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**Research Article**

# Correlation of magnetic resonance imaging findings in low back pain patients with daily travel time and mode

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## ABSTRACT

**Background:** Low back pain (LBP) is the major worldwide cause of pain and it is caused mainly due to long day sedentary work style in office and long hours of travelling in metro cities. The aim was to correlate the association of LBP with increase in time of travel and different modes of travel in metro cities.
**Methods:** Of all the LBP patients referred from orthopedic outpatient department to Radiology Department for magnetic resonance imaging (MRI) spine, 200 cases of those who travelled minimum 2 h daily and more were considered for this study.
**Results:** The results showed correlation of increase in incidence of degenerative changes in spine and changes in disc with increase in travelling time and also the different modes of travel. The changes increased with time significantly in younger population.
**Conclusions:** In our study of 200 patients complaining of LBP and having changes is spine reported on MRI showed reliable association of the LBP to the daily travelling of minimum 2 h and more, and associated with mode of travel, particularly two wheelers followed by public transport.

**Keywords:** Travel time, Travel mode, Disc herniation, Low back pain, Metro cities, Magnetic resonance imaging scan

## INTRODUCTION

In today's world, as the real estate prices have skyrocketed like skyscrapers of mega polis or metropolitan region, people are financially compelled to stay at faraway places in distant suburbs and districts adjoining to the main metropolis where they daily travel for work. The travelling time has increased, particularly in metro cities and urban areas of India. They travel generally by public transport such as metro or local trains and buses as they are affordable. Another group travels by their personal two wheelers as it provides point to point travelling which is quick, convenient, and affordable. The private four wheeler travelling is taken up by rich people only in metros as it is costly.

The time spent by majority of people in metropolitan cities for travelling to and fro daily for work is usually at least 2 h a day which goes up to maximum 4 h a day also. This time of travel has to be spent in both public and private transport in metropolis for daily work.

The different modes of travelling and long distance travelling for long time etc., have lot of effect on the spine and para spinal musculature of a person and majority of patients present with low back pain (LBP).[1] These incapacitate them and thus cause a great loss to their efficient man hours at work in offices.

Hence, a prospective study of 200 cases of LBP having undergone magnetic resonance imaging (MRI) scan[2] of spine was taken up in our institution where we get patients from different walks of life in this metropolis of Navi Mumbai, which has been developed as a twin city adjacent to Mumbai, the mega polis.

The various findings[3] in these patients of LBP were correlated with time and mode of travel.

Almost all diagnoses were achieved on the plain MRI scan,[4] with use of contrast in up to only in 3% cases.[5]

The findings reveal significant effect on inter vertebral disc and vertebral bodies with the increase in daily travel time and were also affected by the mode of transport. The evaluation of these findings has been shown in the results very clearly. It merits to state that we need to improve our urban transport system, so that we can avoid the affliction of young population by the changes of spine-disc lesions and thus avoid wastage of important man hours in the nation building.

## METHODS

### *Materials and Methods*

Of all the LBP patients scanned by MRI in between October 2013 and June 2014, only 200 patients travelling for at least 2 h or more were considered for this study. The patients on the basis of travelling time were divided into sub groups of 2, 3 and 4 h of daily travelling time. Travel time of <2 h was not considered for this study.

Travelling mode was divided into public mode and private mode. The public transport was subdivided into trains and buses and private vehicles were subdivided into two wheelers and four wheelers. The three wheelers like auto rickshaws were not considered as primary mode of travel for 2 h and more as patient and general public usually tend to travel only short distances by three wheelers in metros.

Images were obtained with 1.5 Tesla (Siemen's Magnetom Symphony Maestero Class machine) with common sequences used were T1, T2, STIR in sagittal, axial, and coronal planes and full spine screening of the patients was also done.[6] The age group included 25-65 years. The sex of the patient was considered but was not taken up in statistics as there were almost equal cases in both genders.

After final reporting by experienced senior radiologists, all cases were segregated into different groups of findings as shown in the Table 1. Few of them had multiple findings, but predominant ones were considered as main findings to quantify for that subgroup.

All these patients were from our orthopedic outpatient department referred for MRI scan of lumbar spine. No extra charge was taken for this study from patients.

As this prospective study did not involve any use of non tested contrast media and no significant private information of patients was shared, and images of patients were from our electronic medical records, the Ethical Committee of our institution gave us the approval.

## RESULTS

Prospective study of around 200 patients was considered as collected data and grouped initially into normal and abnormal findings as per their MRI findings. Later, they were divided into variety of subgroups as degenerative change[7] (Figure 1a and b), disc dessication[8] (Figure 2), and disc prolapse[9] (Figure 3), mild disc bulge (Figures 4-6), fractures or spondylolysis[10] (Figure 7a and b) with or without listhesis, infections[11,12] like tuberculosis (Figure 8a and b) and non-tubercular infections (Figure 9a and b), and others which included space occupying lesions like meningiomas (Figure 10) and few congenital conditions[13,14] like low placed cord (Figure 11). The lesions like spinal injury[15] (Figure 7a and b) causing cord contusion (Figure 12), degenerative diseases of cord[16] were also noted down and evaluated. Information in a tabular form is given in Table 1.

Out of 200 patients of LBP, 5 have normal findings (2.5%) on MRI spine and 195 had abnormal findings (97.5%). Of these 195 cases, 25 patients (12.8%) had findings of infection, SOL, congenital variants, which do not reveal any correlation with travel time and mode. The remaining 170 cases (87%) had findings related to disc and spine

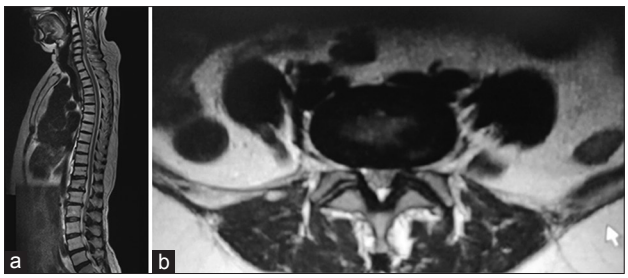


**Figure 1: (a) Degenerative changes (b) Thickened ligamentum flavum.**

**Table 1: Sub groups according to different findings.**

| Normal | Abnormal | | | | | | |
|---|---|---|---|---|---|---|---|
| | Disc involvement and stress fractures | | | | | Infective, other lesions | |
| | Degenerative change | Disc dessication | Disc prolapse | Disc bulge mild | Lysis listhesis | Pott's spine | Others |
| 05 | 54 | 08 | 61 | 27 | 20 | 05 | 20 |
| 05 | 170 | | | | | 25 | |

abnormalities which could be correlated with travel time and mode. Hence, these 170 abnormal and 5 normal, totally 175 cases of LBP were taken up for correlation with travel time and mode.

This subgroup was subdivided into public and private mode of travel as calculated in the Table 2.

It was found that the travel mode was predominantly by train in 70/175 patients (40%) as this was found to be most convenient and cheap in metro cities like ours. The next most common travelling mode taken up by people was by bus, 50 out of 175 (28.57%). The third most common mode taken by 39 patients out of 175 (22.28%) was by their own two wheelers on the potholed roads of Mumbai which is greatly affected by heavy rains in monsoon. Those who travelled comfortably in their private/four wheelers (cars) were only 16 of 175 (9.1%).

The third sub grouping was done according to the travel time in hours on a daily basis as shown in Table 3.

The daily travelled time was predominantly up to 4 h in 76/175 patients (43.42%) followed by up to 3 h travelling by 64 patients (36.75%). Only 35/175 (20%) travelled up to 2 h daily. Thus, it shows that the travelling time is an important factor in metro cities as people tend to stay at far away suburban and distant districts adjacent to metros where housing is affordable for them.

**Figure 2: Schmorl's nodule formation with disc herniation.**

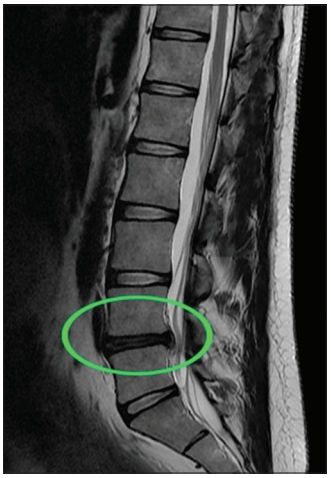

**Figure 3: Disc prolapse.**

**Table 2: Subgroup according to mode of travel in 175 cases.**

| Mode of travel | | | | Total |
|---|---|---|---|---|
| Public transport | | Private vehicle | | |
| Bus | Train | Two wheeler | Four wheeler | |
| 50 | 70 | 39 | 16 | 175 |
| 28.5% | 40% | 22.28% | 9.14% | 100% |
| 120 | | 55 | | 175 |

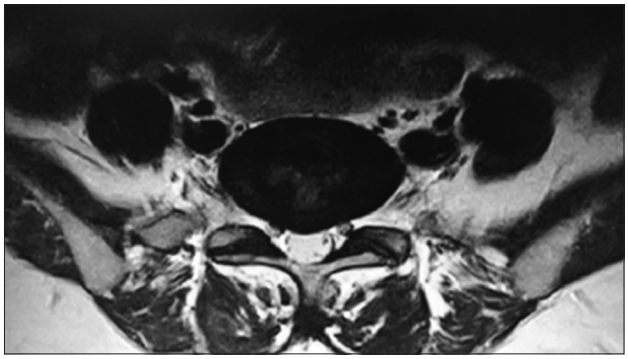

**Figure 4: Central disc herniation on axial scan.**

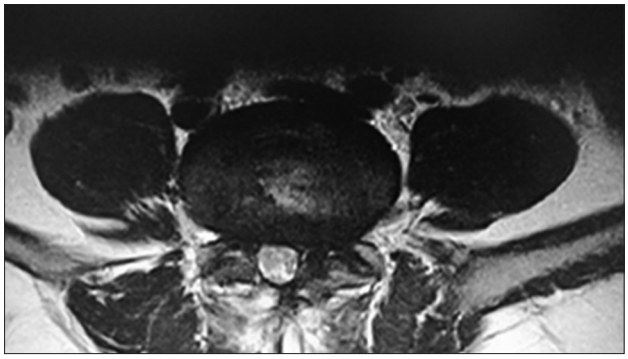

**Figure 5: Paracentral disc herniation.**

**Table 3: Subgroup according to daily travel time in 175 cases.**

| | Daily travel time | | | Total |
|---|---|---|---|---|
| Hours | 2 | 3 | 4 | |
| Patient | 35 | 64 | 76 | 175 |
| Percentage | 20 | 36.75 | 43.42 | 100 |
| Total | 175 | | | 175,551 |

The correlation between travelling mode and the various lesions of spine/disc was studied and the statistics are shown in Table 4.

As Table 4 shows 70/175 patients (40%) were train travelers who had various abnormal findings. Majority of train travelers had changes of disc prolapse in 29/70 patients (41.42%) followed by degenerative changes (28.57%). Majority of bus travelers (54%) had degenerative changes followed by disc prolapse (20%). All these changes appear to be related to continuous standing position in trains and jerk caused in buses by acceleration, de acceleration, etc.

Two wheeler population have predominantly disc prolapse (51.2%) followed by spondylosis with/without listhesis (23.07%).

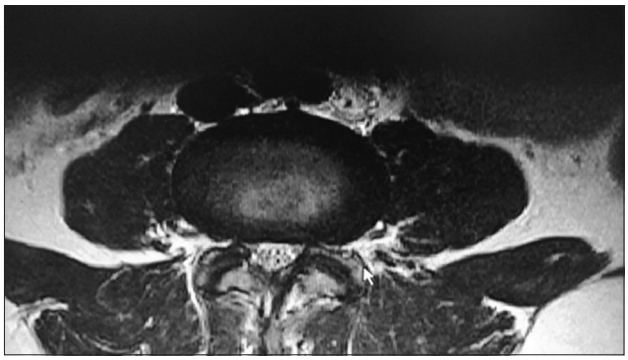

**Figure 6: Nerve root indentation.**

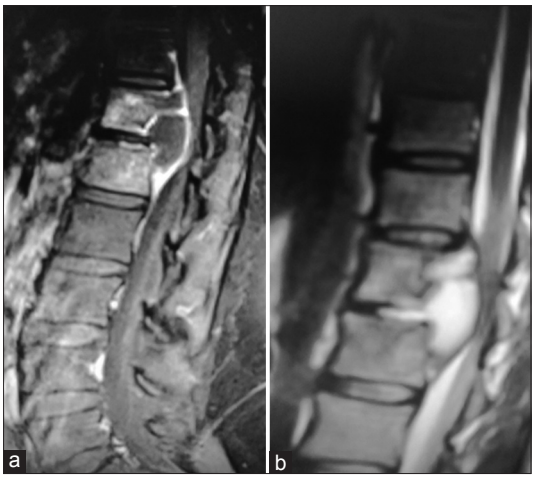


**Figure 8: (a) Tuberculous abscess (b) Post-contrast epidural abscess.**


**Figure 7: (a) Retrolisthesis with fracture causing cord contusion. (b) Retrolisthesis with cord contusion.**


**Figure 9: (a) Non-tuberculous abscess (b) Post-contrast epidural non-tuberculous abscess.**

**Table 4: Correlation between travel mode and various spin/disc lesions.**

| Travel mode | 175 cases (excluding infective and other lesion) | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Disc involvement and stress fractures | | | | | Normal | |
| | Degenerative change | Disc dessication | Discprolapse | Disc bulge mild | Lysis - Listhesis | | |
| Bus | 27 | 01 | 10 | 07 | 05 | 00 | 50 |
| Train | 20 | 04 | 29 | 12 | 04 | 01 | 70 |
| Two wheeler | 06 | 02 | 20 | 01 | 09 | 01 | 39 |
| Four wheeler | 01 | 01 | 02 | 07 | 02 | 03 | 16 |
| Total | 54 | 08 | 61 | 27 | 20 | 05 | 175 |
| Percentage | 30.85 | 4.5 | 34.85 | 15.42 | 11.42 | 2.85 | 100 |

The private four wheeler travelers were least affected with only mild disc bulge in 43.75% and followed by 18.75% having normal findings and only 12.5% having either disc prolapse or lysis/listhesis.

The correlation between travelling time and the various lesions of spine/disc was studied and the statistics are shown in Table 5.

**Figure 10: Post-contrast meningioma.**

**Figure 11: Congenital low placed cord**

The travelling time also showed its effect on the disc and spine. As the time of travel increased, its harmful effect increased. Of the travel time subgroups, the 4 h subgroup (76 patients) had maximum casualties in the form of 37/76 cases of disc prolapse (48.6%), 13/76 cases of disc changes (17.1%) and 12/76 cases of lysis/listhesis (15.78%).

In the second subgroup of 3 h travel time (64 patients), 29/64 (45.31%) had disc changes and 20/64 (31.2%) had disc prolapse.

In the third subgroup of travel time up to 2 h (35 patients), majority 12/35 (34.28%) had only disc changes and 10/35 (28.57%) mild disc bulge only. Interestingly, all the five normal cases of LBP were of these subgroups (5/35 = 14.28%).

Of all normal cases (5/175), the travel time was up to only 2 h in five cases (100%) and of these, out of five (60%) were travelling by private/four wheelers followed by train (20%), two wheeler (20%).

Thus, travel time of <2 h is safe and travel in private and four wheeler (car) has little effect on spine.

**Figure 12: Cord contusion.**

**Table 5: Correlation between travel time and various spine/disc lesions.**

| Travel time | 175 cases (excluding infective and other lesion) | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Disc involvement and stress fractures | | | | | Normal | |
| | Degenerative change | Disc dessication | Disc prolapse | Disc bulge mild | Lysis Listhesis | | |
| 2 h | 12 | 02 | 04 | 10 | 02 | 05 | 35 |
| 3 h | 29 | 02 | 20 | 07 | 06 | 00 | 64 |
| 4 h | 13 | 04 | 37 | 10 | 12 | 00 | 76 |
| Total | 54 | 08 | 61 | 27 | 20 | 05 | 175 |
| Percentage | 30.85 | 4.5 | 34.85 | 15.42 | 11.42 | 2.85 | 100 |

The most common inter vertebral disc lesions were found to be central and B/L disc prolapse with or without nerve root compression or indentation - 61/175 cases, that is 34.8%, (Figure 5). The second most common finding was disc degenerative changes along with osteophytosis, nucleus pulposus herniation (Schmorls' node formation) comprising 54/175 - that is 30.8%, (Figure 6). Mild disc bulge in central and paracenral region mostly posteriorly was found in 27 patients (15.4%), (Figure 7). The spondylosis with/without listhesis was found in 20/175 patient - that is 11.4%, (Figure 8), whereas disc dessication was found in 4.6%, (Figure 9).

## DISCUSSION

This study included 200 patients travelling minimum for 2 h daily and presenting with LBP. Majority of the patients having significant history of LBP and travelling show early degenerative changes, disc dessication, disc prolapsed, and break at pars articularis s/o spondylolysis. Common age group affected is around 35-40 years. LBP due to other causes like infection, SOL, congenital variations do not reveal any significant association with travelling time and its modality, hence this subgroup was not considered in the statistics for the correlation between travel time, mode and disc-spine changes.

The first majority group shows the most common cause of LBP as intervertebral disc (IVD) lesions i.e., central and bilateral disc prolapse with or without nerve root compression or indentation. Few of them presented in the form of diffuse osteophytes, changes of disc dessication, and nucleus pulposus herniation (Schmorls' nodes).

Another group of younger patients with low backache undergone MRI - plain examination revealed changes of spondylolysis (break at pars articularis) and in few had spondylolisthesis. Some had underlying cord contusion, having additional history of trauma. This group showed significant correlation with travelling and use of two wheelers as their mode of travelling.

Another group of patients includes space occupying lesions/ metastasis/demyelination disorders etc. These patients did not reveal any significant correlation with the history of travelling in past or at present.

Next group of patients presenting with low backache belonged to slight younger age group and reveal congenital disorders like low placed cord, spina bifida occulta, syrinx of cord, tethered cord[13] etc. This group did not reveal any significant correlation with travelling or its mode.

Another group of patients having backache with routine office travelling (only around 1 h) and occasional travelling mostly includes normal study or infective lesions which do not correlate to it.

From our collected information and relation with the travelling time and its mode proved to be very significant to make a statement that there is very close association between the travelling time and lesion, i.e., more the time increases, more the changes in disc and spine. Similarly, the travel mode like public transport such as train, bus, and private vehicles such as two wheelers/four wheelers also have relation with the disc lesions/prolapse/degenerative changes and spondylolysis. Infective lesions are mostly epidural, paraspinal abscess with involvement of vertebral body, IVDs and surrounding soft tissues.

## CONCLUSION

Thus the increase in travelling time for at least more than 2 h daily increased the changes in disc and spine. The mode of travel also affected the disc and spine of patients. In the mode of travel, the two wheelers were more prone to cause disc prolapse (percentage wise) and spondylolysis - listhesis, while the private four wheelers caused predominantly only mild disc bulges. The travel in buses caused more degenerative changes and train travelling caused more disc prolapses.

Good roads giving a smooth ride to people are the need of the hour as this can decrease the incidences of leave from office work and save the precious man hours of the nation. The overcrowded local/metro train and bus services need an alternative mode of fast and comfortable transport to decongest these services and avoid the degenerative changes occurring in our young population to accelerate the nation to maximum productivity.

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*Ethical approval: The study was approved by College Ethical Committee*

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