

Use of Numeric Rating Scale (NRS) as Visual Analogue Scale (VAS): Is this Clinically Significant?

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ABSTRACT

Objective: To analyze statistically significant differences between the Numeric Rating Scale (NRS) and Visual Analogue Scale (VAS) in low back pain (LBP) patients.

Study Design: Prospective longitudinal Study.

Place and Duration of Study: Orthopaedic and Spine Department, Combined Military Hospital, Peshawar Pakistan, from Sep 2019 to May 2020.

Methodology: The study included two hundred one patients with low back pain presented to the Orthopedic and Spine OPD. All patients were asked to record their pain with a Visual Analogue Scale (VAS) at the start of the visit and a Numerical Rating Scale (NRS) at the exit, at approximately 5-7 minute intervals in the Outpatient Department.

Results: Two hundred one patients were included in the study. The mean age of the patients was 41.5 years (range 15-75). The comparison of pain measurements with the Numerical Rating Scale (NRS) showed a mean of 7.408(SD1.853), whereas with the Visual Analogue Scale (VAS), it was 6.864 (SD1.954). This showed higher readings with NRS compared to VAS, with a mean difference of 0.544 (p -value was <0.001).

Conclusion: The numerical Rating Scale (NRS) tends to produce higher pain readings than the Visual Analogue Scale (VAS). Treatment guidelines should be considered when interpreting studies that have used VAS interchangeably and wrongly reported it as NRS.

Keywords: Back pain, Low back pain, Pain measurement, Visual analogue pain scale.

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INTRODUCTION

Different scales have been developed to facilitate pain measurement.¹ The first one was the Visual analogue scale (VAS), developed by a psychologist named Hayes in 1921.² It consists of a 10-centimeter (cm) straight line with two ends mentioning no pain at one side and maximum imaginable pain at the other. The point marked by the patient is measured by placing a measuring scale and is afterwards recorded in cm.³ A similar scale called the Graphic Rating Scale (GRS) was also developed, with no pain at one side and mild, moderate, severe, and excruciating pain, which can be analyzed as nominal data.⁴

The other tool to measure pain is the Numeric Rating Scale (NRS), which consists of a line with marked numbers 0-10, with no pain denoting 0 and the maximum imaginable pain as 10. Many versions of NRS 0-6-0-100 exist.⁵ Thus, the patient has to define his pain in 11 grades on a 0-10 scale and 101 grades on a 1-100 scale. The most commonly used NRS is 1-10. This

scale presents numeric data for analysis. The first use of NRS in describing qualitative pain in numbers was by McGill in 1971.⁶ These tools have been developed in software for computer users.

Although the VAS is a 10 cm line scale and NRS is a 0-10 scale, the VAS has been wrongly used as NRS. Many researchers have used the VAS Scale correctly,⁷⁻⁹ but some have used the NRS 0-10 Scale and published it as VAS.¹⁰ This study aimed to analyze any statistical significance between using VAS as NRS in patients with low back pain (LBP). This will also highlight the significance of correct referencing. This is the first study to compare pain readings of NRS and VAS in lower back patients.

METHODOLOGY

The prospective longitudinal study was conducted at the Orthopaedic and Spine Department of Combined Military Hospital, Peshawar, Pakistan, after obtaining Ethical Committee approval (Trg/1107/47 dated 30 August 2019).

Inclusion Criteria: Patients of either gender who presented with low back pain were included in the study.

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Exclusion Criteria: Patients who were mentally disabled and unwilling to cooperate were excluded.

All patients were asked to record their pain with VAS at the start of the visit and NRS at the exit at approximately 5-7 minutes in the outpatient department.

The study included two hundred one cases presenting with low back pain using a non-probability consecutive sampling technique. Informed consent was taken from eligible patients, and proforma was completed. The scales were compared by the distance from the extreme left of the line, marked by the patient on the VAS. Additional data were obtained (including duration of pain, side of radiation and onset of acute, sub-acute or chronic pain).

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Inferential statistics were explored using the Pearson’s correlation test. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

Two hundred one patients were included in the study. There were 125(62.189) % male and 76(37.810%) female patients. The mean age was 41.5 years (range 15-75). 42(20.89%) patients had acute pain (less than four weeks duration), 27(11.44%) sub-acute (4-12 weeks) and 132(65.67%) had chronic pain (more than 12 weeks). Fifty-eight patients had LBP with radiation along the left leg, 76 along the right, and 6 to both, while 62 had only axial pain and no radiation to the legs. The neurological status was normal in 178 patients, and weakness of L4 myotome was observed in 3, L5 in 7 and S1 in 13 patients. The pain measured with the NRS scale showed a mean of 7.408 (SD 1.853); on VAS, it was 6.864 (SD 1.954) (Table-I). Elaborative statistics of numerical rating scale and visual analogue scale on the basis of acute, sub acute and chronic low back pain are shown in the Table-II.

Table-I: Descriptive Statistics between the two Pain Scales, Numerical Rating Scale(NRS) , Visual Analogue Scale (VAS) (n=201)

Variable	Minimum	Maximum	Mean±SD
Visual Analogue Scale(VAS)	1.2	10.00	6.864±1.954
Numerical Rating Scale(NRS)	1	10	7.408±1.852

Table-II: Elaborative Statistics of Numerical Rating Scale and Visual Analogue Scale on the basis of Acute, Sub Acute and Chronic Low Back Pain (n=201)

Lumbosacral Pain	Numerical Rating Scale Mean±SD	Visual Analogue Scale (cm) Mean±SD	<i>p</i> -value
Acute (<4 weeks)	7.548±2.086	7.007±2.071	0.004
Sub acute (4-12weeks)	7.815±1.210	7.144±1.380	0.001
Chronic (>12 weeks)	7.280±1.879	6.761±2.019	0.001

DISCUSSION

This study aimed to analyze any statistical significance between using NRS as VAS in patients with low back pain (LBP). This will also highlight the significance of correct referencing. In our study, the Pearson coefficient showed a positive relationship of 0.7154 between NRS and VAS. Many authors have used NRS and report as VAS. Although the VAS is a 10 cm line scale and NRS is a 0-10 scale. Although many researchers have used the VAS Scale correctly, 7-9 some have used the NRS 0-10 Scale and published it as VAS.¹⁰⁻¹³ Rose *et al.* found a positive relationship with *r*=0.638 in a study to evaluate NRS and VAS.¹ Hawker *et al.* showed a positive relationship between NRS and VAS of 0.6-0.91 in different studies.¹⁵

Our study showed that the chance of expressing pain readings is higher with NRS than VAS, with a statistically significant difference (*p*-value 0.001) in the study population of 201 LBP patients. The readings were higher and significant in all groups. In acute pain (less than four weeks), the *p*-value was 0.004, in sub-acute pain 0.001 and in chronic pain 0.001. Carpenter *et al.* compared NRS readings with VAS in cancer patients and showed that about 75 % of patients do not rate their pain mathematically equivalently, and NRS readings were higher than VAS.¹⁶ De Jong *et al.* compared pain assessment with these scales in burn patients. They found a mean value of 0.571 for NRS and 0.518 for VAS with *p*-value<0.001 and suggested that these instruments cannot be used interchangeably without considering their differences.¹⁷ In a study performed at McGill University Montreal, Canada, the authors compared pain readings in chronic pain of different etiologies measured by VAS, visual analogue thermometer (VAT) and NRS. They found higher recording on NRS than VAS.¹⁸

CONCLUSION

NRS produces higher pain readings than VAS, which is significant in patients with low back pain. Treatment

guidelines should be considered when interpreting studies that have interchangeably and wrongly used NRS and reported it as VAS.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

IFP: & AUR: Conception, study design, drafting the manuscript, approval of the final version to be published.

ANN: & SJI: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

SA: & MAQ: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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