Original article

Functional outcome of Back school model of patient education with perspective of ergonomic kinematic correction in Non Specific low back pain management among motor bikeriders in delivery industry

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Abstract

Background: Non specific Low back pain (LBP) is common among motorbike riders due to various ergonomic factors. Indeed its more common among the personnel in delivery industry who ridemotor bike for long riding hours and assume improper posture during driving.

Materials and Methods: A prospective cohort interventional study comparing 148 motorbike riders in delivery Industry clinically diagnosed with NonSpecific Low back pain was conducted in Department of Physical Medicine and Rehabilitation Government Kilpauk Medical College, Chennai,Tamilnadu, India.

Result: In Group B The *Back School Post session VAS score* ($M = 21.51$, $SD = 10.63$) had lower values than.the *Back- School Pre session VAS score* ($M = 59.78$, $SD = 17.96$). Observation of Functional Outcome scale in terms of ODI score showed in Group A, *Physio care-Post session ODI* ($M = 29.08$, $SD = 11.29$). had lower values than the the *Physio Care Pre session ODI* ($M = 57.22$, $SD = 19.02$) . Similarlythe *Back school Post session -ODI* group ($M = 22.91$, $SD = 11.4$). had lower values than the *Back school Pre session ODI* group($M = 58.76$, $SD = 18.26$).Indeed *Back school Post session -ODI* (group B ($M = 22.91$), $SD = 11.4$).had lower values for the dependent variable than the the *Physio care Post session ODI* (Group A)($M = 29.08$, $SD = 11.29$) . Difference in the post session EQ-5D-5L(HrQol outcome scale) of Group B (Post back school +Exercise session)=(8.08) is greater than Group A(post Physio care+ Exercise session)7.76 and difference between these groups is(8.08)-(7.76)=0.32.

Conclusion– In this study among the subjects with wr LBP due to motor bike riding in delivery industry ,There was statistically significant functional improvement in Post session VAS pain scale,ODI functional scale and EQ-5D5LHrQolin both Back school model of patient education as well as Physio-care .

Key words and Abbreviations – wr-LBP-work related Low Back Pain , VAS-Visual Analogue Scale for Pain,

Introduction

Low back pain is more common cause of away from work .Indeed more common among the people who ride motor bike as a part of their occupation. Low Backpain among the motor bike riders[1-15] may be aggravated with frequent trips per day which leads to long riding hours with less rest free intervals .lack of stretching and repeated as well as constant posture for prolonged hours with pre- occupation to achieve the target number of deliveries. and abnormal bike ergonomics with handle bar reach and saddle seating.

Back School model of Patient education in terms of Job control by correcting work pattern, engineering control by correction of Bike   alignment and fittings and Health promotion in terms of posture core muscle strengthening engagement of musculoskeletal elements of spine. This study analyse the outcome of Back school patient education with perspective of ergonomic kinematic correction. the modification used in terms of correction of engineering control, job control, but not the administrative control.

AIM –to compare the functional outcome of Back school[1,2,3] model of patient education with that of physiotherapy management of in low back pain among motor bike drivers in delivery industry. in management of occupational related low back pain among who motor bike riders   in food delivery industry

Methodology:

STUDY DESIGN: A Prospective cohort Interventional Study

SOURCE OF DATA: Motor bike riders with nonspecific low back pain in Delivery service who sought pain management at Department of   Physical Medicine and Rehabilitation Government Kilpauk Medical College,   Chennai, Tamilnadu, India

STUDY POPULATION: Motor bike riders in Delivery service

Study Duration -12 months May 2020 to March 2021

SAMPLE SIZE: 148 (Group A-consisted of 74 subjects receiving Physio care along with core spinal exercise programme   while another 74 subjects of group B received Back school model   of patient education focussing on ergonomic   kinematic correction along with core spinal exercise programme)

Sampling: Convenient sample

Inclusion criteria:

➢ Age group between 18 to 50 years of age

➢ both male and female

➢ Motor bike riders with at leastmore than 6 months of riding in Delivery service

➢ who ride at least more than 6 hour per day

➢ who ride both petrol as well as electric motor bike

 Exclusion Criteria:

➢ Low back pain due to any, injury, surgeries.

➢ organic low back pain due to other conditions like disc injury, spondylosis, sciatica, lumbar canal stenosis vertebral   fractures,inflammatory cause, neoplastic cause ,back pain due to infective cause

Outcome Measures

➢ **Visual Analogue Scale[6,7](VAS) for Pain is a s**traight horizontal line of fixed length, usually 100 mm100-mm VAS score less than 5 mm may be labeled as no pain, 100-mm VAS scores from 5 to 44 mm may be labeled as mild pain, 100-mm VAS scores from 45 to 74 mm may be labeled as moderate pain, and 100-mm VAS scores 75 mm and greater may be labelled as severe pain.

➢ **Oswestry Disability Index[8,9,10]ODI** as   disease specific functional disability measure and (0 to 100 %) (covers most of Comprehensive **ICF** Core Set for LBP)

➢ **EQ-D5-L5[11,12,13]**as Health related quality of Life index (1 to 5) in each of 5 dimensions

The MCID of EQ-5D-5L was 0.071, with a range between 0.052 and 0.098 in this study, and the calculated MCIDs could only determine   whether patients experienced meaningful changes at the group level.

Methodology

148 (74 Subjects each in Group A and Group B) motorbike Motor bike riders with nonspecific low back pain in Delivery service who sought pain management at Department of Physical Medicine and Rehabilitation Government Kilpauk Medical College, Chennai, Tamilnadu, India, were clinically diagnosed with non specific LBP based on the diagnostic criteria (excluding specific cause of low back ache due to other organic causes as well as due to trauma) were recruited in the study They were divided in to two groups each with counts of 74 subjects, were explained about the Study ....

Intervention-

Group A- received .Physio-care[16] + Core Spinal Exercise[17,18]

for 5 sessions x 30 minutes each 5 sessions x 30 minutes each on consecutive Days

GroupB received Back School[1,2,3] model Patient Education of Ergonomic Kinematics + Core Spinal Exercise[17,18]

for 5 sessions x 30 minutes each on consecutive Days

. Demographic details, disease characteristics, were collected .Pre-session outcome scale at the time of inclusion of subjects in the study and Post session outcome measure after 2weeks of inclusion were recorded in terms **Visual Analogue Scale[6,7](VAS) for Pain**, Disease specific functional outcome scale Oswestry Disability Index (ODI), and EQ-5D-5L questionnaire (European quality of life index)as Health related Quality of life index .

Protocol of Back schoolmdel of patient education with perspective of Ergonomic Kinematic correctionin this study

Job Control (In terms of Work ern Modification)	Body Positioning[19,20,21,25,26] to avoid habitual and Fatigue related Lumbar Kyphosis,
	Avoid continuous prolonged Riding[24] -Riding Volume Reduction up to pain tolerance
	Intermittent Rest[27,28] Minimum intermittent Rest of 5 minutes between rides
Engineering control to correct al moment during riding by ification of motorbike fittings	**Spinal Kinematics Correction**[21,22,23,25,26] -correction done by altering motor bike fitting 1. by increasing Anterior tilt of pelvis by 10° to 15° through augmenting Anterior slope of Saddle of seat,[29.30,31] 2. by modifying handle Bar Height[32] Reach to avoid slouching as well as over reach 3. correcting Asymmetry [26,33,34]of Spinal Muscle Balance due to sagging Pavilion Carriage Load correcting baggage load to rigidly supported to midline

Health promotion to improve conditioning of static as well as amic musculoskeletal elements of e	**Core Spinal Muscle Activation**[17,18]
	Activation of Core Spinal Muscles and Strengthening
	➢ 5 SETS 3 TIMES A DAYS
	➢ (1 SET =5 Repetitions of each exercise program)
	Stretching of Gluteal, Piriformis and Para Spinal Muscles
	➢ 5 SETS 3 TIMES A DAYS
	➢ (1 SET =5 Repetitions of each exercise program)

Results

Demographic Data

In this study the maximum number of subjects belonged to the age between 31 to 40 years in Group A and below 30 years in Group B .The least number of subjects were found with age less than 30 years in both Groups A (20.27%)and Group B(22.98%).. Males were predominant in both Group A (66.22%) and Group B(62.16%) .Regarding observation of Body Mass Index 16.22% and 10.81% of subjects were underweight, 18.92% and 21.62%were obese in Group A and Group b respectively. In Group A-22.97% and in Group B-28.38% subjects were smoking tobacco and 31.08% of Group A and 36.49% of Group B had habitual consumption of alcohol

Table [1]

Demographic Data of Group A and group b					
		Group-A (Physio Care + core spinal Exercise)		**Group-B (Back school programme + core spinal Exercise)**	
		No of patients	**Percentage**	**No of patients**	**Percentage**
Age group	<30	27	36.49%	32	43.24%
	31-40	32	43..24%	25	33.78%
	41-50	15	20.27%	17	22.98%
Sex	Female	25	33.78%	28	37.84%
	Male	49	66.22%	46	62.16%
BMI	Underweight	12	16.22%	8	10.81%
	Normal weight	31	41.89%	36	48.65%
	Overweight	17	22.97%	14	18.92%
	Obese	14	18.92%	16	21.62%

Smoking	Yes	17	22.97%	21	28.38%
	No	57	77.03%	53	71.62%
Alcohol	Yes	23	31.08%	27	36.49%
	No	51	68.92%	47	63.51%

Outcome Scale Scores

1.Descriptive Analysis of Pre and Post session VAS scores(Pain Scale) in wr LBP

a).Descriptive Analysis of Pre and Post Physio care session VAS scores in wr LBP(in Group A)

The *Physi- Post session VAS score* group (*M* = 24.14, *SD* = 11.86). had lower values than the *Physio pre session VAS score* (*M* = 57.92, *SD* = 17.97) ..

b).Descriptive Analysis ofPre and Post Back School session VAS scores in wr LBP, (in Group B)

The *Back School Post session VAS score* (*M* = 21.51, *SD* = 10.63) had lower values than.the *Back- School Pre session VAS score* (*M* = 59.78, *SD* = 17.96)

c).The Difference in the mean Pre and post session VAS score (outcome scale for Pain) was greater in Group B (38.27) when compared to group A (33.78)

Table [2]. Descriptive Statistics of Pre session and post session VAS scores of both Group A and Group B

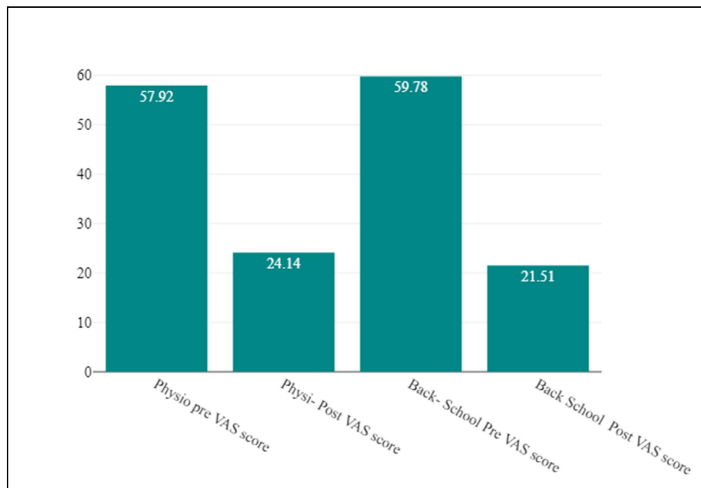|	Physio pre VAS score	Physi- Post VAS score	Back- School Pre VAS score	Back School Post VAS score
Mean	57.92	24.14	59.78	21.51
Minimum	18	6	22	3
Maximum	87	56	89	55
95% Confidence interval for mean	53.76 - 62.08	21.39 - 26.89	55.62 - 63.95	19.05 - 23.98
Mean ± Std.	57.92 ± 17.97	24.14 ± 11.86	59.78 ± 17.96	21.51 ± 10.63

Figure 1--Pre and post session VAS scores of Group A and Group B

2.Descriptive Analysis of Pre and Post session ODI scores(Functional Scale for wr LBP)

Outcome scale in Group A*Physio care Post session ODI* (M = 29.08, SD = 11.29). had lower values than the The *Physio Care Pre session ODI* (M = 57.22, SD = 19.02) . Similarlythe *Back school Post session -ODI* group (M = 22.91, SD = 11.4). had lower values than the *Back school Pre session ODI* group(M = 58.76, SD = 18.26).Indeed *Back school Post session -ODI* (group B (M = 22.91), SD = 11.4).had lower values for the dependent variable than the the *Physio care Post session ODI* (Group A)(M = 29.08, SD = 11.29)

a).Descriptive statistics- *of Physio Care Pre session ODI and Physio care Post session ODI*

In Group A, *Physio care Post session ODI* (M = 29.08, SD = 11.29). had lower values than the The *Physio Care Pre session ODI* (M = 57.22, SD = 19.02)

	n	Mean	Std. Deviation	Std. Error Mean
Physio Care Pre session ODI	74	57.22	19.02	2.21
Physio care Post session ODI	74	29.08	11.29	1.31

b).Descriptive statistics- *of* Back school *Pre session ODI and* Back school *Post session ODI*

In Group B the *Back school Post session -ODI* (M = 22.91, SD = 11.4). had lower values than the *Back school Pre session ODI* group(M = 58.76, SD = 18.26)

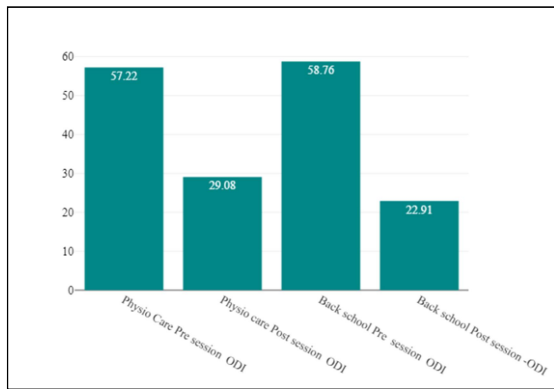|	n	Mean	Std. Deviation	Std. Error Mean
Back school Pre session ODI	74	58.76	18.26	2.12
Back school Post session -ODI	74	22.91	11.4	1.33

Figure 2,Pre and Post Owstery Disability Index ODI Scores in Group A and Group B

c).Descriptive statistics Physio care Post session ODI and Back school Post session –ODI

The results of the descriptive statistics showed that *Back school Post session -ODI* (group B($M = 22.91$), $SD = 11.4$).had lower values for the dependent variable than the the *Physio care Post session ODI* (Group A)($M = 29.08$, $SD = 11.29$)

	n	Mean	Std. Deviation	Std. Error Mean
Physio care Post session ODI	74	29.08	11.29	1.31
Back school Post session -ODI	74	22.91	11.4	1.33

3.Descriptive statistics of Health related quality of Life Index(Euro Quality of Life- EQ-5D-5L)

Table –[3].Descriptive statistics of Health related quality of Life Index(Euro Quality of Life- EQ-5D-5L)[11,12,13]

	Pre Physio- EQol	Post-Physio- EQol	Difference in Pre-Post Physio EQol	Pre Back-School EQol	Post- Back-School EQol	Difference in Pre-Post Back school EQol
Mean	16.38	8.62	7.76	16	8	8
Std. Deviation	2.18	1.84	2.23	1.98	2.27	2.53
Minimum	12	5	4	12	5	-3
Maximum	22	14	13	22	21	15

The above table[3] shows the difference in post session outcome in terms of Health-related quality of Life Index(Euro Quality of Life- EQ-5D-5L) is greater (8.08) among (group B)who received Back School model of patient education+ Core Spinal exercise than the outcome difference (7.76)among subjects (Group A) who received Physio care with Core spinal exercise shows improvement in quality of life in subjects of group B(received Back School model of patient education+ Core Spinal exercise) compared to Group A (who received Physio care with Core spinal exercise)

Difference in the post session EQ-5D-5L(HrQol outcome scale) of Group B (Post back school +Exercise session)=(8.08) is greater than Group A(post Physio care+ Exercise session)7.76 and difference between these groups is(8.08)-(7.76)=0.32 Indeed This outcome difference between these two groups 0.32 is greater than the MCID for EQ-5D-5L (0.072). ie Difference in EQ-5D-DL 0.32 > 0.072(MCID of EQ-5D-5L) showing that the greater influence of Back school Model of Patient education in improving Quality of Life Index than the Physio care without back school model)

Statistical analysis:

The collected data was **Statistically analysed** applying Microsoft Excel. ,based on which graphs and tables were obtained. along with the demographic data of both interventional group and pre as wel as post interventional scores of ODI score as disease specific functional scale , VAS score as pain scale EQ-5D-5L as health related quality of index Scale were used as a measurement tool to evaluate the efficacy of Back school patient education program with perspective of ergonomic kinematic correction

a).Statistical Analysis of Physio Care Pre session ODI scores and Physio care Post session ODI scores

A t-test for paired samples showed that this difference was statistically significant, $t(73) = 15.63, p = {<}.001$, 95% Confidence interval [24.55, 31.72].

t-Test for paired samples

	t	df	p	Cohen's d
Physio Care Pre session ODI - Physio care Post session ODI	15.63	73	<.001	1.82

95% Confidence Interval of the Difference

	Mean	Std. Deviation	Std. Error Mean	Lower limit	Upper limit
Physio Care Pre session ODI - Physio care Post session ODI	28.14	15.49	1.8	24.55	31.72

b).Statistical Analysis of Back school Pre session ODI scpresand Back school Post session –ODI scores

A t-test for paired samples showed that this difference was statistically significant, $t(73) = 15.48, p = {<}.001$, 95% Confidence interval [31.24, 40.47].

t-Test for paired samples

	t	df	p	Cohen's d
Back school Pre session ODI - Back school Post session -ODI	15.48	73	<.001	1.8

95% Confidence Interval of the Difference

	Mean	Std. Deviation	Std. Error Mean	Lower limit	Upper limit
Back school Pre session ODI - Back school Post session -ODI	35.85	19.92	2.32	31.24	40.47

c).Statistical Analysis of Physio care Post session ODI and Back school Post session –ODI

A two tailed t-test for independent samples (equal variances assumed) showed that the difference between *Physio care Post session ODI* and *Back school Post session -ODI* with respect to the dependent variable was statistically significant, $t(146) = 3.31, p = .001$, 95% confidence interval [2.48, 9.87]. Thus, the null hypothesis was rejected.The effect size *d* was 0.54 (equal variances assumed). With *d* = 0.54 there was a medium effect.

t-Test for independent samples

	t	df	p	Cohen's d
Equal variances	3.31	146	.001	0.54
Unequal variances	3.31	145.99	.001	0.54

95% Confidence Interval of the Difference

	Mean Difference	Standard Error of Difference	Lower limit	Upper limit
Equal variances	6.18	1.87	2.48	9.87
Unequal variances	6.18	1.87	2.48	9.87

Based on paired t test with samples within same group in Both Group A (Physio care)and Group B(Back School) there wasstatistically significant improvement between the pre as post session VAS and ODI for functional outcome,

However Independent t test showed Group B had better clinical improvement than Group A in primary outcome variables   in terms of VAS score for pain relief relief and ODI as functional outcome of wr-LBP. The secondary out come variable EQ-5D-5L as Health related Quality of Life index was showed improvement in terms of the post session EQ-5D-5L scores in both Group A (Physio Care) and Group B (Back School) .Indeed Quality of Life was better in Group B.who received Back school intervention with Core exercise when compared to group A who were managed with Physio care with Core exercise.

Discussion

The impact of Low back ache in motor bike delivery boys were assessed according to the literature review were the awkward posture, duration of riding hours , Awkward posture[14] in nonspecific low back mostly related to extreme lumbar Flexion more over prolonged static posture of trunk spine pelvis as well as lower limbs as well as lack of adequate seating in saddle seat of motor bike as in case of normal siting chair ,lack of stretching of spinal muscles, para-spinal muscles, gluteal and piriformis .Theoretical hypothesis for the patho-mechanics of LBP in bike riding , includes mechanical creep[12] (mechanical strain leading to structural deformation of ligaments that occurs with constant loading), decreased perfusion to inter vertebral disc, muscle exhaustion , and eccentrics strain on of back extensors muscles .

Another mechanism is the flexion-relaxation phenomenon[18], in which deactivation of the erector spine and/or multifidus muscles with a flexed spine causes stress vertebral body which is transferred to the passive spine structures of the spine, thus increasing risk to strain of ligaments and inter-vertebral discs.

Indeed other risk factors are related to LBP in Bike riding , include Asymmetric trunk muscle activation, flexibility spinal muscles , unfavourable Bike Assembly and increased riding hours.

Unfavorable Bike assembly means increased distance between seat and Handle bar reach as well as height with reference to saddle seat of bike increase the lumbar flexion there by making the static as well as dynamic stabilisers of spine vulnerable to cumulative trauma. This cascade phenomena leads to non specific low back pain due to the signals from pain sensitive structures of Spine.

Therefore, Ergonomic education in terms of Back school group:education and training Swedish Back School model 5 sessions x 30 minutes each on consecutive Days (anatomy and causes of LBP, function muscles and posture, ergonomics, advice on physical activity promotingand practicing frequent rest break, avoiding, overstretching and repetitive bending, improving job satisfactionessential measures required in managing and preventing low back pain.

After two weeks outcome scale for pain, function and Health related Quality of life index was measured.Pain scale assessed in group A showed that, *Physio- Post session VAS score* ($M = 24.14$, $SD = 11.86$). had lower values than the *Physio pre session VAS score* ($M = 57.92$, $SD = 17.97$) .In Group B The *Back School Post session VAS score* ($M = 21.51$, $SD = 10.63$) had lower values than.the *Back- School Pre session VAS score* ($M = 59.78$, $SD = 17.96$). Observation of Functional Outcome scale in terms of ODI score showed in Group A, *Physio care-Post session ODI* ($M = 29.08$, $SD = 11.29$). had lower values than the the *Physio Care Pre session ODI* ($M = 57.22$, $SD = 19.02$) . Similarlythe *Back school Post session -ODI* group ($M = 22.91$, $SD = 11.4$). had lower values than the *Back school Pre session ODI* group($M = 58.76$, $SD = 18.26$).Indeed *Back school Post session -ODI* (group B ($M = 22.91$), $SD = 11.4$).had lower values for the dependent variable than the the *Physio care Post session ODI* (Group A)($M = 29.08$, $SD = 11.29$) . Difference in the post session EQ-5D-5L(HrQol outcome scale) of Group B (Post back school +Exercise session)=(8.08) is greater than Group A(post Physio care+ Exercise session)7.76 and difference between these groups is(8.08)-(7.76)=0.32

Conclusion

This study among motor bike riders in delivery industry at Chennai ,concluded that moderate to severe disability as well as impaired quality of life are impacts as consequences of Non Specific low back pain, due to various ergonomic factors involved while riding of motorbike .

There   is significant functional improvement in terms of post interventional scores of ODI score as disease specific functional scale , VAS score as pain scale and EQ-5D-5L as health related quality of index Scalein the group one receivedBack school patient education programthan the group two which received Physio care alone Indeed patient education with perspective of ergonomic kinematic correction may be suggest for to reduce severity of pain as well as to prevent recurrence of Non specific low back pain   among the delivery person riding motor bike in delivery industry..

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