100)                        | 1 (100)                      | 5 (50)                         |
| 62 (77.5)       | 1 (100)              | 2 (100)               | 1 (50)                           | 1 (33.3)                       | 1 (100)                      | 8 (80)                         |

MRP- Meropenem, IPM- Imipenem, ERT- Ertapenem, GEN- Gentamicin, AK-Amikacin, COT- Co-Trimoxazole (Trimethoprim/Suphamethoxazole), PI- Piperacillin, PIT- Piperacillin/Tazobactam, AMC- Amoxycylav (Amoxicillin/Clavulanic acid), CPM-Cefepime, CAZ- Ceftazidime, PB- Polymyxin B, AMP- Ampicillin, A/S- Ampicillin/Sulbactam, CIP-Ciprofloxacin

**Table III: Antibiotic resistance pattern of gram-negative bacteria**

| Organism                       | No. of isolates | MDR isolates |             |
|--------------------------------|-----------------|--------------|-------------|
|                                |                 | Frequency    | %           |
| <i>Staphylococcus aureus</i>   | 35              | 34           | 97.1        |
| <i>Klebsiella pneumoniae</i>   | 27              | 27           | 100         |
| <i>Pseudomonas aeruginosa</i>  | 21              | 21           | 100         |
| <i>Escherichia coli</i>        | 13              | 12           | 92.3        |
| <i>Proteus mirabilis</i>       | 10              | 8            | 80          |
| <i>Proteus vulgaris</i>        | 1               | 1            | 100         |
| <i>Enterococcus faecalis</i>   | 2               | 2            | 100         |
| CoNS                           | 3               | 3            | 100         |
| <i>Citrobacter koseri</i>      | 3               | 3            | 100         |
| <i>Citrobacter freundii</i>    | 2               | 1            | 50          |
| <i>Acinetobacter baumannii</i> | 2               | 2            | 100         |
| <i>Morganella morganii</i>     | 1               | 1            | 100         |
| <b>Total</b>                   | <b>120</b>      | <b>115</b>   | <b>95.8</b> |

**Table IV: Distribution of MDR pathogens among total isolates**

## DISCUSSION

Wound care and antibiotic therapy are the two fundamental pillars in the clinical management of wounds. The typical

method of administering antibiotics is empirical, which may induce the emergence of antimicrobial-resistant pathogens to multiple classes of antibiotics.<sup>10</sup> Culture techniques are primarily used in routine microbiology laboratories, and isolation and identification of all the possible pathogens from wounds and antibiotic sensitivities serve as a guide for efficient treatment. All the samples collected from 60 patients yielded bacterial growth, indicating that infection is a universal phenomenon for all chronic wounds. Out of the 60 patients included in the present study, 51.7% had mono-bacterial growth, 40% had bi-bacterial, and 8.3% had polybacterial infections. Numerous studies on wound infection have demonstrated similar findings that mono-bacterial infections were more common than polybacterial infections.<sup>11,12</sup> It seems that only a few bacterial species colonization may be compatible with the wound.

In this study, the frequency of isolation of gram-negative bacteria was higher than that of gram-positive bacteria. Gram-negative bacteria were more frequently isolated during this study due to their prevalence as facultative anaerobes and aerobes in abscesses and skin wounds. These bacteria are more common in open and closed wound types because of their recognized properties to cause abscesses in visceral infections and open wounds. The finding is in concordance with previous studies showing a higher isolation rate of gram-negative bacteria.<sup>13-15</sup> *S. aureus* 35 (29.2%), *K. pneumoniae* 27 (22.5%), *P. aeruginosa* 21 (17.5%), *E. coli* 13 (10.8%), and *Proteus* species 11 (9.2%) were the most frequently isolated bacteria in this study.

Owing to the presence of *S. aureus* in nasal cavities as normal flora in most people, its isolation rates in wound infections were the highest among all the bacteria. Unhygienic behaviour, such as touching a wound with a hand contaminated with nasal discharge, maybe a possible reason. This argument is further supported by the finding that the risk of infection is two to nine times higher for *S. aureus* carriers than non-carriers.<sup>16</sup> Wounds can also become contaminated with gram-positive bacteria directly from the skin's surfaces.<sup>17</sup> Furthermore, *S. aureus* is studied more than most gram-negative bacteria.<sup>18</sup>

In the present study, *K. pneumoniae* was the second most commonly isolated bacteria with an isolation rate of 22.5%, which is in good agreement with the earlier report by Wangoye et al<sup>19</sup> with a 29% *K. pneumoniae* isolation rate.

Similarly, the fact that these bacteria, particularly *P. aeruginosa*, are part of the normal flora in healthy individuals and are also prevalent in the environment may cause the high frequency. As shown by Khanal et al in 2010 in Nepal<sup>20</sup> and Flamm et al in the United States<sup>21</sup>, these bacteria are easily spread when they break through the skin and soft tissue in mechanical cases or burns. Additionally, these bacteria can survive in many antiseptics and disinfectants.<sup>15</sup>

Of the 35 isolates of *S. aureus*, 31 (88.6%) were resistant to the antibiotic methicillin (MRSA). A range of 20% to 56.5% has been recorded for the prevalence of MRSA in other investigations.<sup>22-25</sup> The difference in the rates of MRSA isolation between

studies may be caused by variations in the degree of inappropriate antibiotic use, the standard of hygienic practices followed in various places, different time frames of these studies and the degree to which hand hygiene programs are implemented. Gram-positive isolates, including *S. aureus*, exhibited the highest sensitivity to vancomycin (95%), linezolid (65%), ciprofloxacin (34.28%), and co-trimoxazole (25%) in their antibiograms. However, they were highly resistant to penicillin (97.5%), ampicillin (95%) and erythromycin (95%). Other studies also support increased resistance to penicillin and cephalosporins, as observed in the present study.<sup>22,26</sup>

The antibiogram of the Gram-negative isolates revealed mild susceptibility to aminoglycoside and fluoroquinolones, good susceptibility to carbapenems, and resistance to cephalosporins, ampicillin, piperacillin, co-trimoxazole, and amoxicillin-clavulanic acid. Rising resistance to these antibiotics may be caused by the alarmingly widespread prevalence of organisms that produce extended-spectrum beta-lactamases (ESBLs) and overuse of penicillin along the cephalosporin group of antibiotics. Other studies corroborate the steady rise in antibiotic-resistant bacteria among wound patients.<sup>25,27</sup> In particular, *K. pneumoniae* demonstrated the highest resistance towards ampicillin, followed by piperacillin, piperacillin-tazobactam, cefepime (96.3% each) and Amoxycillin-clavulanic acid (92.6%). This outcome is contrary to that of Azzah S et al.<sup>28</sup> who reported a high sensitivity of *K. pneumoniae* to meropenem, imipenem (92.3% each), and ciprofloxacin (68%). However, this study was done five years ago.

Presently, MDR bacteria account for 95.83% of all bacterial isolates. This aligns with the study by Mohammed A. et al from Ethiopia, which found that MDR bacteria account for 95.55% of wound infections.<sup>29</sup> This is still significantly higher than the previously reported rates from Saudi Arabia (22%)<sup>28</sup> and Bangladesh (66–69%).<sup>30</sup> This may be due to the extensive use of antimicrobials by physicians in this area as an empirical treatment alternative or it may be because prolonged antibiotic usage for chronic wounds has caused the emergence of pathogen strains that are becoming more and more resistant. *K. pneumoniae*, *P. aeruginosa*, *P. vulgaris*, *E. faecalis*, CoNS, *C. koseri*, *A. baumannii* and *M. morgani*, each with 100 % MDR next most common species with 100% MDR rates, followed by *S. aureus* (97.1%), *E. coli* (92.3%) and *P. mirabilis* (80%). Compared to other developing countries' reports, this species-specific MDR profile trend was higher.<sup>28-30</sup> In the present study, there were more male patients (45 or 75%) than female patients of chronic wound infections, considering men are more likely engaged in outdoor work and thus more susceptible to injuries.

Although it is still a complicated issue, the effective treatment of bacteria in a wound is of the utmost importance. As a result, our study evaluates the current situation in a particular area, which is mainly helpful to the clinicians and microbiologists involved by helping them become aware of the real-world circumstances they have to deal with.

## CONCLUSION

In the present study, *S. aureus*, *K. pneumoniae*, *P. aeruginosa*, and *E. coli* were the most frequently isolated microorganisms. Compared to Gram-positive wound infections, isolation rates for Gram-negative pathogens were higher. High levels of resistance to one or more antibiotic agents have been reported, and a substantial number of them exhibited multidrug resistance (MDR), indicating limited therapeutic options for managing chronic non-healing wounds. The results of this study will assist healthcare professionals in choosing empirical antibiotic therapy and implementing infection control measures, which are essential for minimizing the rate at which antibiotic resistance (MDR) emerges.

## LIMITATIONS

Only aerobic/ facultative bacteria were examined, which is a significant limitation of this study. However, the prevalence of anaerobes in open wound infection is rare. However, it will be better to look for anaerobes also. An additional limitation was that the investigation was conducted only on a limited sample size for a brief period. A multicenter study with a good number of participants would have yielded a better understanding of chronic wound infection.

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# Evaluation of the Impact of Helmet Use on the Severity of Traumatic Brain Injury

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## ABSTRACT

**Introduction:** Traumatic brain injuries are a leading cause of morbidity and mortality among motorcyclists, especially in Nepal, where two-wheeler vehicles are highly prevalent. This study investigates the association between helmet use and the severity of traumatic brain injuries in motorcyclists presenting to a tertiary care hospital. **Aims:** To evaluate the impact of helmet use on the severity of traumatic brain injuries and associated clinical outcomes. **Methods:** A prospective cohort study was conducted on 150 motorcyclists admitted to Kathmandu Medical College Teaching Hospital between July and September 2023. Data on demographic and clinical characteristics, including age, gender, mechanism of injury, alcohol or drug use, and injury severity, were collected. The Glasgow Coma Scale scores and imaging findings were analyzed to assess traumatic brain injury severity. Statistical tests, including chi-square and logistic regression, were employed to evaluate the association between helmet use and injury outcomes. **Results:** Among 150 participants, 87 (58%) were helmeted, and 63 (42%) were non-helmeted. The mean age was 32.8 years (SD = 11.2). Helmeted patients had significantly higher Glasgow Coma Scale scores (13.2 vs. 8.4,  $p < 0.001$ ) and were more likely to experience mild or moderate traumatic brain injuries (90%) compared to non-helmeted patients, who had a higher proportion of severe injuries (60%). Imaging revealed that helmeted patients had a lower incidence of intracranial hemorrhage (25% vs. 75%) and contusions (15% vs. 60%) ( $p < 0.001$ ). **Conclusion:** Helmet use significantly reduces the severity of traumatic brain injuries, as evidenced by higher Glasgow Coma Scale scores, lower intracranial hemorrhage rates and reduced likelihood of severe injuries. These findings emphasize the need to promote helmet use to mitigate the burden of traumatic brain injuries in Nepal.

**Keywords:** Traumatic brain injury, helmet use, Glasgow Coma Scale, motorcyclists, Nepal, injury prevention

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## INTRODUCTION

Traumatic brain injury (TBI) is a major public health issue worldwide, including in Nepal, where it is a leading cause of morbidity and mortality. Road traffic accidents, particularly involving motorcyclists, are a primary cause of TBI due to the high prevalence of two-wheelers. Helmet use is widely recognized as an effective measure to reduce the severity of head injuries.<sup>1,2</sup> Helmets are designed to absorb impact energy and protect the skull and brain. Studies have shown that helmet use significantly decreases the risk of head injury and fatality among motorcyclists.<sup>3,4</sup> Despite mandatory helmet laws in Nepal, compliance varies, and the quality and fit of helmets are often suboptimal.<sup>5</sup> Additionally, awareness and attitudes towards helmet use can influence the effectiveness of this intervention. The effectiveness of helmets in reducing TBI severity, particularly in the context of Nepal's unique traffic conditions, remains under-explored. This study evaluates the impact of helmet use on the severity of TBI among motorcyclists

admitted to Kathmandu Medical College Teaching Hospital. By analyzing helmet use prevalence, TBI severity, and clinical outcomes such as Glasgow Coma Scale scores and intracranial injuries, the findings aim to provide critical insights into the effectiveness of current policies and identify strategies for improving helmet compliance. These findings will inform public health initiatives to reduce the burden of TBI in Nepal.

## METHODS

This prospective cohort study was conducted to evaluate the impact of helmet use on the severity of traumatic brain injury (TBI) among patients treated at Kathmandu Medical College Teaching Hospital (KMCTH) from July to September 2023. The study design enabled real-time data collection on helmet use and TBI severity, minimizing recall bias and enhancing the reliability of the findings. The study included individuals aged 18 years and above who sustained TBIs while traveling on motorcycles and sought treatment at the Neurosurgical Outpatient Department (NSOPD) or the Department

of Emergency Medicine at KMCTH. Inclusion criteria required participants to have a confirmed diagnosis of TBI based on clinical and imaging findings. Patients with pre-existing neurological conditions or who refused to provide informed consent were excluded. The research was conducted at the Neurosurgery OPD (NSOPD) and the Department of Emergency Medicine at KMCTH, a major neurosurgical center in Kathmandu, Nepal. Data were collected through a combination of medical record reviews, patient interviews and direct observations.

1. Medical Record Review: Detailed information was extracted from patient medical records, including demographic data, mechanism of injury, helmet use at the time of the incident, clinical assessments, imaging findings, and treatment details.

2. Patient Interviews: Semi-structured interviews were conducted with patients to gather additional information about the circumstances of the injury and their helmet use behavior.

3. Clinical Assessments: The severity of TBI was assessed using the Glasgow Coma Scale (GCS) and imaging studies (CT or MRI scans) to identify the presence and extent of intracranial hemorrhage or contusions.

#### Variables

- **Dependent Variable:** The severity of TBI, assessed using the GCS, presence of intracranial hemorrhage, and contusions on imaging.
- **Independent Variable:** Helmet use at the time of injury, categorized as helmeted or non-helmeted.
- **Additional Variables:** Age, gender, mechanism of injury, and alcohol or drug use at the time of injury were recorded to account for potential confounding factors.

#### Data Collection Tools

- Structured Data Collection Form:** A form was developed to systematically capture demographic information, injury characteristics, helmet use details and TBI severity indicators.
- Helmet Use Questionnaire:** This tool gathered specific details about helmet use, including type, frequency, duration and reasons for non-use.
- Glasgow Coma Scale (GCS):** This clinical tool was used to evaluate the severity of TBI based on the patient's level of consciousness, motor responses and eye-opening.

Data were cleaned, validated, and analyzed using appropriate statistical methods. Descriptive statistics were used to summarize demographic and clinical characteristics. Inferential statistics, including chi-square tests and logistic regression, were employed to assess the association between helmet use and TBI severity while controlling for potential confounding variables. Ethical approval was obtained from the Institutional Review Board (IRB) of KMCTH, ensuring compliance with ethical standards. Confidentiality and privacy

of the participants were maintained, and informed consent was obtained from all participants prior to data collection. Regular monitoring and cross-verification of collected data were conducted to maintain accuracy and completeness.

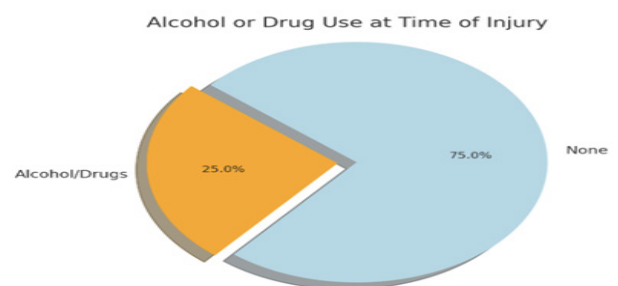
#### RESULTS

A total of 150 patients were included in the study, with 90 (60%) being male and 60 (40%) female. The mean age of the participants was 32.8 years (SD = 11.2), ranging from 18 to 65 years. Of the 150 patients, 87 (58%) were helmeted at the time of the injury, while 63 (42%) were not.

| Characteristic             | Helmeted (n=87) | Non-Helmeted (n=63) | Total (n=150)  | p-value |
|----------------------------|-----------------|---------------------|----------------|---------|
| <b>Age (years)</b>         |                 |                     |                |         |
| Mean (SD)                  | 33.5<br>(10.8)  | 32.0<br>(11.5)      | 32.8<br>(11.2) | 0.42    |
| Range                      | 18-65           | 18-65               | 18-65          |         |
| <b>Gender</b>              |                 |                     |                |         |
| Male                       | 54<br>(62.1%)   | 36<br>(57.1%)       | 90<br>(60%)    | 0.55    |
| Female                     | 33<br>(37.9%)   | 27<br>(42.9%)       | 60<br>(40%)    | 0.55    |
| <b>Mechanism of Injury</b> |                 |                     |                |         |
| Collision                  | 66<br>(75.9%)   | 46<br>(73.0%)       | 112<br>(75%)   | 0.72    |
| Fall/Other                 | 21<br>(24.1%)   | 17<br>(27.0%)       | 38<br>(25%)    | 0.72    |
| <b>Alcohol/Drug Use</b>    |                 |                     |                |         |
| Yes                        | 15<br>(17.2%)   | 15<br>(23.8%)       | 30<br>(20%)    | 0.30    |
| No                         | 72<br>(82.8%)   | 48<br>(76.2%)       | 120<br>(80%)   | 0.30    |

**Table I: Demographic and Clinical Characteristics of Study Participants**

Below is a pie chart (Figure 1) indicating that 25% of participants were under the influence of alcohol or drugs at the time of injury, while 75% were not.



**Figure 1: Alcohol or Drug Use at Time of Injury**

## Injury Mechanism and Helmet Use

The majority of injuries (75%) resulted from direct collisions with other vehicles, while the remaining 25% were due to loss of control or skidding. Alcohol or drug use at the time of injury was reported by 20% of the participants. Among those who used helmets, 68% reported wearing full-face helmets, and 32% wore half-face helmets.

| TBI Severity        | Helmeted (n=87) | Non-Helmeted (n=63) | Total (n=150) | p-value |
|---------------------|-----------------|---------------------|---------------|---------|
| Mild (GCS 13-15)    | 78 (89.7%)      | 30 (47.6%)          | 108 (72%)     | <0.001  |
| Moderate (GCS 9-12) | 7 (8.0%)        | 18 (28.6%)          | 25 (16.7%)    | <0.001  |
| Severe (GCS 3-8)    | 2 (2.3%)        | 15 (23.8%)          | 17 (11.3%)    | <0.001  |

**Table II: Helmet Use and TBI Severity**

Table II shows the distribution of TBI severity among helmeted and non-helmeted riders. Chi-square tests were used to determine the significance of differences in TBI severity.

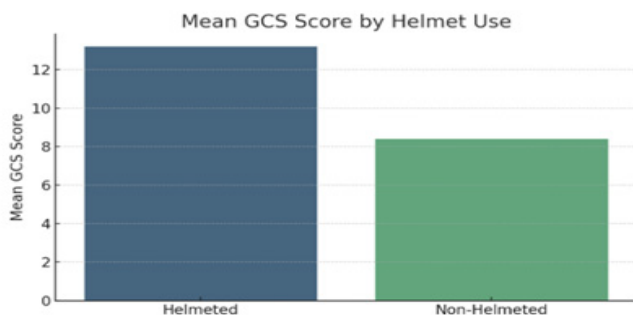
## TBI Severity

### Glasgow Coma Scale (GCS) Scores

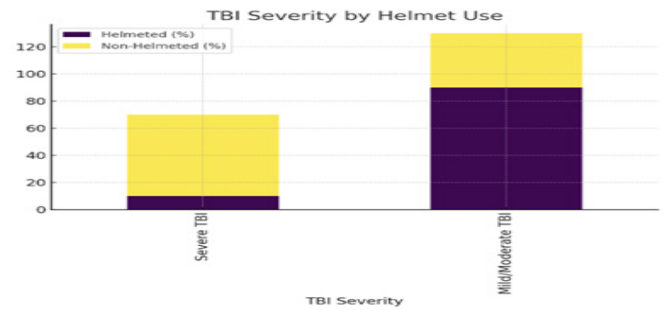
The GCS scores ranged from 3 to 15, with a mean score of 11.5 (SD = 3.2). Helmeted patients had a significantly higher mean GCS score (13.2, SD = 2.1) compared to non-helmeted patients (8.4, SD = 3.7) ( $p < 0.001$ ).

- **Mean GCS Score by Helmet Use:** This bar chart (Figure 2) shows the difference in mean GCS scores between helmeted and non-helmeted patients. Helmeted patients have a higher mean GCS score (13.2) compared to non-helmeted patients (8.4), indicating less severe TBIs in helmeted individuals.

- **TBI Severity by Helmet Use:** This stacked bar chart (Figure 3) compares the severity of TBIs between helmeted and non-helmeted patients. Helmeted individuals mostly experienced mild/moderate TBIs (90%), while a higher percentage of non-helmeted patients suffered from severe TBIs (60%).



**Figure 2: Mean GCS score by helmet use**

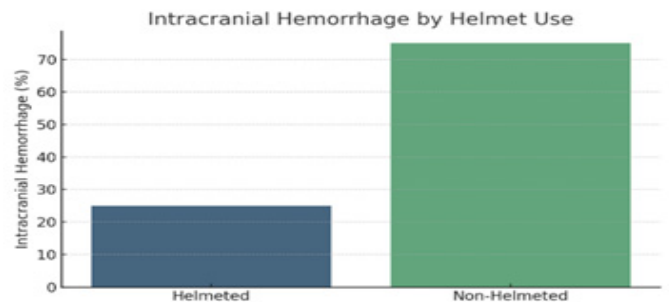


**Figure 3: TBI severity by helmet use**

## Intracranial Hemorrhage and Contusions

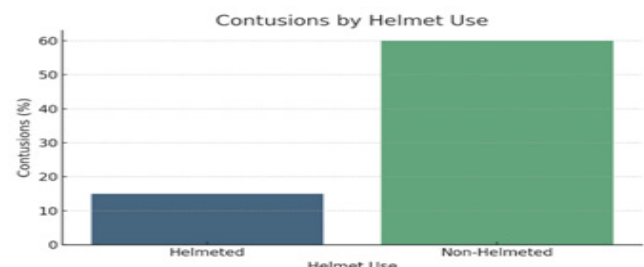
Imaging studies revealed that 45% of the patients had intracranial hemorrhage, and 30% had contusions. Among helmeted patients, 25% had intracranial hemorrhage and 15% had contusions. In contrast, 75% of non-helmeted patients had intracranial hemorrhage, and 60% had contusions. The difference in the incidence of intracranial hemorrhage and contusions between helmeted and non-helmeted patients was statistically significant ( $p < 0.001$ ).

- **Intracranial Hemorrhage by Helmet Use:** This bar chart (Figure 4) illustrates the percentage of patients with intracranial hemorrhage among helmeted and non-helmeted individuals. A significantly higher percentage of non-helmeted patients (75%) experienced intracranial hemorrhage compared to helmeted patients (25%).



**Figure 4: Intracranial hemorrhage by helmet use**

- **Contusions by Helmet Use:** This bar chart (Figure 5) displays the percentage of patients with contusions among helmeted and non-helmeted individuals. Non-helmeted patients (60%) had a higher incidence of contusions compared to helmeted patients (15%).



**Figure 5: Contusion by helmet use**

## Statistical Analysis

Chi-square tests indicated a significant association between helmet use and TBI severity. Helmeted patients were less likely to suffer severe TBIs (GCS  $\leq 8$ ) compared to non-helmeted patients ( $\chi^2 = 28.6$ ,  $p < 0.001$ ).

Logistic regression analysis, controlling for age, gender, mechanism of injury, and alcohol or drug use, demonstrated that helmet use was a significant protective factor against severe TBI (OR = 0.25, 95% CI: 0.13-0.48,  $p < 0.001$ ). Other significant predictors of TBI severity included alcohol or drug use (OR = 2.5, 95% CI: 1.1-5.7,  $p = 0.03$ ).

| Variable            | Odds Ratio (95% CI) | p-value |
|---------------------|---------------------|---------|
| Helmet Use          | 0.25 (0.13-0.48)    | <0.001  |
| Age                 | 1.01 (0.98-1.05)    | 0.42    |
| Gender (Male)       | 0.85 (0.42-1.71)    | 0.65    |
| Alcohol/Drug Use    | 2.50 (1.10-5.68)    | 0.03    |
| Mechanism of Injury | 1.20 (0.60-2.40)    | 0.62    |

**Table III: Logistic Regression Analysis of Factors Associated with Severe TBI**

Table III presents the logistic regression analysis to identify factors associated with severe TBI. The odds ratios (OR) and 95% confidence intervals (CI) were calculated, adjusting for age, gender, mechanism of injury, and alcohol or drug use. The p-values indicate the significance of each factor in predicting severe TBI.

This study highlighted the significant protective effect of helmet use on the severity of TBIs among motorcyclists. Helmeted individuals had higher GCS scores, lower incidence of intracranial hemorrhage and contusions, and reduced likelihood of severe TBI. These findings underscore the importance of promoting helmet use to reduce the burden of TBIs in Nepal.

## DISCUSSION

This study aimed to evaluate the impact of helmet use on the severity of traumatic brain injury (TBI) among patients treated at Kathmandu Medical College Teaching Hospital (KMCTH) from July to September 2023. Our findings provide valuable insights into the protective effects of helmet use in a lower-middle-income country context, which has significant implications for public health and injury prevention strategies.

Our analysis demonstrated that helmeted riders had significantly lower TBI severity compared to non-helmeted riders, as evidenced by higher Glasgow Coma Scale (GCS) scores and reduced incidences of intracranial hemorrhages and contusions. These results are consistent with numerous studies that have established the efficacy of helmets in mitigating the impact of head injuries in motorcycle accidents.<sup>1,6,7</sup> Helmets act as a mechanical barrier, absorbing and dissipating the energy of a collision, thereby reducing the force transmitted to the skull and brain.<sup>3</sup> A comprehensive review by Liu et al highlighted that helmet use reduces the risk of head injury by

approximately 69% and the risk of death by 42%.<sup>8</sup>

The study population predominantly consisted of young males, which aligns with global epidemiological data indicating that young men are at a higher risk of motorcycle-related TBIs.<sup>9,10</sup> This demographic trend underscores the need for targeted interventions to promote helmet use and safe riding practices among this high-risk group. Additionally, alcohol or drug use at the time of injury was recorded in a significant proportion of patients, highlighting the role of substance use in exacerbating the risk of severe TBIs.<sup>11,12</sup> Studies by Taylor et al and P eck et al have similarly noted that substance use significantly increases the likelihood and severity of motorcycle accidents.<sup>1,13</sup>

The statistical analysis revealed a significant association between helmet use and reduced TBI severity, even after adjusting for potential confounding variables such as age, gender, mechanism of injury, and substance use. These findings corroborate the results of previous studies conducted in diverse settings, reinforcing the universal protective benefits of helmet use.<sup>14-16</sup> A matched-pair cohort study by Norvell and Cummings also supports these findings, showing that helmeted riders have a substantially lower risk of fatal head injuries compared to non-helmeted riders.<sup>17</sup> The logistic regression model demonstrated that helmet use was a strong independent predictor of lower TBI severity, with helmeted riders being less likely to sustain severe TBIs compared to non-helmeted riders.<sup>18</sup>

The study's findings have important implications for public health policies and injury prevention programs in Nepal and similar settings. Despite the well-documented benefits of helmet use, compliance rates remain suboptimal, partly due to lack of enforcement and public awareness.<sup>19,20</sup> A study in Vietnam by Passmore et al indicated that the implementation of mandatory helmet laws led to a significant reduction in head injuries.<sup>19</sup> Our study underscores the urgent need for comprehensive strategies to enhance helmet use, including stricter enforcement of helmet laws, public education campaigns, and subsidizing helmet costs to improve accessibility.<sup>21-23</sup> Research by Oluwadiya et al in Nigeria and Naci et al globally highlights the effectiveness of such multifaceted approaches in improving helmet use and reducing TBI incidents.<sup>24,25</sup>

The findings of this study align with global research on the protective effects of helmet use. As demonstrated in Table IV helmeted riders consistently show higher Glasgow Coma Scale scores, lower incidences of severe traumatic brain injuries, intracranial hemorrhages, and contusions compared to non-helmeted riders across various studies. This comparison underscores the universal benefits of helmet use, even in the context of Nepal's unique traffic conditions. The data further highlight the need for comprehensive strategies to improve helmet compliance and quality to achieve similar outcomes globally.

| Statistical Significance                    | Contusions (Non-Helmeted) | Contusions (Helmeted) | Intracranial Hemorrhage (Non-Helmeted) | Intracranial Hemorrhage (Helmeted) | Severe TBI (Non-Helmeted) | Severe TBI (Helmeted) | Mean GCS Score (Non-Helmeted) | Mean GCS Score (Helmeted) | Helmet Use                          | Study                              |
|---------------------------------------------|---------------------------|-----------------------|----------------------------------------|------------------------------------|---------------------------|-----------------------|-------------------------------|---------------------------|-------------------------------------|------------------------------------|
| $p < 0.001$ for all comparisons             | 60%                       | 15%                   | 75%                                    | 25%                                | 18.8%                     | 8.3%                  | 8.4                           | 13.2                      | Helmeted: 58%,<br>Non-Helmeted: 42% | Current Study (Nepal)              |
| $p < 0.001$ for TBI severity and hemorrhage | 55%                       | 12%                   | 80%                                    | 20%                                | 22%                       | 10%                   | 8.2                           | 13.5                      | Helmeted: 70%,<br>Non-Helmeted: 30% | Smith et al <sup>26</sup>          |
| $p < 0.001$ for TBI severity and contusions | 65%                       | 18%                   | 70%                                    | 30%                                | 25%                       | 12%                   | 8.7                           | 12.8                      | Helmeted: 65%,<br>Non-Helmeted: 35% | Anderson et al. 2022 <sup>27</sup> |
| $p < 0.001$ for TBI severity and hemorrhage | 58%                       | 14%                   | 78%                                    | 22%                                | 20%                       | 9%                    | 8.5                           | 13.0                      | Helmeted: 60%,<br>Non-Helmeted: 40% | Wang et al 2018 <sup>28</sup>      |
| $p < 0.001$ for TBI severity and hemorrhage | 50%                       | 10%                   | 82%                                    | 18%                                | 15%                       | 7%                    | 8.1                           | 13.6                      | Helmeted: 75%,<br>Non-Helmeted: 25% | Davis et al <sup>29</sup>          |

**Table IV: Comparison of Study Findings with International Research**

This study, while providing significant insights into the impact of helmet use on traumatic brain injuries (TBI) among motorcyclists, has several limitations. Firstly, the sample size of 150 patients, though substantial, may not be representative of the

broader population, potentially limiting the generalizability of the findings. Secondly, the study's reliance on self-reported data for alcohol and drug use at the time of injury introduces the possibility of reporting bias, as participants may under-report or misrepresent their substance use. Additionally, the study's observational design precludes establishing causal relationships between helmet use and TBI severity, as confounding factors such as the type and speed of collision, road conditions, and adherence to traffic regulations were not controlled for. Furthermore, the classification of helmet types (full-face vs. half-face) was based on patient reports without independent verification, which could affect the accuracy of the data. There is the lack of assessment of helmet quality, as we only considered helmet type (full-face vs. half-face), but did not evaluate variations in helmet material, certification, or structural integrity, which could influence the protective effectiveness in preventing traumatic brain injury. Lastly, the study was conducted in a single medical center, which might limit the applicability of the results to other settings with different demographics or healthcare practices. Future research should aim to address these limitations by including larger, more diverse samples and employing more rigorous data collection methods to enhance the robustness of the findings.

## CONCLUSION

In conclusion, our study reaffirms the critical role of helmets in reducing the severity of TBIs among motorcycle riders. The significant protective effect of helmet use, as demonstrated in this study, highlights the need for robust public health interventions to promote helmet compliance and enhance road safety. By addressing the barriers to helmet use and reinforcing the enforcement of helmet laws, we can significantly reduce the burden of TBIs and improve outcomes for motorcycle accident victims.

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# Assessment of Prescribing Pattern of Antidepressants in Patient Suffering from Depressive Disorder Visiting the OPD at a Tertiary Care Teaching Hospital

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## ABSTRACT

**Introduction:** Depression is a prevalent condition that strongly affects the quality of life, academic performance, social behavior, family life, and workplace productivity. Treatment of depression, is of paramount importance and it can be achieved by proper and judicious use of antidepressant drugs. **Aims:** To assess drug utilization patterns of antidepressant drug & their relevant classes to understand the drug practicing behavior of antidepressant drugs. **Methods:** A descriptive cross sectional study was conducted on 159 patients visiting outpatient Department of Psychiatry at Nepalgunj Medical College Teaching Hospital after obtaining the Ethical Clearance. Patients that were eligible as per the inclusion criteria were selected for the study. All the relevant data such as demographic information, drug names, their class, route of intake was collected from the prescription card of the patient on a preformed proforma. **Results:** Total of 237 drugs were prescribed, belonging to four different classes of antidepressants to total 159 patients among which Selective Serotonin Reuptake Inhibitors (44.65%) followed by serotonin and norepinephrine reuptake inhibitors (23.27%) were most highly prescribed. Escitalopram (18.98 %) was most frequently utilized among all existing antidepressants. Antidepressant prescribed from National list of Essential Medicine (NLEM), Nepal was just 34.59 % of total prescription. **Conclusion:** Selective Serotonin Reuptake Inhibitors was the commonly prescribed group of antidepressant drugs and Escitalopram was prescribed in highest number for treatment of depression. The drug prescribing habits was rationale as per WHO prescribing indicators except underutilization of antidepressant drugs from NLEM and the complete absence of Generic drug from the prescription.

**Keywords:** Antidepressant drugs, drug utilization, Escitalopram, Fluoxetine, SSRI, SNRI

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## INTRODUCTION

Depression is a common mental health illness addressed and treated with antidepressants and other psychotropic drugs.<sup>1</sup> It commonly presents as significant changes in weight, modified eating habits, restlessness or sluggishness, feelings of guilt or worthlessness, decreased engagement in everyday activities, sleep disorder altered sexual drive lasting a minimum of two weeks.<sup>2,3</sup> Persistent and severe depression negatively affects academic performance, social behavior, and productivity at work, leading to reduced income potential or job loss. Additionally, individuals suffering from depression face an

increased chance of death from suicide, accidents and heart conditions.<sup>4</sup> The five primary Groups of antidepressants Primarily used in the treatment of depressive episodes are selective serotonin reuptake inhibitors (SSRIs), atypical antidepressants, Monoamine oxidase inhibitors (MAOIs), tricyclic antidepressants (TCAs).<sup>1</sup> World Health Organization defines Drug utilization studies (DUS) as the marketing, distribution, prescription, and use of medicinal products in a society, with special emphasis on the resulting medical and socioeconomic consequences.<sup>5</sup> A Drug Utilization Study assists in evaluating the appropriate usage of medications, understanding the cur-

rent utilization of drugs in medical and clinical environments as well as in society. According to WHO, the appropriate use of medications involves giving patients the right drugs at the right doses, for the right amount of time, and at the lowest cost possible to them and their community.<sup>6</sup> This study aims to evaluate drug Prescribing patterns of antidepressant drugs, their classes, route and their utilization from National list of Essential Medicine, Nepal (NLEM) in order to understand and promote the rational use of antidepressants in patients with depressive disorders.

## METHODS

A 6-month descriptive cross-sectional study was conducted from 29 February to 2 September 2024 on 159 patient obtained after calculation of sample size in the outpatient of department of Psychiatry at Nepalgunj Medical College Teaching Hospital. Ethical Consent was obtained from the Institutional Review Committee prior to the start of the study. Patient that were eligible and selected as per the inclusion criteria and exclusion criteria for the study. Demographic information such as age and gender, antidepressant class, Antidepressant drugs name under different class, routes, name of drugs other than antidepressant was noted in a predesigned proforma.

### Inclusion Criteria

1. Patients suffering from depressive disorder with no other Psychiatric illness
3. Patient of both gender (male, females)
4. Patients of age between 21 –70 years

### Exclusion Criteria

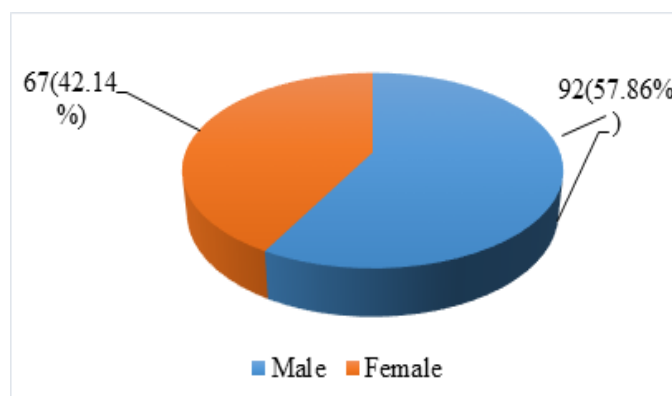
1. Patients treated with only non-pharmacological approach
2. Pregnant and lactating woman
3. Patients not giving informed consent.

### Statistical Analysis & Data Assessment

The data obtained from the prescription such as Age Group, Gender, drug name, drug class, route of administration was categorized and tabulated in terms of number and percentage on Microsoft excel worksheet. The final results achieved were analyzed using descriptive statistics and graphically presented via bar chart, and pie chart wherever necessary. SPSS software was used as its more user friendly and stronger tool than Microsoft Excel.

## RESULTS

A total of 159 prescriptions among which total number of antidepressant prescribed were 237. Out of total 159 study population, 92(57.86%) females were observed to be suffering from depression than males 67(42.14%) as depicted in Figure 1



**Figure 1: Distribution of Depressive Disorder as per Gender**

The majority 46(28.93 %), of the patient were in age group between 41- 50 years, the highest group among the suffer depression whereas the least group affected from the disorder were 15(9.43%) in age between 31-40. Table I

| S. no | Age group (Years) | Number (n) | Percentage (%) |
|-------|-------------------|------------|----------------|
| 1     | 21-30             | 33         | 20.75          |
| 2     | 31-40             | 15         | 9.43           |
| 3     | 41-50             | 46         | 28.93          |
| 4     | 51-60             | 26         | 16.35          |
| 5     | 61-70             | 39         | 24.52          |
| 6     | Total             | 159        | 100            |

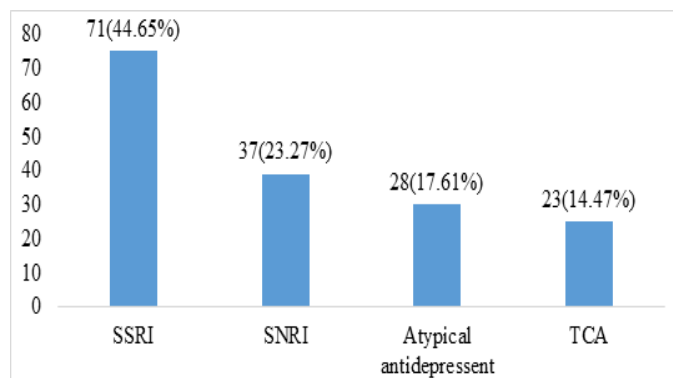
**Table I: Distribution of Antidepressant as per the Age group n=159**

Total 237 antidepressant drugs under various groups were prescribed among which Escitalopram 45(18.98%) was the highest prescribed antidepressant drug prescribed followed by venlafaxine 29 (12.23%); whereas Amitriptyline 8 (3.37%) was the least. Table II

| S.N. | Drugs Name    | Number (n =237) | Percentage (%) |
|------|---------------|-----------------|----------------|
| 1    | Escitalopram  | 45              | 18.98          |
| 2    | Venlafaxine   | 29              | 12.23          |
| 3    | Sertraline    | 28              | 11.81          |
| 4    | Mirtazepine   | 26              | 10.97          |
| 5    | Fluoxetine    | 24              | 10.12          |
| 6    | Trazadone     | 19              | 8.01           |
| 7    | Duloxetine    | 18              | 7.59           |
| 8    | Imipramine    | 15              | 6.329          |
| 9    | Clomipramine  | 13              | 5.48           |
| 10   | Paroxetine    | 12              | 5.06           |
| 11   | Amitriptyline | 8               | 3.375          |
|      | Total         | 237             | 100            |

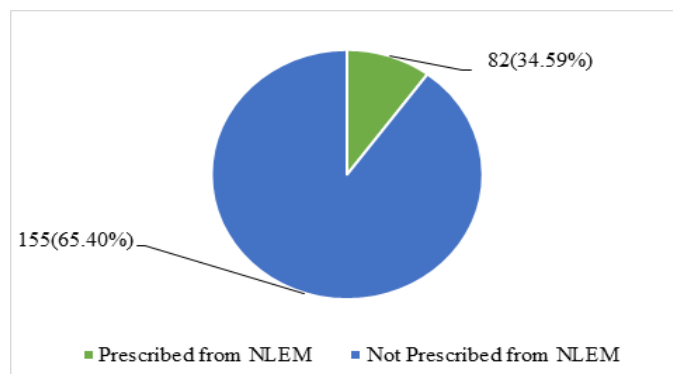
**Table II: Distribution of individual Antidepressant Drugs**

All the antidepressant that were prescribed was administer by oral route 237(100 %). Total of four groups of antidepressant were utilized for treatment; where selective serotonin reuptake inhibitors (SSRI) topped the ranked with 71(44.65%) followed by serotonin and norepinephrine reuptake inhibitors(SNRI) with 37(23.16 %). Figure 2



**Figure 2: Distribution of Antidepressants as per their Group**

Among all the prescriptions utilized for the study, only 82(34.59%) were from the National List NLEM while majority 155(65.40%) were not prescribed from NLEM. Figure 3



**Figure 3: Antidepressant drugs prescribed as per National List of Essential Medicine (NLEM)**

As per the drug prescribing indicators, all the parameters are in alignment with WHO prescribing indicators except drug from NLEM & Generic prescription. Table III

| S.no. | Parameters                                                                        | Result | Reference Range |
|-------|-----------------------------------------------------------------------------------|--------|-----------------|
| 1     | Average no of drugs per prescription                                              | 1.5    | 1.6 -1.8        |
| 2     | Percentage of drugs prescribed by the Generic name                                | 0      | 100%            |
| 3     | Percentage of encounters with an antibiotic prescribed                            | 0      | ≤30%            |
| 4     | Percentage of encounters with an injectable prescribed                            | 0      | <20 %           |
| 5     | Percentage of drugs prescribed from National Essential Drug List per prescription | 34.59% | 100%            |

**Table III: Drug Prescribing Indicators & their Standard Value as per WHO**

## DISCUSSION

In the present study finding, more females (57.86%) were diagnosed with depression than males (42.14%), which agreed with the WHO factsheet stating: "More women are affected by depression than men".<sup>8</sup> Higher prevalence of depression in female may be possibly because of hormonal difference between male and female. These alterations in hormonal regulation cause dysregulation of the stress response, which makes them more sensitive to depressive episodes. However, a similar study conducted by Mohammed et al in Kerela, India showed that prevalence was a bit higher in males (53%) than females (48%).<sup>9</sup> Status which might directly or indirectly affects the development of depressive disorder. This difference could be because of geographical location as different geographical areas have different lifestyle, habits and social socioeconomic. In our study, it was evident that middle age group from 41 – 50 years (28.93% were more suffering from depressive episodes. This observation is in alignment with a survey of depression across various age group led by Laura A et al in USA which also found person from age group 40-50 to be higher than any other age group.<sup>10</sup> Higher predominance of depression in this age group may be because of inability to cope properly with increasing economic, moral, social and family responsibility all of which are generally at their peak in this age group.

The finding in our study depicted that selective serotonin reuptake inhibitor(SSRI) represented (44.65%) was the most frequently prescribed drug group among all the antidepressant groups which is supported by a study outcome conducted Sharma KD et al Manipal Institute of Medical Sciences, Sikkim, India in 2023 where SSRI (89%) category of antidepressants was extensively utilized for treatment of depressive symptoms and disorder.<sup>4</sup> Though in both the studies, selective serotonin reuptake group of antidepressants were highly prescribed but the difference between their utilization was quite huge. This higher difference between utilization of selective serotonin reuptake inhibitor group of drugs may be because of change in diagnostic criteria of depression. Diagnostic and Statistical Manual of Mental Disorders (DSM) was used by the study carried out by Sharma KD et al<sup>4</sup> whereas International Classification of Disease version 10 (ICD-10) DSM was considered in our study. In addition, the sample size could also be one of the contributing reasons for such a significant change. Our study included 159 observational patients, which is considerably lower than the 316 patients in the study conducted by Sharma KD et al. The higher use of SSRIs is likely due to their better safety profile, high clinical efficacy, and wider availability. The next most utilized drug class was SNRI. So, the increased use of SSRI followed by SNRI points towards the better efficacy in treating depressive disorder. In our study, it was found that Escitalopram (18.98%) was the commonest drug utilized both under SSRI group as well as in any other group of antidepressant in our study. The finding in our study is in alignment with two similar prospective observational study led by Mehdi S et al<sup>1</sup> in Australia at School of Health and Biomedical Sciences in 2022 and Lam MK,<sup>11</sup> Tripathi A et al<sup>12</sup> in Lucknow India at King George's Medical University 2016 that revealed Escitalopram was the most frequently prescribed to the

patient for the treatment of all sorts of depression. However, Lam MK also reports use of Tricyclic Antidepressants (TCAs) in (38%) and in our study 14.47% only which is not in alignment with previous study finding.<sup>11</sup> Increased use of SSRI in all of these study is most probably because of its superior efficacy in treating symptoms of depression and practically minimal to no side effects of sedation that is seen clinically among all the antidepressant with varying degree. However, a 2009 study carried out by Indrajit B et al at Manipal College of Medical Sciences, Pokhara, Nepal showed different result where Fluoxetine (42.1%) was observed to be the most frequently used drugs in the patient suffering from depressive disorder.<sup>13</sup> The predominance of fluoxetine in the study obtained by Indrajit B et al may be because of the significant time lag of 14 years as the safety & efficacy of Escitalopram was not well realized by the clinician.<sup>13</sup> However, our finding is not in alignment with the WHO/INRUD (International Network for Rational Use of Drugs)<sup>14</sup> guidelines which clearly states that 100 % drug should be prescribed by generic drug as well as from the National list of Essential Medicines as no drug was prescribed by the generic name.<sup>14,15</sup> The reason of drug not being prescribed by generic name at all is because of the unavailability of Generic drugs owing to no manufacturing neither from the private or government owned pharmaceutical company. In addition, lack of any proper guidelines from the government also plays the significant role in use of generic drugs. Only handful of 34.59% drug was prescribed from NLEM of Nepal 15 which strongly deviates the prescribing guidelines suggested by the WHO.<sup>14</sup> The strongest reason of drugs not being prescribed from NIEM by the Psychiatrist in our study is because of the absence of most antidepressant drugs that meets the mental health need of most of the populations of Nepal from the NLEM laid down by Department of drug administration (DDA) that fulfill the mental health needs of most of the general populations.

## LIMITATIONS

As we conducted a descriptive cross sectional study with smaller sample size of only 159 that cannot be used to generalised antidepressant use.

## CONCLUSION

The findings of our study reflects more female are suffering from depressive disorder than male, SSRI was the highest prescribed Class and Escitalopram was the maximum prescribed drug among all the Class. The drug prescribing habits was found to be rationale based on WHO drug Prescribing indicators except under prescribing of antidepressant from NLEM and complete absence of generic drugs from Clinician's Prescription.

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# Comparison of Three Different Doses of Esmolol to Attenuate Hemodynamic Stress Response During Laryngoscopy and Endotracheal Intubation

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## ABSTRACT

**Introduction:** The hemodynamic stress can result from laryngoscopy and endotracheal intubation due to sympathoadrenal stimulation. Esmolol administered intravenously reduces the hemodynamic stress response. The lowest effective dose of esmolol for this purpose is still in debate, hence we chose to study three different doses. **Aims:** To evaluate various doses of esmolol administered intravenously in managing hemodynamic stress response in patients undergoing laryngoscopy and endotracheal intubation. **Methods:** This prospective and cross-sectional analytical study was conducted among 66 patients, administered 0.5 (Group A), 1 (Group B) and 1.5 mg/kg (Group C) doses of esmolol to 22 patients in each group undergoing laryngoscopy and endotracheal intubation, considering all inclusion and exclusion criteria. Parameters like heart rate, arterial blood pressure were all monitored before premedication, after premedication, before intubation, after intubation, till 7 minutes at different time intervals following laryngoscopy and intubation. **Results:** The heart rate data for Groups A, B, and C shows significant differences at various stages. For example, post succinylcholine Group data also showed significant differences, particularly at 3 and 4 minutes post-intubation ( $p < 0.001$ ). Mean arterial pressure (MAP) measurements further demonstrate significant differences at multiple stages (e.g., post-intubation MAP: Group A  $115.5 \pm 8$ , Group B  $108.2 \pm 7.2$ , Group C  $109.2 \pm 8.9$ ,  $p < 0.001$ ). **Conclusion:** The study has shown that it is better to choose 1.5 mg/kg to manage hemodynamic stress response during laryngoscopy and endotracheal intubation.

**Keywords:** Endotracheal intubation, Esmolol, Hemodynamic stress, Laryngoscopy

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## INTRODUCTION

Laryngoscopy and tracheal intubation compromise hemodynamic responses, i.e. alteration of cardiovascular function including tachycardia, bradycardia, rise in arterial blood pressure, and various types of arrhythmias, maximum after intubation and lasting for 5-10 minutes. Laryngoscopy and endotracheal intubation stimulate sympathoadrenal receptors, releasing catecholamines in the stream. It is a somato-visceral type of reflex.<sup>1</sup> Perhaps this sympathoadrenal response is innocuous, transient and without sequelae in the average individual but is potentially dangerous and devastating for hypertensive patients, those with ischemic heart disease, cerebral pathology and susceptible respiratory tract.<sup>2</sup> This response can cause myocardial ischemia during the surgical period, cerebral vascular accident and acute heart failure.<sup>3</sup> There is an utmost requirement of hemodynamic stress response attenuator to compensate for the complication emerging

during laryngoscopy and intubation. Various pharmacological as well as non-pharmacological techniques have been carried out, like lidocaine, opioids, barbiturates, benzodiazepines, beta-blockers, calcium channel blockers, magnesium sulphate, vasodilators and topical agents.<sup>1</sup> Esmolol, a cardio-selective beta-adrenergic receptor blocker, can be an ideal pharmacological agent for such cases because of its rapid onset of action, ultra-short duration, no rebound phenomenon on withdrawal and no life-threatening adverse effect. Esmolol has been proven efficacious clinically in providing hemodynamic control during laryngoscopy and intubation without fatal side effects.<sup>2,3</sup> In this study, we evaluated the efficacy of three doses of esmolol in attenuating hemodynamic response to laryngoscopy and endotracheal intubation. It allows for identifying the dose-response relationship, assessing the efficacy of each dose, and evaluating the safety profile to minimise adverse effects.

## METHODS

This prospective, analytical, cross-sectional study was conducted in the Department of Anaesthesia and Critical Care at Nepalgunj Medical College after getting approval from the institutional review committee. The total duration for study was 6 months from approval from IRC. A total of 66 patients with ASA grading 1 and 2 belonging to age group 20-50 years of both sexes undergoing elective surgeries under general anaesthesia requiring laryngoscopy and endotracheal intubation were included in this study. Pregnant, morbidly obese, patients with severe hypertension, diabetes, ischemic heart disease, emergency surgery, patients under medication like beta-blockers, ASA 3 or more, unwilling and uncooperative patients, and intubation time more than 30 seconds, which were not included in the study. All patients were admitted and a thorough pre-anesthetic evaluation was done. Informed consent was obtained from all patients. All patients were given anxiolytic diazepam oral 5mg the night before surgery and kept nil per oral from midnight. Induction of anaesthesia was standard for all patients. Patients were connected to baseline monitors in the operating room, IV access was opened with an 18 g cannula, and IV fluids were started. Baseline parameters like pulse rate, systolic, diastolic, MAP and SpO<sub>2</sub> were recorded. Patients were randomly selected into three groups, with 22 in each group. For Group A, 0.5 mg/kg; Group B, 1mg/kg; and for Group C, 1.5 mg/kg of esmolol was given intravenously 2 mins before laryngoscopy and intubation.

Preoxygenation was done for 3 minutes with 100% oxygen. Fentanyl 2 mcg/kg was given 2 mins before induction. The study drug was prepared in a 10 ml syringe and given bolus over 15-25 seconds. Drugs were provided by an anaesthesiologist who was unaware of the study. No anticholinergic was given. The patient was induced with a titrating dose of propofol 2mg/kg and muscle relaxant succinylcholine 1.5mg/kg. After adequate muscle relaxation, direct laryngoscopy was done, and the patient was intubated with appropriate-sized cuffed endotracheal tubes within 15-30 seconds. Anaesthesia was maintained with oxygen, isoflurane, intermittent vecuronium bolus dose, and intermittent positive pressure ventilation. Heart rate, systolic BP, diastolic BP, and Mean arterial pressure were measured and recorded before premedication, after premedication, during intubation, after intubation and till 7 minutes after laryngoscopy and intubation. Bradycardia refers typically below 40 beats per minute. Hypotension was defined as fall in blood pressure by 30% from the baseline. Data entry was done in MS excel and SPSS version 28 was used for statistical analysis ANOVA test was utilised to determine the statistical analysis of data of three groups. The t-test is used to compare the mean values of continuous parameters like heart rate and blood pressure between groups. Demographic characteristics like gender was analyzed using Chi Square while age and BMI were compared using Kruskal Wallis test. P-value < 0.05 was considered statistically significant.

## RESULTS

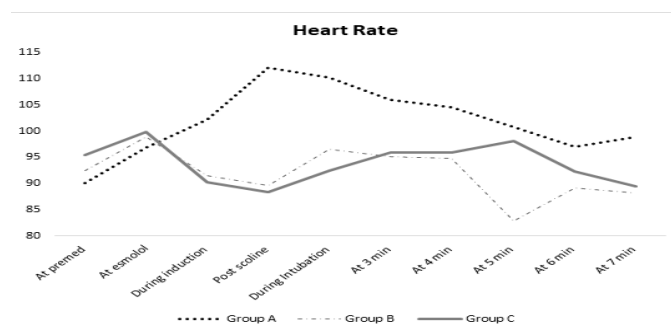
All three groups A, B and C, were comparable in terms of Age, Gender, and BMI. There was no statistically significant differ-

ence between the groups ( $p > 0.05$ ).

| Parameter |        | Group A | Group B | Group C | P-value |
|-----------|--------|---------|---------|---------|---------|
| Gender    | Male   | 12      | 14      | 11      | 0.078   |
|           | Female | 10      | 8       | 11      |         |
| Age       | 20-30  | 7       | 6       | 9       | 0.088   |
|           | 31-40  | 9       | 8       | 9       |         |
| BMI       | 19-24  | 18      | 20      | 16      | 0.068   |
|           | >24    | 4       | 4       | 8       |         |

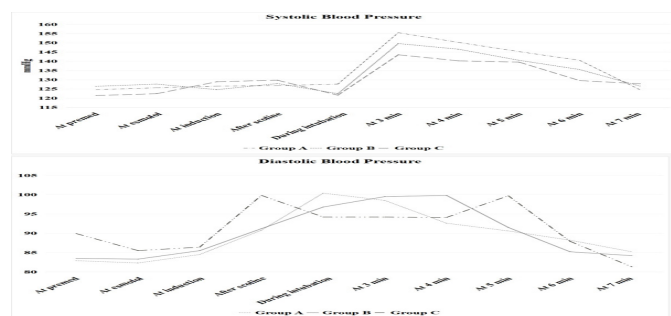
**Table 1: Demographic characteristics of the patients in each group**

The heart rate recorded for Groups A, B, and C showed significant differences ( $p$ -values < 0.05) at various stages (Figure 1). Group A consistently had higher heart rates, peaking at 110.4 post-succinylcholine and during intubation. Groups B and C had lower heart rates during induction and subsequent minutes. The significant  $p$ -values highlight notable differences among the groups, especially post-choline and during intubation.



**Figure 1: Variation of heart rate in each group at different stages**

The systolic blood pressure data also demonstrated variations among the groups at different stages (Figure 2). Systolic pressure for Groups A, B, and C showed significant differences ( $p$ -values < 0.05). Group A consistently had higher systolic pressure, peaking at 155.5 at 3 minutes post-intubation. Groups B and C had lower pressure, particularly during induction and at subsequent minutes. Diastolic pressure also varied, with Group C showing significantly higher pressure post-choline and during intubation.



**Figure 2: Variation of Systolic (above) and Diastolic Blood (below) Pressure in each group at different stage**

Table II represents patients' mean arterial pressure (MAP) in Groups A, B, and C measured at various time periods. The MAP data showed significant differences among Groups A, B, and C at multiple stages. No significant differences were observed at administering esmolol and premedication (p-values 0.081 and 0.455). Significant differences were noted after choline (p=0.021) and post-intubation (p<0.001). At 3-7 minutes post-intubation, MAP differences remained substantial (p-values 0.003 to <0.001), with Group A consistently having higher MAP values.

| Mean arterial pressure | Group A   | Group B   | Group C    | P value |
|------------------------|-----------|-----------|------------|---------|
| At esmolol             | 99.3±8.2  | 99.2±5.9  | 100.1±6.6  | 0.081   |
| At premed              | 97.2±7.5  | 99.2±6.2  | 102.5±10.2 | 0.455   |
| After Succinylcholine  | 103.6±7.2 | 98.6±8.9  | 96.2±19.9  | 0.021   |
| Post intubation        | 115.5±8   | 108.2±7.2 | 109.2±8.9  | <0.001  |
| During intubation      | 125.5±8.2 | 119.2±8.2 | 116.2±6.9  | <0.001  |
| At 3 min               | 121.5±8.2 | 119.2±6.9 | 111.2±5    | 0.003   |
| At 4 min               | 117.2±7.1 | 115.2±8   | 110.25±5   | <0.001  |
| At 5 min               | 115.2±7   | 106.2±6.6 | 108.5±7    | 0.004   |
| At 6 min               | 109.2±6.1 | 106.2±5.5 | 106.8±7.2  | 0.006   |
| At 7 min               | 105.7±6.2 | 107.2±5.9 | 100.00±4   | <0.001  |

**Table II: Mean Arterial Pressure of the patients in each group**

Table III represents the incidence of adverse events among patients in three groups. Adverse events included bradycardia (1 in Group C, p=0.527), hypotension (1 in Group C, p=0.871), nausea/vomiting (1 in Group B, 2 in Group C, p=0.812), headache (2 in Groups A and B, 1 in Group C, p=0.989), dizziness (1 in Groups A and B, 2 in Group C, p=0.726), and injection site reactions (1 in each group, p=0.613). No statistical significance among groups.

| Adverse Event           | Group A (n=22) | Group B (n=22) | Group C (n=22) | Total (n=66) | p-value |
|-------------------------|----------------|----------------|----------------|--------------|---------|
| Bradycardia             | 0              | 0              | 1              | 1            | 0.527   |
| Hypotension             | 0              | 0              | 1              | 1            | 0.871   |
| Nausea/Vomiting         | 0              | 1              | 2              | 3            | 0.812   |
| Headache                | 2              | 2              | 1              | 5            | 0.989   |
| Dizziness               | 1              | 1              | 2              | 4            | 0.726   |
| Injection Site Reaction | 1              | 1              | 1              | 3            | 0.613   |
| Total                   | 4              | 5              | 8              | 17           | 0.946   |

**Table III: Adverse Events of the patients in each group**

## DISCUSSION

Laryngoscopy and surgical stimulation commonly cause alteration in cardiac rhythm and pulse rate during different stages of anaesthesia.<sup>4</sup> Laryngoscopy and intubation cause some

physiological agitation, thus causing hypertension and tachycardia. This neuroendocrine reaction of the body can cause complications in patients with cardiac diseases like ST changes, ventricular arrhythmia, and pulmonary oedema because of a shift in the ratio between myocardial oxygen requirement and supply.<sup>3,5</sup> Within 2 mins of laryngoscopy and intubation the total autonomic balance (TAB) increases and usually returns to baseline within 5-10 mins.<sup>6</sup> To prevent increased blood pressure from direct laryngoscopy, the duration should be restricted to 15 seconds.<sup>7</sup> Nevertheless, the perfect inhibitor of this reflex is yet to be researched to suppress it completely. Strategies and chemicals have been applied in one way or another with different levels of effectiveness to the mentioned aim. The potential of esmolol for ultra-quick action to hinder hemodynamic stress responses is ideal for countering laryngoscopy and intubation complications. Feng et al explained the usefulness of esmolol bolus injection in preventing and limiting heart rate cardiac output, as well as systolic pressure increases.<sup>8</sup> Similarly, a study done by D Wiest on Esmolol's therapeutic efficacy and pharmacokinetic characteristics in obtunding stress response to laryngoscopy and intubation concluded that the pharmacokinetic profile of esmolol allows the drugs to provide rapid pharmacological control and minimize the potential for profound adverse effect. Bolus dose of 100-200mg effectively attenuates the adrenergic response associated with tracheal intubation.<sup>9</sup>

A study conducted by Vucovic et al for the efficacy of esmolol in attenuating cardiovascular response related to laryngoscopy and tracheal intubation discovered that patients who had esmolol administered 2 minutes before intubation exhibited a significantly decreased pressor response to laryngoscopy corresponding to our administration timing of drugs.<sup>10</sup> Similar studies done by Mulimani SM et al have shown that Inj. Esmolol given 2 min before intubation has a good response in attenuating the laryngoscopy response.<sup>11</sup> In this study, Groups A, B, and C were comparable in age, gender, and BMI with no significant differences (p > 0.05). However, significant differences were observed in cardiovascular responses, specifically heart rate, systolic blood pressure, and mean arterial pressure (MAP). Group A had higher heart rate and systolic blood pressure, particularly post-succinylcholine and during intubation, with significant differences at various stages (p < 0.05). Group A also had higher MAP post-intubation. No significant differences were found in adverse events such as bradycardia, hypotension, nausea, headache, dizziness, and injection site reactions across the groups (p > 0.05). The study demonstrated significant cardiovascular variations in response to esmolol doses, but adverse effects were similar across groups. The 1 mg/kg dose showed higher heart rate and blood pressure than the other doses, with post-intubation MAP of 115.5 ± 8 mmHg, indicating limited control of blood pressure. The 1 mg/kg dose was safe but less effective in controlling hemodynamic stress. The 1.5 mg/kg dose provided the most effective reduction in heart rate and blood pressure, with post-intubation MAP of 109.2 ± 8.9 mmHg, and minimal adverse effects, making it the most potent and safest option for hemodynamic control. A similar study by Rathore A et al concluded that to blunt both the pulse rate and systolic blood pressure response of laryn-

gосcopy and intubation, a higher dose is used, where they used 50mgs,100mgs and 150mgs. However, they showed that higher doses tend to have adverse effects in a few individuals, so one must be cautious while using higher doses.<sup>12</sup>

Raghavan L and Basker N investigated how alternating doses of esmolol influence reduction in hemodynamic stress response during laryngoscopy plus endotracheal intubation; the finding showed that the ultimate dose of 1.5 mg/kg functioned effectively in mitigating hemodynamic response lacking significant adverse effect when compared to lower doses which are similar to our study.<sup>5</sup> Jagadeesh GM and. Dutta PK did a study in different centres, comparing three doses of esmolol. They concluded that Esmolol 1.5mg/kg as a safe dose of esmolol in obtunding the heart rate and blood pressure change to laryngoscopy; our result is similar to their result concerning heart rate, systolic blood pressure, diastolic pressure, mean arterial pressure. Still, neither of them compared the adverse effect, but we compared the adverse impact, which is insignificant.<sup>13-14</sup>

In our study, the complete analysis revealed that intravenous Esmolol 1.5 mg/kg was more effective in attenuating the heart rate response and blood pressure changes accompanying laryngoscopy and intubation. This study offers insight into the administration of esmolol in surgical patients requiring laryngoscopy and intubation, particularly its dosing regimen for managing hemodynamic response during crucial patients, which will be an addition to improving anaesthesia practice and patient safety.

## LIMITATIONS

This study had a small sample size. Future studies should contain a larger sample size. For beat-to-beat blood pressure measurement, invasive blood pressure monitoring was not done.

## CONCLUSION

This study showed that it is better to choose Esmolol 1.5 mg/kg in managing hemodynamic stress response during laryngoscopy and endotracheal intubation than the other two doses. Future research should explore the underlying mechanisms driving these cardiovascular responses and investigate the potential long-term effects of the interventions.

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# Histopathological Analysis of the Product of Conception Following First Trimester Abortion; Is There a Diagnostic Value?

Tiwari A, Karki A, Khanal A, Sapkota P

## ABSTRACT

**Introduction:** Abortion is one of the most common problems faced by women of reproductive age group in Nepal. The most common complication associated with abortion is Retained Product of Conception. Histopathology is the confirmatory diagnostic test for the confirmation of intrauterine pregnancy and associated gestational trophoblastic neoplasm. **Aims:** To evaluate the value of histopathological examination of products of conception in first trimester abortion. **Methods:** A hospital based descriptive cross sectional study conducted from June 2021 to May 2023, among the women admitted with diagnosis of first trimester abortion at Lumbini Medical College and Teaching Hospital. **Results:** Among 89 cases of abortions, incomplete abortion was the commonest type constituting 83.1% of the studied group. The majority of participants belonged to age group of 21-30 years (49.4%) with a mean age of  $28.64 \pm 12.7$  years. Histopathologic examination confirmed products of conception in 54 (60%) patients, partial molar pregnancy in 7 (7.86%) patients, decidual reaction in 4 (4.49%) patients, complete mole in 1 (1.12%) patient and hydropic abortus in 12 (13.48%) patients. **Conclusion:** The histopathological examination of the products of conception proved to be an important tool in confirming intrauterine pregnancy and to find out possible pathologies associated with product of uterine evacuation like molar pregnancy and hydropic changes that necessitate special follow-up and further management.

**Keywords:** Abortion, Histopathology, Hydropic changes, Molar pregnancy

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## INTRODUCTION

According to the World Health Organization (WHO), spontaneous abortion refers to the expulsion or extraction of a fetus or embryo weighing 500 g or less from its mother before the fetus has reached a viable gestational age.<sup>1</sup> It is the most common complication of pregnancy and more than 80% of spontaneous abortion occurs in the first 12 weeks.<sup>2</sup> The abortion can be classified as spontaneous and induced, moreover, spontaneous abortion can further be classified as threatened, inevitable, complete, incomplete, missed, and septic abortion.<sup>3</sup> The pathology of spontaneous abortions is therefore an important aspect necessary for understanding the etiology and pathogenesis of the abortion.<sup>4</sup> The most common problems associated with bleeding in first-trimester pregnancy are abortion, ectopic pregnancy, and molar pregnancies.<sup>5</sup> These conditions are not clinically differentiated if conceptus tissue is not sent for histopathological examination (HPE).

If the molar pregnancies are missed, this would lead to prolonged follow-up and serious implications on maternal health. The main reasons for doing a routine histopathological examination for the product of conception are: to prove the presence of an intrauterine gestation and to exclude undiagnosed gestational trophoblastic disease in the form of partial or complete hydatidiform mole.<sup>6</sup> In addition, it is often hoped especially in the clinical setting of recurrent spontaneous miscarriage, that further diagnostic information explaining the underlying cause of the pregnancy loss may be obtained from such examination.<sup>7</sup> This study aimed to assess the role of histopathology in cases of first trimester miscarriages and to determine clinical relevance of histopathological examination following surgical evacuation.<sup>5</sup>

## METHODS

This was a retrospective study done in Lumbini Medical

College and Teaching Hospital. Total 89 cases collected from purposive sampling with the diagnosis of first-trimester abortion from June 2021 to May 2022, were included. The products of conception were received in 10% formalin at the Department of Pathology. After the gross examination of the specimen, tissue processing was done using an automatic tissue processor. Specimens were processed and embedded in paraffin wax. The sections of 3-5 micrometer thickness were obtained and stained with Haematoxylin & Eosin. All slides were examined and interpreted by a team of authors.

### Inclusion criteria

Female patients of child bearing age 15 to 50 years with a history of incomplete abortion who underwent uterine evacuation in the first trimester.

### Exclusion criteria

Improperly fixed specimens and ectopic pregnancy products.

### Statistical analysis

Data was analyzed using Microsoft excel and IBM SPSS statistics software 30.0. Data was collected and presented as frequency and percentages tables. Mean and standard deviation was calculated as per the requirement.

## RESULTS

### Age group distribution

The patient age in the study ranges from 15-50 years with a mean age of (28.64 ± 12.7). The age group 20-30 years was the most frequently affected 44 (49.4%) followed by the age group of 30- 40 years 29 (32.6%). The age group of 40-50 years was least affected 5 (5.6%) followed by the age group of 15 to 20 years which were 11 (12.4%) (Table I).

| Maternal age | Frequency     | Percentage (%) |
|--------------|---------------|----------------|
| 15 to 20 yrs | 11            | 12.4%          |
| 20-30 years  | 44            | 49.4%          |
| 30-40 years  | 29            | 32.6%          |
| 40-50 years  | 5             | 5.6%           |
| Total        | 89            |                |
| Minimum age  | 15            |                |
| Maximum Age  | 46            |                |
| Mean ±SD     | 28.64 ± 12.7% |                |

**Table I: Distribution of cases as per age**

### Period of Gestation

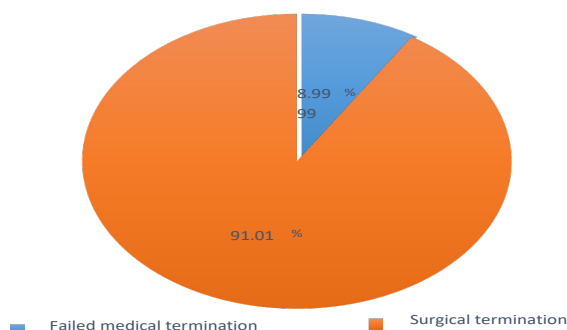
In the present study, uterine evacuation was performed for different periods of gestation, mean period of gestation was found to be 8.8 with ±1.72 standard deviation. It was found that 34 (38.2%) abortions had occurred between periods of 8 to 10 weeks of gestation whereas the least cases 4 (4.49%) observed during the period less than 6 weeks. (Table II)

| Period of Gestation | Frequency | Percentage |
|---------------------|-----------|------------|
| Less than 6 weeks   | 4         | 4.49%      |
| 6 to 8 weeks        | 25        | 28.09%     |
| 8 to 10 weeks       | 34        | 38.20%     |
| 10 -12 weeks        | 26        | 29.21%     |
| Total               | 89        |            |
| Mean ±SD            | 8.8 ±1.72 |            |

**Table II: Distribution as per period of gestation**

### Types of termination

In the present study, pregnancy termination was done by various methods. It was found that 81 (91.01 %) of patients had surgical termination. Failed medical termination was recorded to be 8 (8.99%).



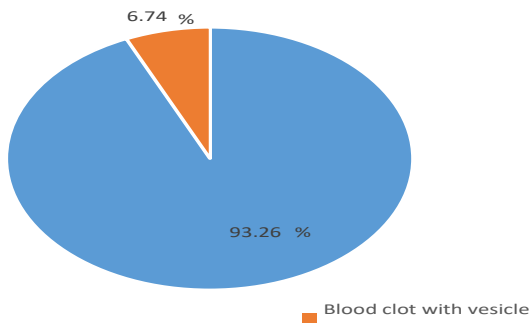
**Figure 1: Distribution of cases as per termination**

### Gross Appearance of products of conception

The present study revealed that blood clots with villi 83 (93.26%) followed by the least number of blood clot with vesicle 6 (6.747%). Fetal parts were not identified in any cases (Figure 2).



**Illustration 1: Decidualised tissue with blood clots and vesicles**



**Figure 2: Distribution of cases as per gross appearance of POC**

### Microscopic finding

All 89 cases were evaluated by visualization under the microscope and 10 cases were found to have absent villi so, 79 cases of villi were studied as below:

### Morphological features in villi

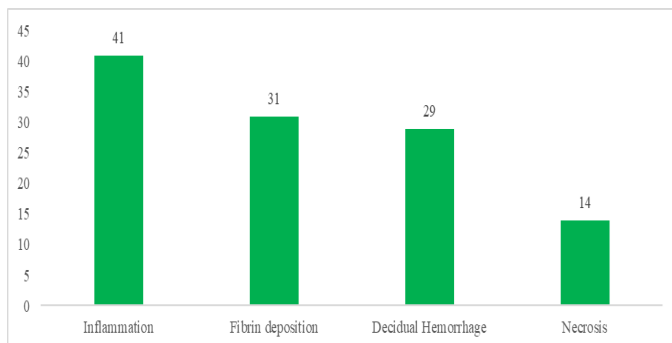
Out of 79 villi cases studied separately for other morphological features, 66 (83.5%) hemorrhages were found followed by hydropic changes in villi 37 (46.83%), perivillous fibrin deposition in 72.15%, and the least was cistern formation in 4 (4.49%). (Table III).

| Other morphological features in villi | Frequency | Percentage |
|---------------------------------------|-----------|------------|
| Hemorrhages                           | 66        | 83.5%      |
| Perivillous fibrin deposition         | 57        | 72.15%     |
| Hydropic changes                      | 37        | 46.83%     |
| Cistern formation                     | 4         | 4.49%      |

**Table III: Distribution of cases as per other morphological features in villi**

### Histopathological changes in decidua

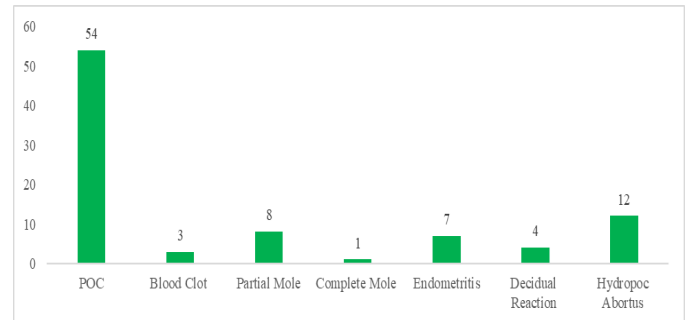
While analyzing the histopathological changes in 89 cases separately. Inflammation, fibrin deposition, and hemorrhages were found to be in 41 (46%), 31 (34.8%) cases, and 29 (32.5%) respectively whereas necrosis was found to be in 14 (15.7%) cases least in the study.



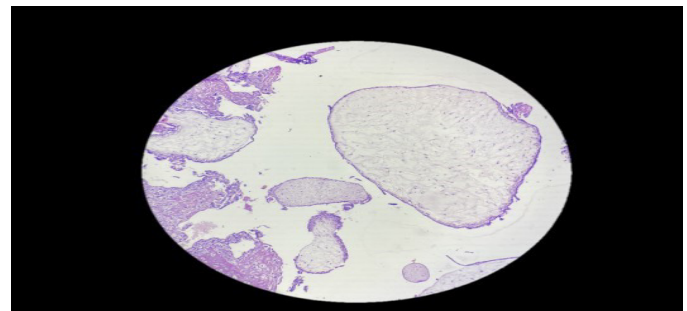
**Figure 3: Distribution of cases showing the histopathological changes in decidua**

### Histopathological Diagnosis

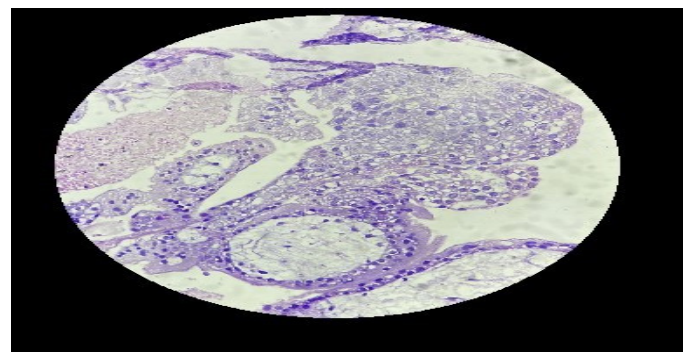
Out of 89 cases, the majority 54 (60.67%) specimens showed features consistent with the product of conception, 12 (13.48%) cases had features of hydropic abortus, 8 (8.98%) cases had partial mole, 7 (7.86%) cases had endometritis, 4 (4.49%) cases had a decidual reaction and 1 (1.12%) cases showed features with complete mole. There were 3 (3.37%) cases only with blood clot.



**Figure 4: Distribution of cases as per histopathological diagnosis**



**Illustration 2: Hydropic Villi**



**Illustration 3: Trophoblastic Proliferation**

### DISCUSSION

The products of conception which are passed during abortion following uterine evacuation should be subjected to HPE to confirm the intrauterine pregnancy and to diagnose the gestational trophoblastic disease that requires immediate

treatment or long-term follow-up.<sup>8</sup>

In the present retrospective study of duration 12 months. It was found that the mean age at the time of abortion was 28.64 years with a standard deviation of  $\pm 12.7$ . The minimum age was 15 years and the maximum 50 years. The majority of women belong to the age group 21-30 years 49.4% while only 5.6% were 41-50 years which is concordant with Makaju et al, Heena Iqbal et al, Vidhyasagar et al, Thirkumar M et al.<sup>1,9-11</sup> In the present study, the majority of patients (83.1%) were admitted with a diagnosis of incomplete abortion. This is in agreement with a study conducted by Lama et al, Rashid et al and Thapa et al, which also revealed incomplete abortion in the majority.<sup>2, 7, 12</sup>

Similarly, the study also revealed that villous hydropic changes were of 46.83%, hemorrhages at 83.5%, perivillous fibrin deposition at 72.15%, and cistern formation at 4.49% were identified which in contrast to the study of Shilpa et al.<sup>2</sup>

Moreover, the study revealed that inflammation and fibrin deposition in decidua are the major findings comprising 41.4% and 29.7% respectively which is similar to the study done by Makaju et al and Sarin et al<sup>1, 13</sup> which showed inflammation in 41.1% and fibrin deposition in 75% cases respectively. Our study revealed 46% of haemorrhages and 34% of fibrin in decidua. A study done by Fram K et al<sup>14</sup> states that the majority of cases (91%) went surgical evacuation for the termination of pregnancy which is concordant with the present study where 81 (91%) went surgical evacuation.

In the study conducted by Vidhyasagar et al, histopathological examination of specimens was performed in 190 cases.<sup>9</sup> Majority of these (123 - 64.74%) specimens showed features consistent with products of conception, 9(4.74%) cases had features of infected products of conception, 12(6.32%) cases had features of decidua, 13(6.84%) cases had features of infected decidua and 8(4.2%) cases showed features of decidua with endometrial glands. There were 23(12.1%) specimens which did not show any feature related to pregnancy. In contrast to that study, current study reveals the product of conception, 12(13.48%) cases had features of hydropic abortus, 8(8.98%) had partial mole, 7(7.86%) cases had endometritis, 4(4.49%) cases had decidual reaction and 1(1.12%) cases showed features with complete mole and 3(3.37%) cases were found to have blood clot.

Tasci et al found that uterine evacuation was performed in cases of incomplete miscarriage (n = 970, 60.4%), missed miscarriage (n = 406, 25.2%) and anembryonic miscarriage (n = 230, 14.3%). Histopathologic examination revealed the product of conception in 1,119 patients (69.7%) while partial hydatidiform mole was diagnosed in 33 patients (2.1%). The complete hydatidiform mole was detected in only seven cases (0.43%). Exaggerated placental site and placental site trophoblastic nodule was detected in two cases (0.12%). Decidual tissue without chorionic villi was reported in 272 patients (16.9%) raising the suspicion of the presence of other pathology.<sup>15</sup>

A study done by Nogueira et al stated that grossly, first-trimes-

ter specimens consisted of blood clots admixed with minimal decidua and fragmented villous tissue.<sup>16</sup> In the present study on gross examination, blood clot with villi was seen in 93.25% and blood clot with vesicle 6.74%. Ernst et al however, support the idea that careful pathologic examination of Dilation and Evacuation specimens can identify significant fetal and placental changes that can confirm clinical diagnoses, provide a conclusive diagnosis from clinical differential diagnostic lists, help explain the cause of IUFD, and identify unexpected anomalies that may provide additional clues to a diagnostic syndrome or mechanism of anomaly formation. Since family planning, genetic counseling, and bereavement treatment may all be affected, proper study of D&E specimens may have an impact on therapeutic care.<sup>17</sup>

The histological report of the 1, 576 women studied by Heath et al confirmed that 1,465 (93%) of the women had obtained the products of conception; in two other women (0.13%), molar changes were reported, supporting the ultrasound preoperative diagnosis. In 0.5% of medical terminations, 5% of surgical terminations, 10% of evacuations following an earlier evacuation, 12% of evacuations for a failed pregnancy and 19% of evacuations for an incomplete miscarriage, the products of conception were not confirmed in the tissue specimens. Decidua was recorded in 87 women (6%), two of whom had undergone evacuation for an ultrasound diagnosis of spontaneous miscarriage; nevertheless, in both cases, a tubal ectopic pregnancy was later discovered.<sup>8</sup>

Alsibiani et al evaluated the medical records of all 558 patients with a diagnosis of first-trimester miscarriage. A histopathologic examination revealed fetal products in 537 (96.2%) of the patients, no fetal products in 17(3%) of the patients, molar pregnancy in 2(0.4%) of the patients, and decidual tissues devoid of chorionic villi (Arias-Stella reaction) in 2(0.4%) of the patients. Only one unsuspected partial molar pregnancy was identified after clinical correlation by histopathology testing.<sup>18</sup>

Diagnoses for villitis and trophoblastic proliferative illness, according to Novak et al can only be determined through histologic examination. Histology or histology-based diagnostic approaches may become more crucial if more non-chromosomal causes of recurrent abortion are identified.<sup>19</sup>

## LIMITATIONS

This study is based only on patients admitted to Lumbini Medical College Teaching Hospital with limited time frame and small sample size and cytogenetic studies are not carried out due to lack of ability and patient cooperation. The diagnosis was based solely on histopathological examination.

## CONCLUSION

This study provides insight into detection of gestational trophoblastic neoplasm in suspected molar pregnancy and for the detection of non-molar hydropic abortus. Therefore, we conclude that histopathology examination of any available POC following first trimester abortion is mandatory, which is

crucial in predicting future chances of abortion and transformation into other gestational trophoblastic neoplasm.

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# Comparison of Tubeless Mini Percutaneous Nephrolithotomy and With Tubed Mini Percutaneous Nephrolithotomy for Kidney Stones: A Prospective Study

Shah RS<sup>1</sup>, Mishra K<sup>1</sup>, Sah S<sup>1</sup>, Karn P<sup>1</sup>, Thapa N<sup>2</sup>

## ABSTRACT

**Introduction:** Renal stone disease is a prevalent condition with a high recurrence rate, significantly impacting patients' quality of life. Different modalities of renal surgery are using globally. Mini Percutaneous nephrolithotomy (PCNL) is an effective treatment for renal stones. Due to the significant pain and morbidity after Percutaneous nephrolithotomy because of nephrostomy tubes, various modifications of Percutaneous nephrolithotomy are being performed. **Aims:** To compare the safety and efficacy of tubeless mini Percutaneous nephrolithotomy against tubed mini Percutaneous nephrolithotomy. **Methods:** It is prospective Hospital study conducted from July 2021 to December 2022 at Nobel Medical College. total 100 patients under inclusion criteria were divided into two groups: 50 in Group A (tubed mini Percutaneous nephrolithotomy) and 50 in Group B (tubeless mini Percutaneous nephrolithotomy) alternatively. The 2 groups were compared for Clavien Dindo grading of complications in Percutaneous nephrolithotomy analgesic requirements, hospital stay and time of operative procedure. Data was analysed by using the chi-square test for qualitative variables and the student t test for quantitative variables. A P value 0.05 was considered significant. Ethical clearance was obtained from institutional review committee. **Results:** The mean age was similar between groups (Group A: 35.44 years; Group B: 36.26 years). Complications were comparable, with postoperative pyrexia being the most common in both groups. However, Group B demonstrated significantly shorter hospital stays (80% discharged within 2 days vs. 30% in Group A) and lower analgesic requirements ( $p < 0.05$ ). **Conclusion:** Tubeless mini Percutaneous nephrolithotomy is a safe and effective alternative for selected patients, offering reduced hospital stays and lower analgesic needs compared to tubed mini Percutaneous nephrolithotomy.

**Keywords:** Renal stones, Tubed mini Percutaneous nephrolithotomy, Tubeless

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## INTRODUCTION

Renal stone disease is a persistent medical disorder with a recurrence rate of around 50%, and consequently has a significant influence on health-related quality of life.<sup>1</sup> Among different modalities of treatment, Percutaneous nephrolithotomy (PCNL) has become gold standard for management of simple and complex renal stones with success rates more than 90%.<sup>2,3</sup> Since the introduction of PCNL, different modifications have been made. Amongst which mini PCNL has been found to provide excellent surgical outcomes with reduced complications.<sup>4</sup> Initially, Chan and Jarrett reported a mini PCNL in 17 patients in whom the tract was dilated up to 13F.<sup>5</sup> These investigators

have reported that by using a mini PCNL, the morbidity was significantly reduced. Until 1997, when Bellman and co-workers reported tubeless PCNL, a nephrostomy tube had been placed routinely to reduce urinary extravasation, to provide tamponade to achieve haemostasis, and to deal with residual calculi, if any.<sup>6</sup> In mini PCNL, whether to place a nephrostomy tube or perform tubeless mini PCNL is an ongoing matter of debate. Recently, the study by Gupta DK et al in 2018 showed added advantage of significantly reduced postoperative pain, less analgesic requirement, shorter hospital stay, less postoperative blood loss mini tubeless PCNL in selected cases.<sup>7</sup> The rationale of the study is to evaluate efficacy and safety of tubeless mini PCNL in our setting.

## METHODS

A total of 100 patients who underwent mini PCNL in Department of Urology, Nobel medical college Nepal, from July 2022 to December 2022 were included in this prospective study. Ethical clearance was obtained from Institutional Review Committee. Patient aged above 16 with solitary stone less than 3 cm were included in study. Those patients who needed more than one percutaneous tract or in whom significant intraoperative bleeding was observed or in whom excessive manipulation at the ureteropelvic junction was done or phad to be excluded from study. Out of 100 patients, Nephrostomy tube was kept in every alternate case. Patients who underwent standard mini PCNL with ureteric stent and Nephrostomy tube were grouped as Group A while patient who underwent mini tubeless mini PCNL with only ureteric stent were labelled as Group B.

In patients who needed bilateral PCNL, the priority to the kidney was given in following order: Infected obstructed, more symptomatic side, and technically easier side. Preoperatively, patients were evaluated by urinalysis, tests for renal function and ultrasonography, plain radiography of the kidneys, ureters, and bladder (KUB) and CT urography when needed. A prophylactic antibiotic was administered to all patients. The procedure was performed under subarachnoid block. With the patient in the lithotomy position, a ureteral access catheter was placed in the ipsilateral PCS. A 14 Fr Foley catheter was then placed and fixed to the ureteral access catheter with paper tape. The patient was then placed in the prone position, with all the pressure points well padded. The PCS was defined using retrograde contrast.

The Percutaneous approach to the stone was achieved, under fluoroscopic guidance, by a transpapillary puncture in the superior, middle, or lower calyx. A small incision was made at the selected puncture site. Once the needle was in the calix, clear urine could be aspirated for confirmation. Once the correct position of the needle was confirmed, a straight-tip .038-inch guidewire was passed in the PCS, and the tract was dilated over this guidewire up to 18Fr by telescoping metal dilators. An 18 Fr Amplatz sheath was secured in the tract. The stone was fragmented by a Pneumatic Lithoclast and removed by forceps or suction. In patients with staghorn calculi, fragmentation was started at the peripheral part of the stone to clear the passage. Stones that blocked the UPJ were broken last to prevent fragments passing into the ureter. After completion of the procedure, the ureteral access catheter was removed and placement of a Double-J tip catheter was done in all cases. Finally, a 16 Fr nephrostomy tube was placed in all patients in group A. The skin was closed by taking deep sutures after the procedure. Per operative and post-operative complications were recorded. Patient was rendered stone free once it was not visible in plain X-ray KUB done in post-operative day 1. Post-operative pain was assessed using the Visual Analogue Scale Score. For pain management, all patients were given intravenous dose of Paracetamol 1gm 8 hourly and Ketorolac as when required. Nephrostomy tubes were taken out on subsequent post operative days in Group A after clinical judgement. Post operative complications were graded as per CD grades (table I).

Patients were followed up to 1 month and ureteric stents were removed on POD30. Variables such as mean operative time, complications, drop in Hb, analgesic requirement, hospital stay were compared in two groups.

| Grades | Complications                                                                                     |
|--------|---------------------------------------------------------------------------------------------------|
| I      | Fever, transient elevation of Creatinine, atelectasis, pleural effusion                           |
| II     | Peri tubal urinary leak, blood transfusion, pneumonia                                             |
| IIIa   | Angioembolization, chest tube placement, retention due to clots, dislodgement of nephrostomy tube |
| IIIb   | Collecting system perforation, urethral stricture                                                 |
| IVa    | Bowel injury, Nephrectomy                                                                         |
| IVb    | Sepsis                                                                                            |
| V      | Death                                                                                             |

**Table I: Clavien Dindo grading of complications in PCNL<sup>8</sup>**

## Statistical analysis

Statistical analysis was performed by using the chi-square test for qualitative variables and the student t test for quantitative variables. A P value 0.05 was considered significant.

## RESULTS

Mean age of tubed mini PCNL (Group A) was 35.44yrs with M/F ratio of 1.1, whereas mean age was 36.26yrs in tubeless mini PCNL (group B) with M/F ratio of 1.2 (table II). Preoperative Hb and stone size were not significantly different in either group. Mean operative time, drop in haemoglobin and grades of complications in both groups were comparable (table III). In tubed mini PCNL group, post operative pyrexia 26% (13) was the most common complication followed by retention due to clots 8% (4), dislodgement of tube 8% (4), peritubal leak 6% (3), blood transfusion 4% (2). While in tubeless mini PCNL group, postoperative pyrexia was seen in 28% (14) followed by retention due to clots in 12%(6) and blood transfusion was required in 6% (3). However, hospital stay and analgesic requirements were significantly lower in Group B. Majority of patients 64% (32) required more than 60 mg of inj. Ketorolac in tubed mini PCNL group while only 20% (10) of patients in tubeless mini PCNL group required more than 60 mg of inj. Ketorolac. Similarly, 80% (40) of patients in tubeless mini PCNL group were discharged within 2 days while only 30% (15) of patients in tubed mini PCNL were discharged within 2 days which was statistically significant.

| Parameters              | Group A<br>(tubed PCNL) | Group B<br>(tubeless<br>mini PCNL) | P<br>value |
|-------------------------|-------------------------|------------------------------------|------------|
| Mean age (yrs)          | 35.44                   | 36.26                              | >0.05      |
| Gender (M/F ratio)      | 1.1                     | 1.2                                | >0.05      |
| Preoperative Hb (gm/dl) | 12.89                   | 13.28                              | >0.05      |
| Stone size (mm)         | 20.38                   | 23.62                              | >0.05      |

**Table II: Patient Demographic profile**

| Parameters                           | Group A<br>(tubed mini<br>PCNL) | Group B<br>(tubeless<br>mini PCNL) | P<br>value |
|--------------------------------------|---------------------------------|------------------------------------|------------|
| Mean operative time<br>(min)         | 25.5                            | 24.6                               | >0.05      |
| Analgesic requirement<br>(ketorolac) |                                 |                                    | <0.05      |
| <=60mg                               | 18 (36%)                        | 40 (80%)                           |            |
| >60mg                                | 32 (64%)                        | 10 (20%)                           |            |
| Complications                        |                                 |                                    | >0.05      |
| Grade 1                              | 13 (26%)                        | 14 (28%)                           |            |
| Grade 2                              | 5 (10%)                         | 3 (6%)                             |            |
| Grade 3                              | 8 (16%)                         | 6 (12%)                            |            |
| Grade 4                              | 0                               | 0                                  |            |
| Grade 5                              | 0                               | 0                                  |            |
| Hospital stays (days)                |                                 |                                    | <0.05      |
| 0-2 days                             | 15                              | 40                                 |            |
| >2 days                              | 35                              | 10                                 |            |

Table III: Results

## DISCUSSION

As the result suggests, tubeless mini PCNL is as safe and effective as tubed mini PCNL. We observed complications comparable in both groups. However analgesic requirement and hospital stay were significantly lower in tubeless PCNL group.

Similar study was conducted by Feng et al, in 2001 concluded the tubeless PCN population required less morphine use, had a decreased length of hospitalization, and had a smaller total procedural cost compared with the other two groups.<sup>9</sup>

Desai et al in 2004, performed meta-analysis of 15 RCTs involving 947 subjects comparing standard and tubeless PCNL and concluded postoperative pain, analgesia, hospital stay, and urine leakage was significantly reduced in tubeless PCNL group.<sup>10</sup> In respect of drop in haemoglobin, stone free, blood transfusion and pyrexia, tubeless PCNL group appeared to be equivalent with PCNL with tube group. Tubeless PCNL technology is associated with shorter hospitalization time, lower incidence of postoperative pain and less analgesia requirement after nephrolithotomy and they recommended tubeless PCNL to be used as a substitute for traditional PCNL with tube of the first-line treatment.

Furthermore, Aghamir and associates in 2004 reported the concept of totally tubeless PCNL i.e., PCNL without nephrostomy tube and ureteric stent.<sup>11</sup> They performed totally tubeless PCNL in 43 patients and compared it with tubed PCNL. The hospital stay was shorter and the major advantage for patients undergoing totally tubeless PCNL was the absence of stent-related flank pain and dysuria. However, we used an 6F DJ stent for drainage in both mini tubeless group and tubed mini PCNL group.

In a similar study, Shah and co-workers in 2005 reported the safety and effectiveness of simultaneous bilateral tubeless PCNL in 10 patients.<sup>12</sup> The investigators reported that the difference in the mean drop in haemoglobin, transfusion requirement, and complication rate was not statistically significant in patients undergoing tubeless PCNL in comparison with the tube placed group, but the mean hospital stay of the tubeless group was 20 hours less than that of the tubed PCNL group, although this was not significant.

Similarly in another article published by Merchant and co-workers in 2011, the patients in the tubeless group had a shorter hospital stay (3.7 vs. 5.8 days;  $P < 0.001$ ), and less postoperative pain at postoperative days 2 and 3 ( $P < 0.001$ ).<sup>13</sup> No significant difference in bleeding or leakage complications was observed. This study also supports the feasibility and safety of tubeless PCNL in a selected group of the patients, suggesting some intraoperative criteria to be considered when performing it.

In another study conducted by Lu et al in 2012 in mini PCNL, the two groups had similar age, maximum stone diameter and gender distribution.<sup>4</sup> There were no significant differences in operation time, presence of postoperative fever, stone clearance, and level of postoperative serum hemoglobin. However, the tubeless mini PCNL group had significantly shorter hospital stays (3 vs. 4 days,  $p = 0.032$ ) and significantly less back pain (5 patients vs. 14 patients,  $p = 0.003$ ) than the conventional mini PCNL group. Thus, reassuring safety and efficacy of tubeless PCNL even in mini PCNL.

In another study by Sebaey et al in 2016 where they compared tubeless and tubed PCNL, they found there was no statistically significant difference between the two groups for the mean operative time, mean postoperative drop in haemoglobin, mean postoperative urine leakage, mean hospital stay, and stone-free rate.<sup>14</sup> The mean (SD) postoperative dose of analgesia was statistically significantly higher in the tubed PCNL group compared with the Tubeless mini PCNL group, at 112.5 (48.03) versus 48.8 (43.5) mg, respectively. In study by Gupta DK et al in 2018, they found shorter hospital stay and lower analgesic requirement in tubeless mini PCNL.<sup>7</sup> However, they also observed significant drop in haemoglobin in tubed mini PCNL which was not seen in our study.

Hence, we can appreciate the fact that, even in mini PCNL, Tubeless PCNL has overtaken tubed PCNL with regards to safety and efficacy. Superior caliceal access gives the best clearance by a single tract, because the posterior superior calix provides direct access to the renal pelvis, upper pole calices, lower pole calices, and the upper ureter. The disadvantage is the associated pleural and chest complications. Because of the above complications, a nephrostomy tube is almost always recommended in supracostal superior caliceal tracts. In the study by Shah and co-workers, they reported the safety and effectiveness of tubeless PCNL in supracostal superior caliceal punctures.<sup>12</sup> In our study we performed supracostal puncture in 15 cases of tubeless mini PCNL group and 18 cases in tubed PCNL, however there were no thoracic complications in our study.

## LIMITATIONS

Since this is a single centre study, a multicentre study at a larger scale is required. The expenditure and complications of both interventions were not considered.

## CONCLUSION

Tubeless mini PCNL is safe and effective in a selected group of patients. It has significantly shorter hospital stay and less post-operative analgesic requirement in comparison with tubed mini PCNL.

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# Assessment of Knowledge about First Aid, Diagnosis and Prevention of Snake Bite among Medical Students: A Cross Sectional Study

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## ABSTRACT

**Introduction:** Snakebite is a global health problem and important medical emergency encountered in many parts of the world with considerable morbidity and mortality. Knowledge and awareness about snake bite directly impacts outcome. **Aims:** To assess the knowledge about first aid, diagnosis and prevention of snake bite among medical students. **Methods:** A cross sectional study was conducted among the MBBS students of Nepalgunj Medical College. Semi-structured questionnaires were used to assess the knowledge about first aid, diagnosis and prevention of snake bite among medical students of both non-clinical and clinical group. **Results:** Total students enrolled were 321. Among them 230 (71.7%) were male and 91 (28.3%) were female with male preponderance. Majority of students belonged to clinical level 61.4% as compared to non-clinical 38.6%. Regarding first aid knowledge, majority of clinical students responds correctly as compared to non-clinical. Clinical diagnosis of snake on the basis of recognizing signs and symptoms, both clinical and non-clinical groups had satisfactory response. Similarly regarding preventive measures, results showed majority of the students from both the groups were aware about preventive measures against snake bite. **Conclusion:** Both clinical and non-clinical students have adequate knowledge regarding clinical diagnosis and preventive measures against snake bite but first aid knowledge was more among clinical students. Integrating snake bite topic from early non-clinical stage will positively reflect on the care for snakebite victims.

**Keywords:** First aid, Knowledge, Medical students, Prevention, Snake bite

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## INTRODUCTION

Snakebites are emergent and life-threatening injuries that may require intensive care. The annual number of snakebites around the globe is estimated to be around 1.2-5.5 million. Of this, 81-95% occur in tropical regions of South Asia, South-East Asia, Sub-Saharan Africa and Latin America.<sup>1</sup> It mostly affects the farmers and those who work in the fields and thus one of the occupational injury. The public health issues of snakebite is neglected globally and it has only been added to WHO's list of neglected tropical diseases in June 2017.<sup>2</sup> In Nepal, 80% of the snakebite deaths occurred either in villages or during transport to the health care facility.<sup>3</sup> These observations highlight an urgent need to understand the healthcare seeking behavior of the community for snakebites. Inappropriate perception, the practice of unproven traditional methods and inadequate knowledge about snakes and snakebites may increase mortality due to snakebite envenoming.<sup>4,5</sup> However, most of these

deaths are preventable, and hence community awareness is crucial. This study focused on the assessment of the level of knowledge on first aid measures, diagnosis and prevention regarding snakebites among medical students, who will be part of the healthcare providers in the future.

## METHODS

A cross sectional study was conducted among the MBBS students of Nepalgunj Medical College. All the students present at the time of collection of the questionnaire and consenting for participation were included in the study. The students were approached by the authors after the end of their regular class and explained about the objectives of the study and the way to answer the questionnaire. They were encouraged to fill up the questionnaire to the best of their knowledge and perception. They were also informed that the responses would be confidential, and no any identifiers will used in the forms while fill-

ing up the questions so that the students will be encouraged to answer confidently. A questionnaire including the participants' knowledge about the first aid methods for snake bite was prepared based on the WHO protocol of management of snake bite.<sup>6</sup> Further demographic characteristics of medical students, preventive measures and clinical features were also included in questionnaire. At the college, the students were categorized as clinical from third year MBBS (VII semester), fourth year (IX semester) and interns. On non-clinical were includes first year MBBS (I st and II nd semester). The responses for the knowledge-based questions was "yes" or "no".

The study was conducted after receiving ethical approval letter from Institutional review committee of Nepalgunj Medical College. (Date: 13 Jan 2023, Ref no: 50/079-080). Informed consent was obtained from all participants before their inclusion in the study.

### Statistical analysis

Data collected in structured proforma was entered in Microsoft Excel and statistical analysis was done using SPSS software.

## RESULTS

| Sex              | Frequency | Percent |
|------------------|-----------|---------|
| Female           | 91        | 28.3    |
| Male             | 230       | 71.7    |
| Total            | 321       | 100     |
| Year of study    | Frequency | Percent |
| FIRST            | 124       | 38.6    |
| THIRD            | 132       | 41.1    |
| FOURTH           | 26        | 8.1     |
| INTERN           | 39        | 12.1    |
| Total            | 321       | 100     |
| Level of Student | Frequency | Percent |
| Non clinical     | 124       | 38.6    |
| Clinical         | 197       | 61.4    |
| Total            | 321       | 100     |

**Table I: Demographic characteristics of medical students**

Total students enrolled in the study were 321. Among them 230 (71.7%) were male and 91 (28.3%) were female with male preponderance. Most of the participation from third year 41.1% and first year 38.6% then followed by interns 12.1% and least by fourth year 8.1%. Majority of students belongs to clinical level 61.4% as compared to non-clinical 38.6%.

| Is telling the victim to stay calm beneficial? | Frequency | Percent |
|------------------------------------------------|-----------|---------|
| NO                                             | 4         | 1.2     |
| YES*                                           | 317       | 98.8    |

|                                                                                        |     |      |
|----------------------------------------------------------------------------------------|-----|------|
| Can envenomation be cured by antivenom therapy?                                        |     |      |
| NO                                                                                     | 51  | 15.9 |
| YES*                                                                                   | 270 | 84.1 |
| Should the wound of bite site be rinsed (not scrubbed) with water as soon as possible  |     |      |
| NO                                                                                     | 64  | 19.9 |
| YES*                                                                                   | 257 | 80.1 |
| Are all snakebites associated with envenomation?                                       |     |      |
| NO*                                                                                    | 237 | 73.8 |
| YES                                                                                    | 84  | 26.2 |
| Should pressure immobilization bandages be applied around the bite site?               |     |      |
| NO                                                                                     | 83  | 25.9 |
| YES*                                                                                   | 238 | 74.1 |
| Should healthy volunteers suck the venom out of the wound?                             |     |      |
| NO*                                                                                    | 268 | 83.5 |
| YES                                                                                    | 53  | 16.5 |
| Should the site of the bite be raised above the level of the person's heart?           |     |      |
| NO*                                                                                    | 229 | 71.3 |
| YES                                                                                    | 92  | 28.7 |
| Should tight bands (tourniquets) be applied around the limb proximal to the bite site? |     |      |
| NO*                                                                                    | 152 | 47.4 |
| YES                                                                                    | 169 | 52.6 |

\*Denotes correct response

**Table II: Knowledge regarding first aid in case of snakebites**

When the first aid knowledge among the clinical and nonclinical students was compared, correct response was found more among clinical students.

| Knowledge                                       | Clinical | %    | Non Clinical | %    | P      |
|-------------------------------------------------|----------|------|--------------|------|--------|
| Is telling the victim to stay calm beneficial?  |          |      |              |      |        |
| Incorrect response                              | 2        | 1.0  | 2            | 1.6  |        |
| Correct response                                | 195      | 99.0 | 122          | 98.4 | 1      |
| Can envenomation be cured by antivenom therapy? |          |      |              |      |        |
| Incorrect response                              | 11       | 5.6  | 40           | 32.3 |        |
| Correct response                                | 186      | 94.4 | 84           | 67.7 | <0.001 |

|                                                                                        |     |      |    |      |        |
|----------------------------------------------------------------------------------------|-----|------|----|------|--------|
| Should the wound of bite site be rinsed (not scrubbed) with water as soon as possible? |     |      |    |      |        |
| Incorrect response                                                                     | 26  | 13.2 | 38 | 30.6 |        |
| Correct response                                                                       | 171 | 86.8 | 86 | 69.4 | <0.001 |
| Are all snakebites associated with envenomation?                                       |     |      |    |      |        |
| Incorrect response                                                                     | 21  | 10.7 | 63 | 50.8 |        |
| Correct response                                                                       | 176 | 89.3 | 61 | 49.2 | <0.001 |
| Should pressure immobilization bandages be applied around the bite site?               |     |      |    |      |        |
| Incorrect response                                                                     | 44  | 22.3 | 39 | 31.5 |        |
| Correct response                                                                       | 153 | 77.7 | 85 | 68.5 | 0.069  |
| Should healthy volunteers suck the venom out of the wound?                             |     |      |    |      |        |
| Incorrect response                                                                     | 8   | 4.1  | 45 | 36.3 |        |
| Correct response                                                                       | 189 | 95.9 | 79 | 63.7 | <0.001 |
| Should the site of the bite be raised above the level of the person's heart?           |     |      |    |      |        |
| Incorrect response                                                                     | 48  | 24.4 | 44 | 35.5 |        |
| Correct response                                                                       | 149 | 75.6 | 80 | 64.5 | 0.032  |
| Should tight bands (tourniquets) be applied around the limb proximal to the bite site? |     |      |    |      |        |
| Incorrect response                                                                     | 75  | 38.1 | 94 | 75.8 |        |
| Correct response                                                                       | 122 | 61.9 | 30 | 24.2 | <0.001 |

Chi square test. Questions were adapted from a previous study <sup>7,14</sup>

**Table III : Comparison of first aid knowledge among clinical and non-clinical students**

| Signs and Symptoms       | Clinical (n=197) | %    | Non-clinical (n=124) | %    | P      |
|--------------------------|------------------|------|----------------------|------|--------|
| Swelling pain blistering |                  |      |                      |      |        |
| NO                       | 5                | 2.5  | 10                   | 8.1  |        |
| YES                      | 192              | 97.5 | 114                  | 91.9 | 0.022  |
| Blurring of vision       |                  |      |                      |      |        |
| NO                       | 3                | 1.5  | 18                   | 14.5 |        |
| YES                      | 194              | 98.5 | 106                  | 85.5 | <0.001 |
| Unconsciousness          |                  |      |                      |      |        |
| NO                       | 19               | 9.6  | 16                   | 12.9 |        |
| YES                      | 178              | 90.4 | 108                  | 87.1 | 0.362  |

|                         |     |      |     |      |        |
|-------------------------|-----|------|-----|------|--------|
| Heaving of eyelids      |     |      |     |      |        |
| NO                      | 15  | 7.6  | 29  | 23.4 |        |
| YES                     | 182 | 92.4 | 95  | 76.6 | <0.001 |
| Weakness of neck muscle |     |      |     |      |        |
| NO                      | 31  | 15.7 | 48  | 38.7 |        |
| YES                     | 166 | 84.3 | 76  | 61.3 | <0.001 |
| Difficulty respiration  |     |      |     |      |        |
| NO                      | 16  | 8.1  | 34  | 27.4 |        |
| YES                     | 181 | 91.9 | 90  | 72.6 | <0.001 |
| Severe muscle ache      |     |      |     |      |        |
| NO                      | 25  | 12.7 | 27  | 21.8 |        |
| YES                     | 172 | 87.3 | 97  | 78.2 | 0.031  |
| Shock or collapse       |     |      |     |      |        |
| NO                      | 12  | 6.1  | 24  | 19.4 |        |
| YES                     | 185 | 93.9 | 100 | 80.6 | <0.001 |

Chi square test. Questions were adapted from a previous study <sup>15, 16</sup>

**Table IV: Medical students who recognized signs and symptoms of snakebite**

As shown in table V, both clinical and non-clinical students have adequate knowledge regarding preventive measures against snake bite.

| Preventive measures                                                 | Clinical (n=197) | %    | Non-clinical (n=124) | %    | P      |
|---------------------------------------------------------------------|------------------|------|----------------------|------|--------|
| Avoiding of storing paddy harvest inside houses                     |                  |      |                      |      |        |
| NO                                                                  | 12               | 6.1  | 17                   | 13.7 |        |
| YES                                                                 | 185              | 93.9 | 107                  | 86.3 | 0.02   |
| Controlling rodents inside the houses                               |                  |      |                      |      |        |
| NO                                                                  | 4                | 2.0  | 14                   | 11.3 |        |
| YES                                                                 | 193              | 98.0 | 110                  | 88.7 | <0.001 |
| Storing firewood outside the houses                                 |                  |      |                      |      |        |
| NO                                                                  | 4                | 2.0  | 41                   | 33.1 |        |
| YES                                                                 | 193              | 98.0 | 83                   | 66.9 | <0.001 |
| Clearing an area, devoid of leaf litter and grass around the houses |                  |      |                      |      |        |
| NO                                                                  | 3                | 1.5  | 6                    | 4.8  |        |
| YES                                                                 | 194              | 98.5 | 118                  | 95.2 | 0.08   |
| Tapping the ground with a stick, while walking outside at dusk      |                  |      |                      |      |        |
| NO                                                                  | 5                | 2.5  | 14                   | 11.3 |        |
| YES                                                                 | 192              | 97.5 | 110                  | 88.7 | 0.001  |
| Carrying a torch or a flame while walking outside at dusk           |                  |      |                      |      |        |
| NO                                                                  | 0                |      | 6                    | 4.8  |        |
| YES                                                                 | 197              | 100  | 118                  | 95.2 | 0.003* |

Wearing protective shoes while walking outside at dusk and while farming activities

|     |     |      |     |        |
|-----|-----|------|-----|--------|
| NO  | 1   | 0.5  | 10  | 8.1    |
| YES | 196 | 99.5 | 114 | 91.9   |
|     |     |      |     | <0.001 |

Chi square test, \*fisher exact test Questions were adapted from a previous study<sup>13</sup>

**Table V: Knowledge of preventive measures among medical students**

## DISCUSSION

The current questionnaire-based, cross-sectional study was conducted among medical students of NGMC. This study assessed the knowledge about first aid, clinical diagnosis and preventive measure of snake bite among medical students. Total participation of students, both clinical and non-clinical were 321. We found that majority of students responded correctly regarding first aid knowledge in snake bite cases. On comparison among clinical and non-clinical group, considerable number of students among clinical group showed adequate knowledge of first aid as compared to non-clinical group which was also statistically significant. Similar observation was also reported by Subedi et al.<sup>7</sup> The relatively adequate knowledge about first aid among clinical students might be due to exposure to cases during clinical posting and studied in clinical text books which might be lacking in non-clinical students. Some traditional way of first aid techniques like healthy volunteers should suck the venom out of wounds, bite site should be raised above the level of the patient's heart and tight tourniquets should applied around the limb proximal to the bite site etc. also practiced in Nepal as reported by Pandey et al.<sup>8</sup> Application of deleterious methods of first aid was also reported by Halesha et al<sup>9</sup> in Indian study and Alirol et al<sup>10</sup> in South Asia region. In our study a high percentage of the participants both clinical and non-clinical group were aware of common signs and symptoms of snake bite. In a study conducted by Kharusha IK et al<sup>11</sup> among nursing students from Palestine also revealed correct response in recognizing signs and symptoms of snake bite. Awareness regarding clinical features of snake bite impacts great value as early recognition and early intervention might be lifesaving. In our study, we found significant number of students both clinical and non-clinical group having adequate knowledge regarding preventive measures against snake bite. Study conducted by Chaaithanya IK et al<sup>12</sup> in Maharashtra, India among the tribal community and health care providers, it was found that although both the group were aware of preventive measures against snake bite but majority of the tribal community is following unproven household methods (sprinkling of DDT, Thimet powder) for the prevention of snakebites as compare to healthcare providers which follows use of torch, wearing protective shoes, carrying wooden sticks which was comparable to our study. Similarly study conducted by Silva A et al<sup>13</sup> among Srilankan farmers found that preventive measure against snake bite is not practical. As we know that, snake bites can be especially dangerous to outdoor workers or people spending more time outside during the warmer months of the year. Most snakebites occur when people accidentally step on

or come across a snake, frightening it and causing it to bite defensively. However, by taking extra precaution in snake-prone environments, many of these bites are preventable by following proper preventive measures.

## LIMITATIONS

This is a single hospital based study, results may not be generalized among all medical students from different Medical College as study curriculum might vary as per University.

## CONCLUSION

The overall knowledge of signs and symptoms and preventive measures against snake bite among clinical and non-clinical students was found comparable and adequate but regarding first aid knowledge, correct response was found more among clinical students as compare to non-clinical ones. Medical students are likely to encounter such cases in their professional and practical life in future so that this subjected could not be neglected and better to include this topic in curriculum from preclinical stage.

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# Outcome of Modified Weis Procedure Versus Jones Procedure in Senile Entropion at Tertiary Eye Centre of Western Nepal

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## ABSTRACT

**Introduction:** Involutional lower eyelid entropion is a common condition of eyelid that affects ageing population. Various surgical procedures have been described for correction of involutional entropion of the lower eyelid that addresses one or more of the anatomical factors. **Aims:** This study evaluate the success rate, recurrence, and postoperative complications between the two procedures modified Weis versus Jones procedure for involutional lower lid entropion. **Methods:** A prospective, cross sectional study. All patients with senile entropion who met the inclusion criteria were randomly divided into Group A (modified Weis group) and Group B Jones group Patients were evaluated on the 1<sup>st</sup> and 14 postoperative day and followed up at 6 months. The surgical outcomes were normal eyelid position at rest, recurrence and complications of surgery. **Results:** 59 patients (64 eyelids) with involutional entropion that met the inclusion criteria underwent surgical repair. Left eyelid (29) was more involved than the right eye (25). 5 patients had bilateral entropion repair. There were no major intraoperative complications except bleeding which occurred in 8 eyelids (12.5%). Postoperative period was uneventful. The success rate of Modified Weis procedure at 6 months was 93.7% whereas it was 100% in Jones procedure. The success rate was same at 3 months and 6 months duration. **Conclusion:** The functional and surgical outcome for involutional entropion with either transconjunctival modified Weis approach or external Jones approach was same. But Jones procedure has comparatively high success rate and minimal or no recurrence.

**Keywords:** Jones procedure, Modified Weis, Senile Entropion, Western Nepal

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## INTRODUCTION

Involutional Senile lower lid entropion is a common condition of eyelid that affects ageing population.<sup>1</sup> Without treatment, the inward rotation of the eyelid margin results in foreign body sensation, tearing, ocular irritation, corneal ulcer resulting in corneal scarring, decreased visual acuity and even sight loss.<sup>2</sup> The causative factors for the involutional entropion is multifactorial. Horizontal lid laxity, lateral canthal tendon laxity, overriding of preseptal orbicularis oculi muscle over pretarsal orbicularis muscle, and disinsertion or dehiscence of vertical lower lid retractors are considered to be pathogenesis of senile lower lid entropion.<sup>3-6</sup> The partial atrophy of orbital rim resulting from age related enophthalmos also predisposes to entropion.<sup>7</sup> Various surgical procedures have been described for correction of involutional entropion of the lower eyelid that addresses one or more of the anatomical factors. The

treatment of choice which has been shown to have a positive impact on quality of life and recurrence rate varies in previous studies.<sup>8</sup> Because of the multifactorial nature of the disease, the best surgical technique to address all the factors has not yet been reported. This study aims to investigate the comparative success rate, recurrence, and postoperative complications between two procedures (modified Wies versus Jones procedure) for involutional lower lid entropion. Hence, this disease is one of the most commonly encountered department of oculoplasty at Lumbini Eye Institute Bhairahawa. This type of study has not been studied in the western part of Nepal.

## METHODS

A prospective, cross sectional study was conducted in the Department of Oculoplasty at Lumbini eye Institute and Research Centre Bhairahawa from June 2019 to May 2020 after the ethical approval from Institutional Research Review Board

of Lumbini Eye Institute and research center. The study was approved on 20 May 2019 with approval number 022 (Reference no: 022/018/019). All patients with senile entropion whose age was more than 60 years attending to oculoplasty outpatient department (OPD) were included in this study. They were consecutively divided into Group A (modified Weis group) and Group B (Jones group). Exclusion criteria included the patients who had history of previous lower eyelid surgery, those not for surgery and post operative follow-up of less than 6 months period. Patient with other types of entropion like cicatricial, congenital entropion, upper lid entropion, recurrent entropion were also excluded from the study. Written informed consent was obtained prior to initiation of the study which included use of the medication, inclusion in the study. All patients were evaluated through clinical history regarding patient age, gender, laterality of the entropion, meticulous clinical examinations and necessary investigations to exclude other causes of lacrimation. The nasolacrimal duct obstruction was excluded in all cases after lacrimal syringing test.<sup>9</sup> All the patients were examined under biomicroscopic slit lamp, best corrected visual acuity, corneal status and fundus evaluation was done.

Grading of entropion was done by following methods:

Grade 1- only posterior lid border is enrolled

Grade 2- turning of intermarginal strip

Grade 3- whole of lid margin including anterior border intumed

Data collection was done in standard proforma regarding age of patient at the time of surgery, gender, grades of entropion, type of surgery. Any intraoperative and postoperative complications, outcome of surgery and recurrence of entropion was noted.

Informed written consent was obtained from all patients. All surgeries were performed under local anesthesia. Approximately 2-3 ml of 2% lidocaine with 1: 1,00,000 dilution of adrenaline and 2% bupivacaine will be injected subcutaneously across the whole length of the lower lid. Surgery was performed by 3 experienced oculoplastic surgeons.

The modified Wies procedure were similar to the steps described by Bayer CK<sup>10</sup> in suture repair for entropion. After injecting local anesthetics traction suture with 4-0 silk was applied. Lower lid was everted with the help of Jaegar's spatula. An incision was made with no. 15 Bard Parker blade just inferior to the lower tarsal border through the conjunctiva and lower lid retractors. The horizontal length of the incision was titrated according to the extent of entropion and the length of the lower eyelid not extending medially beyond the lower punctum. 4-0 silk was passed through the skin just below the lash and along the anterior surface of the tarsus. Then, the suture was passed through the retractor conjunctival complex. Then the suture was retrieved back through the skin repeating the way back. Three middle, medial and lateral or rarely any two of such sutures were applied and tightened carefully to correct the entropion. Antibiotic ointment was applied. Eye pad was applied for a few hours. The technique for Jones procedure was similar to the methods previously described by

Kamel et al.<sup>11</sup> A lid guard was placed to protect the globe. The lower eyelid was stabilized with a 4-0 silk traction suture and clamped to the guard and drape. A horizontal skin incision 4 mm from lashes was made with a no. 15 blade. The orbicularis muscle was cut. The skin and the orbicularis muscle layer were reflected up to expose the tarsal plate and down to expose the orbital septum and the underlying fat pad. The lower eyelid retractors were dissected from the tarsus and conjunctiva. The orbital septum was opened and the lower eyelid retractors were dissected. Three long-acting 6-0 absorbable plicating sutures were passed through the lower lid retractors, through the lower border of the tarsal plate and out through the lower lid retractors. The sutures were tied. The excess of the retractors was excised. The skin was closed with interrupted sutures. Sutures were removed in day seven to 2 weeks according to the need in both the procedures. All the patients were examined on the 1<sup>st</sup> and 14 postoperative days respectively. Subsequent follow up visits were done at 6 months. At each visit, eyelids were examined in primary and downgaze to see whether eyelashes touches cornea or not. The patients were asked to squeeze their eyelids closed to detect any latent recurrences. Surgical success was defined as complete disappearance of symptoms and good positioning of the eyelid margin, apposition to the globe in primary position of gaze, when looking down or blinking. The outcome of surgery were evaluated as: a) successful surgery i.e. normal eye lid position at rest b) corneal status and improvement in symptoms c) recurrence and complications.

The data analysis SPSS statistical Package of Social Sciences, version 20 was used. Statistical analysis Mean, standard deviation, P value and correlation co-efficient were calculated. The two groups were compared with Chi square test and paired t test.

## RESULTS

59 patients (64 eyelids) with involutional entropion that met the inclusion criteria underwent surgical repair. Left eyelid (29) was more involved than the right eyelid (25). 5 patients had bilateral entropion repair. Mean age at the time of presentation in modified Weis group is 70.53 years  $\pm$  8.6 whereas it was slightly younger age in Jones group 67.52 years  $\pm$  9.2. (Table I)

| Surgery Type | Mean Age(yrs) (SD) | Sex         |            | Total n(%) |
|--------------|--------------------|-------------|------------|------------|
|              |                    | Female n(%) | Male n(%)  |            |
| Group A      | 70.53 $\pm$ 8.6    | 13 (22%)    | 17 (28.8%) | 30 (50.8%) |
| Group B      | 67.52 $\pm$ 9.2    | 20 (33.9%)  | 9 (15.3%)  | 29 (49.2%) |
| p value      | 0.2                | 33 (55.9%)  | 26 (44.1%) | 59 (100%)  |

**Table I: Demographic profile of patients between two groups**

Majority of patients had grade 3 entropion in both the groups with p value 0.6 which was statistically not significant. (Table II)

| Surgery Type | Grade 2       | Grade 3       | Total no. of eyelids |
|--------------|---------------|---------------|----------------------|
| Group A      | 12<br>(18.8%) | 20<br>(31.2%) | 32<br>(50.0%)        |
| Group B      | 9<br>(14.1%)  | 23<br>(35.9%) | 32<br>(50.0%)        |
| Total        | 31<br>(32.8%) | 43<br>(67.2%) | 64<br>(100%)         |
| P value 0.6  |               |               |                      |

**Table II: Distribution according to grading of Entropion**

In this study, corneal involvement was seen more in Modified Wies group in 25 patients than in Jones group where only in 22 patients had corneal involvement. (Table III)

| Surgery Type | Clear cornea  | Spk's         | Epithelial defect | Corneal ulcer | Scar        |
|--------------|---------------|---------------|-------------------|---------------|-------------|
| Group A      | 7<br>(10.9%)  | 17<br>(26.6%) | 2<br>(3.1%)       | 3<br>(4.7%)   | 3<br>(4.7%) |
| Group B      | 10<br>(15.6%) | 15<br>(23.4%) | 5<br>(7.8%)       | 1<br>(1.6%)   | 1<br>(1.6%) |

**Table III: Distribution according to corneal status of operated eyes**

|         | 1st POD        |                      |                        | 2 weeks POD  |                      |                       | 3 and 6 months POD |                      |                       |
|---------|----------------|----------------------|------------------------|--------------|----------------------|-----------------------|--------------------|----------------------|-----------------------|
|         | Normal N (%)   | over correction n(%) | under correction n (%) | Normal N (%) | over correction n(%) | under correction n(%) | Normal N (%)       | over correction n(%) | under correction n(%) |
| GroupA  | 30<br>(93.75 ) | 2<br>(6.25)          | 0                      | 29<br>(90.5) | 2<br>(6.4)           | 1<br>(3.2)            | 30<br>(93.6)       | 1<br>(3.2)           | 1<br>(3.2)            |
| GroupB  | 31<br>(96.8)   | 1<br>(3.2)           | 0                      | 32<br>(100)  | 0                    | 0                     | 32<br>(100)        | 0                    | 0                     |
| p value | 0.35           |                      |                        | 0.2          |                      |                       | 0.3                |                      |                       |

**Table IV: Post operative outcome of two study groups in different time intervals**

The success rate in Group A at 3 and 6 months period was 93.6% and in Group B was 100%. In group A, 1 patient had overcorrection and 1 patient had undercorrection whereas no such complications observed in Group B at 3 and 6 months follow up. (Table IV) There were no major intraoperative complications except bleeding, which occurred in 8 eyelids (12.5%). Postoperatively, there were no major complications. However, one patient who underwent modified Weis procedure presented with bleeding after 1 week and managed with cauterization of the bleeding vessel. At 3 months follow

up 1 case in modified weis group had recurrence because of spastic components along with involuntional entropion. She was managed with injection botulinum toxin 5IU. Recurrence was improved at 1 month of follow up after then she was lost to follow up. The success rate of modified Weis procedure at 3 months was 93.7% whereas it was 100% in Jones procedure. The success rate was the same at 3 months and 6 months duration.

## DISCUSSION

This study showed similar functional and surgical outcomes for involuntional entropion with regards to recurrences and complications with either modified Weis approach or Jones approach. Though, modified Weis correction in our patients resulted in slightly higher recurrence rate but the differences were not statistically significant. In this study, two groups did not differ significantly with regard to age and gender of the patient. This study found that the senile entropion was more prevalent in females as compared to males which was the similar result found in studies by Erb et al<sup>12</sup>, Cai et al<sup>12</sup> and Kamel et al<sup>11</sup> This may be due to smaller tarsal plates in females than in male populations. Unlike the Quickert everting suture, transconjunctival method used in the entropion repair correct the major pathogenesis of involuntional entropion reattaching the lower eyelid retractors to the tarsal plate. The quickert procedure is technically easy and has a short learning curve. The present study has demonstrated that our entropion correction method through transconjunctival route i.e. modified Weis method has a lower recurrence rate (7%) compared to those previously reported studies for Quickert sutures (11%) done in chinese population by Tsang et al.<sup>13</sup> This study is similar to the study by Borboris et al<sup>14</sup> which also concluded that Jones plication was superior to Weiss procedure. This study provided strong evidence that success rate was greater after the Jones procedure than the modified Weis procedure. More recurrence in entropion was observed after the modified Weis procedure (7%) which resembles with other literatures. The difference in the rates in this study was statistically not significant, probably because of the small sample size in this study. Likewise, Ben simon et al<sup>1</sup> also found that recurrence was higher with the internal approach (15% versus 3% with subciliary incision) but this also was not statistically significant in this study. This study reveals 100% success rate with Jones procedure with no recurrence which is comparable to the study by kadir et al<sup>15</sup> Unlike our study, Caldetto et al<sup>16</sup> found that the success rate after Jones procedure in senile entropion is only 96.6% with no recurrences but follow up was much longer 29 months than ours which is only 6 months . Similar to our study, Han et al<sup>17</sup> also found the success rate of transconjunctival method for entropion repair is 93.6%. We did not encounter any complications like lid retraction, pyogenic granuloma and ectropion which were found by the study by Ben simon et al.<sup>1</sup> However among the complications like, punctal ectropion and scarring as seen in study by kadir et al<sup>15</sup> we only observed only few cases of ecchymosis.

In this study, one patient with recurrent entropion showed good response with injection botulinum toxin which is the

similar result shown by Deka et al.<sup>18</sup> Similarly, Iozzo et al.<sup>19</sup> showed that entropion can also be treated with injection botulinum toxin with significantly high success rate. The recurrence rate was 27% after 6 months, and 27% after 9 months. Of note, the patients with recurrence repeated the injection and showed an increasingly long wellness period. But in this study long term success rate of botulinum toxin cannot be observed because of lost to follow up of patient.

## LIMITATIONS

The limitation of study arises from the small sample size. The sample size in this study was not calculated as all the cases attended to oculoplasty outpatient department that met the inclusion criteria in the given period were included. Additionally, short term follow up upto 6 months is also weakness of this study because of which recurrent entropion may be underreported. The importance of long-term follow-up for entropion surgery and its relationship between success rate of the surgical procedure have been emphasized in previous studies.<sup>8</sup> Although the follow-up duration in this study was not long, it is noteworthy that there were no recurrences or sight threatening complications during follow-up monitoring. The modified Weis procedure may be the treatment options for beginner surgeons as it is quick and safe method for involutional entropion.

## CONCLUSION

Both functional and surgical outcomes for involutional entropion with either modified Weis approach or external Jones approach was satisfactory. But, Jones procedure has comparatively high success rate and minimal or no recurrence. But the difference in the success rate in this study was statistically not significant. However, the modified Weis procedure is technically easy and has a short learning curve.

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# Prevalence of Thyroid Disorders in Type 2 Diabetes Mellitus Patients in Nepalgunj Medical College

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## ABSTRACT

**Introduction:** Thyroid dysfunction is defined as the altered serum thyroid stimulation hormone level with normal or altered thyroid hormones. It is a common endocrine disorder affecting around 300 million people worldwide. Hypothyroidism is a common thyroid disorder in diabetic patients, impacting diabetes control. Both thyroid dysfunction and diabetes are significant public health concerns in Nepal. Addressing thyroid dysfunction in diabetic patients is crucial for optimal disease management as untreated thyroid dysfunction can invariably affect glycemic control and contributes to cardiovascular complications. **Aims:** To assess the prevalence of thyroid disorders amongst Type 2 diabetic patients in Nepalgunj Medical College. **Methods:** This is a cross-sectional, hospital-based study conducted at the Diabetes Endocrine Outpatient Department, department of Medicine, and among indoor patients of these units at Nepalgunj Medical College. The study utilized a non-probability consecutive sampling technique. **Results:** Among the 100 participants, 37% had abnormal thyroid function whereas 63% of the participants had normal thyroid function. Among participants with diabetes over 13 years of duration 36.2% had thyroid dysfunction and with duration of diabetes 10-12 years 50% had thyroid dysfunction. The most common thyroid disorder present was subclinical hypothyroidism noted in 17% of the total participants. **Conclusion:** A high prevalence of thyroid dysfunction was seen in Type 2 Diabetes Mellitus patients. Screening for hypothyroidism, appropriate management and control of diabetes may lower the risk of thyroid dysfunction.

**Keywords:** Diabetes Mellitus, Hypothyroidism, Thyroid dysfunction, Thyroid stimulation hormone

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## INTRODUCTION

Thyroid dysfunction is defined as the altered serum thyroid stimulation hormone (TSH) level with normal or altered thyroid hormones (free tri-iodothyronine- fT3 and free thyroxine- fT4). It is a common endocrine disorder affecting around 300 million people worldwide, with nearly 30% population affected in eastern Nepal alone.<sup>1,2</sup> Hypothyroidism is more prevalent than hyperthyroidism, and women are disproportionately affected.<sup>1</sup> Diabetic patients, especially those with Type 1 diabetes, are at higher risk for thyroid disorders, with up to 30% of female Type 1 diabetics developing thyroid disease.<sup>3</sup> Hypothyroidism is a common thyroid disorder in diabetic patients, impacting diabetes control.<sup>4</sup> In Type 2 diabetes, glycemic control issues further influence thyroid function, affecting TSH release and

the conversion of T4 to T3.<sup>5</sup> Both thyroid dysfunction and diabetes are significant public health concerns in Nepal worsened by iodine deficiency, and urban lifestyle changes contributing to obesity and metabolic syndrome.<sup>6-8</sup> Studies have revealed that there is high prevalence in thyroid function profiles in diabetic subjects with overall prevalence of hypothyroidism as high as 25% in some geographical areas.<sup>9,10</sup> Addressing thyroid dysfunction in diabetic patients is crucial for optimal disease management as untreated thyroid dysfunction can invariably affect glycemic control and contributes to cardiovascular complications.<sup>11</sup> On this account, this research study aims to assess the prevalence of thyroid disorders amongst Type 2 diabetic patients in western Nepal. The findings can also open the door to future studies to evaluate whether regular screening of Thy-

roid function would be beneficial in Type 2 DM patient.

## METHODS

This was an observational hospital-based study conducted at the Diabetes Endocrine Outpatient Department (OPD), Medicine OPD, and among indoor patients of these units at Nepalgunj Medical College, Nepalgunj with a cross-sectional design. The study was carried out at Diabetic endocrine outpatient department (OPD), Medicine OPD and among patients in in-patient department (IPD) at Nepalgunj Medical College, Nepalgunj from April 2021 to December 2021. The study utilized a non-probability consecutive sampling technique, where all eligible patients who met the inclusion criteria and provided consent during the study period were included. A total of 100 patients with T2DM were enrolled in the study. Data were collected using a structured proforma that included demographic details, clinical history, and relevant investigations. After obtaining informed consent, each patient underwent a thorough clinical examination, including height, weight, and blood pressure measurements. Laboratory investigations included fasting blood glucose, HbA1c, and thyroid function tests (T3, T4, and TSH levels). The participant's demographic information, duration of diabetes, glycemic control (HbA1c), and any history of medication use were recorded. Thyroid dysfunction was diagnosed based on the results of thyroid function tests. Subclinical hypothyroidism, clinical hypothyroidism, subclinical hyperthyroidism, and clinical hyperthyroidism were identified and categorized as per standard diagnostic criteria. The research was started after receiving ethical approval letter from Institutional review committee of Nepalgunj Medical College. (Date: 11 April 2021, Ref no: 558/077-078). Informed consent was obtained from all participants before their inclusion in the study. Patient diagnosed with Type 2 Diabetes Mellitus (T2DM) for more than 6 months under anti-diabetic medication in between 15 and 75 years were included in the study while patients with known thyroid disorders prior to the study, pregnant women, those with significant comorbidities or recent thyroid surgery or those who had the use of pulse corticosteroids, or radioiodine treatment, amiodarone or other medications that interfere with thyroid function were excluded from the study. The data collected in the course of the study was analyzed depending on factors such as gender, age, HbA1c values, duration of diabetes, and types of thyroid disorder. The collected data were entered into a Microsoft Excel sheet and analyzed using SPSS version 25. Descriptive statistics like frequencies and percentages were used to summarize the data. The prevalence of thyroid dysfunction was presented as percentages. No tests for statistical significance were applied in this study as the aim was to describe the prevalence and distribution of thyroid disorders among the study population rather than infer associations or causality. This methodological approach enabled a clear presentation of the prevalence of thyroid dysfunction in T2DM patients, reflecting patterns related to age, gender, glycemic control, and duration of diabetes.

## Study Related definitions of thyroid disorders.<sup>12</sup>

| Thyroid Disorders           | TSH       | T3        | T4        |
|-----------------------------|-----------|-----------|-----------|
| Hypothyroidism              | elevated  | decreased | decreased |
| Subclinical hypothyroidism  | elevated  | normal    | normal    |
| Hyperthyroidism             | decreased | elevated  | elevated  |
| Subclinical Hyperthyroidism | decreased | normal    | normal    |

## A. Operational Definition of Diabetes according to ADA

### Criteria for diagnosis of diabetes

Fasting plasma glucose  $\geq 126$  mg/dL (7.0 mmol/L)\*

Or

Two-hour post glucose  $\geq 200$  mg/dL (11.1 mmol/L) during an OGTT\*

Or

HbA1C  $\geq 6.5\%$ \*

Or

In a patient with classic symptoms of hyperglycemia or hyperglycemia crisis, a random plasma glucose  $\geq 200$  mg/dL (11.1 mmol/L)

In the absence of unequivocal hyperglycemia, results should be confirmed by repeat testing.

Fasting is defined as no caloric intake for at least 8 hours

OGTT (oral glucose tolerance test) should be performed using a glucose load equivalent of 75 g anhydrous glucose dissolved in water.<sup>13</sup>

## RESULTS

### 1. Thyroid Status and Gender Distribution

Among the 100 participants, 37% had abnormal thyroid function whereas 63% of the participants had normal thyroid function. Of the entire male participants, 34.8% (16 out of 46) patients were diagnosed with thyroid dysfunction, and 6.52% (30 out of 46) participants had normal thyroid hormone levels. In contrast, 38.9% (21 out of 54) of the female participants had thyroid disorder, while 61.1% (33 out of 54) of the female participants had normal thyroid function.

| Sex    | Thyroid Status |                     | Total |
|--------|----------------|---------------------|-------|
|        | Normal         | Thyroid Dysfunction |       |
| Male   | 30<br>(65.2%)  | 16<br>(34.8%)       | 46    |
| Female | 33<br>61.1%    | 21<br>(38.9%)       | 54    |

Table I: Gender Distribution of Thyroid Status of the Participants

## 2. Thyroid Status and Age Distribution

The occurrence of thyroid dysfunction was however more common in certain age groups. Participants over 50 years of age had the high prevalence of thyroid dysfunction with 22 out of 56 (39.3%) of the participants being affected. Between the age group 41-50 years, 11 (42.3%) participant developed thyroid dysfunction. The patients of age group 31-40 years had 3 (23. 1%) participants having thyroid dysfunction whereas the age group 20-30 had only 1 (20%) participant with thyroid dysfunction (Table II)

| Age Group | Thyroid Status |                     | Total |
|-----------|----------------|---------------------|-------|
|           | Normal         | Thyroid Dysfunction |       |
| 20-30     | 4              | 1                   | 5     |
| 31-40     | 10             | 3                   | 13    |
| 41-50     | 15             | 11                  | 26    |
| >50       | 34             | 22                  | 56    |
| Total     | 63             | 37                  | 100   |

**Table: II Thyroid Status among participants of Different Age groups**

## 3. Thyroid Status and HbA1c Levels

Our study showed that increased level of HbA1c is associated with an increased risk of thyroid dysfunction. Of the participants with HbA1c ranging from 6.5-7.0%, 25% (2 of 8) had thyroid dysfunction. In the HbA1c range of 7.1-8.0%, 39.1% (9 out of 23) had thyroid dysfunction, while in participants with HbA1c levels >8.0%, 37.7% (26 out of 69) had thyroid dysfunction (Table III).

| HBA1C   | Thyroid Status |                     | Total |
|---------|----------------|---------------------|-------|
|         | Normal         | Thyroid Dysfunction |       |
| 6.5-7.0 | 6              | 2                   | 8     |
| 7.1-8.0 | 14             | 9                   | 23    |
| >8.0    | 43             | 26                  | 69    |
| Total   | 63             | 37                  | 100   |

**Table III: Thyroid Status among the Participants according to their HBA1C level**

## 4. Thyroid status and duration of Diabetes

The prevalence of thyroid dysfunction was significantly higher among the Diabetic patients and the highest prevalence of the thyroid dysfunction was depicted among the patients who had the longer duration of diabetes. Among participants with diabetes over 13 years of duration, 36.2% (17 out of 47) had thyroid dysfunction. The thyroid dysfunction was seen in 50% of the participants (13 out of 26) with duration of diabetes 10-12 years. In participants with diabetes for 5-9 years, 23.8% (5 out of 21) had thyroid dysfunction, while those with diabetes for less than 4 years showed prevalence of thyroid dysfunction of 33.3% (2 out of 6) which is higher compared to those with 5-9 years duration of diabetes (Table IV)

| Duration of DM in Years | Thyroid Status |                     | Total |
|-------------------------|----------------|---------------------|-------|
|                         | Normal         | Thyroid Dysfunction |       |
| 0-4                     | 4              | 2                   | 6     |
| 5-9                     | 16             | 5                   | 21    |
| 10-12                   | 13             | 13                  | 26    |
| >13                     | 30             | 17                  | 47    |
| Total                   | 63             | 37                  | 100   |

**Table IV: Thyroid status of Participants based on their duration of Diabetes Mellitus**

## 5. Types of Thyroid Disorders

Out of the total participants, the most common thyroid disorder present was subclinical hypothyroidism present in 17% of the total participants. We also identified clinical hypothyroidism in 13% patients, subclinical hyperthyroidism in 3% patients and clinical hyperthyroidism in 4% patients. There were more female patients that had subclinical hypothyroidism in the study with prevalence being 20.4% in female and 13.04% in male (Table V).

|        | Thyroid Status |                            |                         |                             |                          | Total |
|--------|----------------|----------------------------|-------------------------|-----------------------------|--------------------------|-------|
|        | Normal         | Subclinical hypothyroidism | Clinical hypothyroidism | Subclinical hyperthyroidism | Clinical hyperthyroidism |       |
| Male   | 30             | 6                          | 5                       | 2                           | 3                        | 46    |
| Female | 33             | 11                         | 8                       | 1                           | 1                        | 54    |
| Total  | 63             | 17                         | 13                      | 3                           | 4                        | 100   |

**Table V: Types of thyroid Disorder among various genders**

Overall, the results presented here show that thyroid pathology is highly prevalent in Type 2 Diabetes Mellitus patients with proportional differences in male and female, increasing age, elevated HbA1c level, and duration of diabetes.

## DISCUSSION

The present study done in the Western part of Nepal highlights about the thyroid dysfunctions in T2DM patients. The result demonstrated that 37% of the T2DM patients had thyroid dysfunction where 38.9% of the female patients had thyroid dysfunction as compared to only 34.8% of the male patients. These results are consistent with other studies that report a higher prevalence of thyroid dysfunction among the people with diabetes.<sup>14, 15</sup>

Abnormalities of thyroid function are often observed in diabetics especially in patients with poor glycemic control. HbA1c level was significantly associated with the prevalence of thyroid dysfunction, people with higher HbA1c had more tendency to have thyroid dysfunction. In particular, thyroid disorder was found in 37.7% of patients with HbA1c >8%, the finding that

is consistent with the previous studies wherein poor glycemic control is associated with higher risk of thyroid disease.<sup>16</sup> This aligns line with the view that both insulin resistance and thyroid dysfunction share common metabolic pathways, including dysregulation of lipid metabolism and increased inflammatory markers.<sup>17</sup>

We found out that the rate of thyroid dysfunction was significantly higher in elderly patients comprising patients who are more than 50 years of age (22%). This finding agrees with the general decrease in thyroid hormone concentrations that is associated with ageing as described in the literature.<sup>18</sup> A more prolonged diabetes duration also has amplified thyroid dysfunction with patients having diabetes for >13 years having a thyroid dysfunction prevalence of 36.2%.<sup>19</sup> This depicts the importance of early thyroid screening in diabetic individuals especially in those with long-standing diabetes.<sup>20</sup>

Our study also found that hypothyroidism, both subclinical and clinical, was the most common form of thyroid disease, accounting for 30% of thyroid dysfunction cases. Female preponderance was noted in subclinical hypothyroidism, there being elevated female to male ratio similar to other studies done in the global context which depicts that woman are more vulnerable to thyroid ailments especially hypothyroidism.<sup>21</sup>

These results, therefore, have major clinical implications. Thyroid dysfunction in diabetic patients can exacerbate metabolic issues, complicating glycemic control and increasing the risk of cardiovascular complications.<sup>22</sup> It is advocated that screening for thyroid disorders should be carried routinely in T2DM patients, especially in those with the poor glycemic control and long duration of disease, and among the elderly population.<sup>23</sup> It is likely that early diagnosis of hypothyroidism or hyperthyroidism might have a positive impact on the patient's overall metabolic profile and decrease the possibility of developing complications in diabetic patients.

## LIMITATION

The major limitation of this study was the sample size.

## CONCLUSION

This study reveals a notable prevalence of thyroid dysfunction among Type 2 Diabetes Mellitus (T2DM) patients. The results highlight that thyroid dysfunction is more common in female patients and tends to increase with age, poor glycemic control (higher HbA1c levels), and longer duration of diabetes. It was further detected that subclinical hypothyroidism was the most common type of thyroid disorder, more common in the female patients. The relationship between thyroid dysfunction and poor glycemic control further stresses the regular screening of thyroid abnormalities among T2DM patients, especially those with poor blood glucose profile and of long duration of the disease. Early detection and management of thyroid disorders in diabetic patients could lead to better glycemic control and reduce the risk of cardiovascular and metabolic complications. Therefore, the results of this study favor the implementation of thyroid screening as an essential element in the care

of T2DM patients to enhance the patient's overall status. To enhance the knowledge about associated outcomes of thyroid dysfunction based on diabetes further large scale and longitudinal studies are advised.

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