



Original Article

## Effect of Lumbar Discectomy on the Quality of Life (QOL)

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### ABSTRACT

**Objective:** Quality of life is an individual's perception. Herniated lumbar discs badly affect quality of life due to lower back pain and neurological deficits. The purpose of the study is to see the impact of lumbar disc herniation (LDH) on the quality of life of individuals and to examine the effect of surgery on the quality of life in these patients.

**Materials and Methods:** A prospective observational study was conducted in the Department of Neurosurgery at Sir Ganga Ram Hospital / Fatima Jinnah Medical University, the data was collected through purposive sampling from LDH patients (N=159). The data was collected at three-point times; preoperatively (N=159) immediately postoperatively (n=125), and after 3 months post-operative (n=92). Quality of life was measured by the World Health Organization Quality of Life (WHO-QOL BREF scale) and the Aberdeen Lower Back Pain Scale (ALBPS).

**Results:** The quality of life in pre-operative patients was very poor and lumbar discectomy significantly ( $p<.05$ ) not only improved the overall quality of life but with high significance reduced lower back pain at  $p<.001$  hence showing the effectiveness of surgery among LDH patients.

**Conclusion:** For patients with recommended surgery for lumbar disc herniation, early intervention enhances quality of life. After surgery, significant pain improvement was seen as shown by ALBPS. WHO-QOL BREF assessment also highlights surgical impact on quality of life, before and after the procedure.

**Keywords:** Quality of life, Discectomy, Herniated Disc, Low Back Pain, Spine.

**Abbreviations:** LDH = Lumbar disc herniation; WHO-QOL BREF = World Health Organization Quality of Life; ALBPS = Aberdeen Lower Back Pain Scale; QoL = Quality of Life.

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## INTRODUCTION

Quality of life is an individual's perception of their position in life in context to the expectations, goals, concerns, and standards in their culture and value systems.<sup>1</sup> Lumbar disc herniation is one of the most common pathologies to be seen in neurosurgical outpatient departments that adversely affects the quality of life of the patients.<sup>2</sup> Lumbar disc herniation (LDH) is considered to be a frequent pathology in routine clinical practice.<sup>3</sup> Multiple risk factors are involved in the pathogenesis of LDH which include heavy weight lifting, smoking, obesity, a sedentary lifestyle, sudden straining or twisting, genetics, frequent prolonged driving, and incorrect posturing like working for long hours in incorrect postures.<sup>4,5</sup> These risk factors are not only causing the disease but have negative consequences on the overall quality of life of the patients.

It most commonly presents as low back pain with or without radiation to one or both of the lower limbs. It causes neurological deficits leading to disability.<sup>5,6</sup> The deficit may be motor or sensory in the distribution of the affected nerve root. It sometimes also manifests in the form of cauda equina syndrome. Various treatment strategies have been offered to patients that range from conservative management, physiotherapy sessions, and epidural injections to surgical procedures.<sup>6,7</sup>

Various surgical methods are available to treat herniated lumbar discs including both minimally invasive procedures to open methods.<sup>7,8</sup> Surgical outcomes in patients with discectomy vary from person to person. Surgical outcomes in a controlled clean environment can have a lot of physical, emotional, and psychological effects on a person's life.<sup>9</sup> A lot of complications including hematoma formation, wound infection and dehiscence, discitis, cerebrospinal fluid leakage, etc can also change the post-surgical outcomes. Hence a necessity of post-surgical assessment of the quality of life in these patients becomes mandatory.

The current study aims to see the impact of lumbar disc herniation on quality of life, to examine the efficacy of surgery on quality of life and reduction in lower back pain, and to see the level of pain and quality of life among LDH patients across different periods. Thus, the hypotheses that have been formulated are that lower back pain will reduce the overall quality of life, lumbar discectomy will be inversely correlated with lower back pain and the surgery will positively correlate with quality of life.

## MATERIALS AND METHODS

### Study Design and Setting

A prospective observational study was conducted in the Neurosurgical Department of Sir Ganga Ram Hospital / Fatima Jinnah Medical University, Lahore from 1<sup>st</sup> Nov 2021 to 31<sup>st</sup> Dec 2022. The data was collected after consideration from the ethical review board of the university in a prospective registry. Preoperative and Postoperative data was collected from the patients who underwent standard bilateral laminectomy and discectomy. Post-operative data was collected immediately post-op and after a 3-month interval.

### Hypotheses

In light of the aims of the study, the 3 hypotheses have been formulated which are as follows:

1. Lower back pain will reduce the overall quality of life.
2. Lumbar discectomy will be inversely correlated with lower back pain.
3. Lumbar discectomy will positively correlate with quality of life.

### Data Collection and Tools

The data was collected after obtaining informed consent and patients were assessed via the World Health Organization Quality of Life (WHO-QOL BREF scale) and Aberdeen Lower Back Pain Scale

(ALBPS).<sup>10,11</sup> Quality of life assessment has been assessed through the WHO-QOL BREF scale. Recently WHOQOL-BREF has been developed which contains 26 items only.<sup>12,13,14</sup> It can produce a multidimensional profile of scores across multiple domains and subdomains of quality of life.<sup>13,14,15,16</sup> It evaluates the four dimensions of quality of life i.e., physical health, psychological health, social health, and psychological health. Apart from these two separate individual items explain thoroughly the individual's overall perception of quality of life and individual's overall perception of health. Assessment of quality of life post-surgery was mandatory in our surgical setup where a lot of patients undergo discectomies for lumbar disc herniation and recurrent herniated discs. ALBPS is a 16-item questionnaire that assesses the disability of patients with acute and chronic Low back pain.

### Sample Characteristics

159 patients (Males: n = 87; Females: n = 72) with ages ranging from 18 to 55 years with a mean age of 36.5 years were included in the study. Table 1 shows sample characteristics. All of the patients underwent standard bilateral partial laminectomy and discectomy except 4 patients who underwent wide open laminectomy for cauda equina syndrome.

### Inclusion Criteria

All the adult patients ranging from age 18 to 55 were included of either gender. Their clinical and radiological assessment was done to establish the diagnosis. The patients chosen met the criteria for the indication of surgery for protruded intervertebral disc (PIVD).

### Exclusion Criteria

Patients with trauma, pseudo-disc herniation, and other spinal pathologies were excluded. The patients' characteristics are given below in Table 1.

### Data Analysis

The data of the current study was gathered over thirteen months. The data gathered was analyzed using IBM SPSS v.26. The data was normally distributed. Further bivariate correlations and t-statistics have been carried out to test the hypotheses. Bivariate correlations are a statistical technique used to explore and quantify the relationship between all the study variables to test the hypotheses. Similarly, the paired t-test was conducted to compare the observations between three-time spans (initially pre-operative and immediate post-operative observations were compared, and then post-operative and 3 months after operation were compared). The skewness and kurtosis in the data were applied to see whether the data was normally distributed or not.

## RESULTS

### Gender and Age Distribution

A total 159 number of patients were included in this initially with ages ranging from 18 to 55 years old. 27 patients were in the 18-30 years category; 58 patients were in the 31 to 42 years old category and 74 patients were in the 43-55 years old category. 87 of these patients were male while 72 were female as shown in Table 1.

**Table 1:** Baseline Patient Characteristics (N= 159).

Variables	Pre-Operation N=159
<b>Age (Years)</b>	
Mean	18-55 (± 4.9)
18-30	27(16.98%)
31-42	58(36.47%)
43-55	74(46.54%)
<b>Gender</b>	
Males	87(54.71%)
Females	72(45.28%)
<b>Comorbidities</b>	
Diabetes	29(18.23%)
Hypertension	71(44.65%)
Ischemic heart disease	06(03.77%)

Table 2 shows the psychometric properties of the study variables. The skewness and kurtosis values closer to 1 show that the data was normally distributed. Cronbach Alpha ( $\alpha$ ) is the reliability indicator of the measures. Values of  $\alpha$  above 0.7 indicate that all instruments are consistent in measuring the substituent constructs and all the instruments have good reliability indices.

Bivariate correlations were used to explore and quantify the relationship between two variables. The range of correlation lies between +1 to -1. The values closer to 1 indicate strong correlations whereas values lying close to 0 indicate weak correlations. The findings with  $p < .05$  are statistically significant. Table 3 shows significant positive correlations among all four domains of QoL. All

**Level of Operation**

L3 / L4	04(2.51%)
L4 / L5	99(62.26%)
L5 / S1	56(35.22%)

**Types of Job**

White collar jobs	29(18.23%)
Blue collar jobs	41(25.78%)

**Table 2:** Alpha Reliability Coefficients and Descriptive Properties of WHO-QoL and ALBPS (N=159).

Variables	Items	$\alpha$	M	SD	Skewness	Kurtosis
<b>1. Quality of Life Questionnaire</b>						
Physical Health	7	0.83	12.25	3.04	-.73	1.23
Psychological Health	6	0.79	15.21	4.62	-.85	1.41
Social Relationships	3	0.71	10.51	2.76	-.68	.52
Environment	8	0.85	23.52	3.56	-.95	1.02
<b>2. Aberdeen Low Back Pain Scale (ALBPS)</b>						
Lower Back Pain	16	0.83	12.25	3.04	-.73	1.23

four domains of QoL i.e., physical health, psychological health, social relationships, and environment are significantly positively correlated with each other and scale total. The correlation

**Table 3:** Bivariate Correlations between QoL and ALBPS among patients (N=159).

		Quality of Life	Physical Health	Psychological Health	Social Relations	Environment	Lower Back Pain
<b>Quality of Life</b>	Coefficient of Pearson Correlation	1	0.535**	0.542**	0.359*	0.224**	-0.551**
	p-value		0.000	0.000	0.039	0.000	0.002
<b>Physical Health</b>	Coefficient of Pearson Correlation	0.535**	1	0.867**	0.474**	0.418**	-0.505**
	Sig. (2-tailed)	0.000		0.000	0.001	0.000	.000
<b>Psychological Health</b>	Coefficient of Pearson Correlation	0.542**	0.867**	1	0.327**	0.673**	-0.463**
	Sig. (2-tailed)	0.000	0.000		0.008	0.000	0.000
<b>Social Relations</b>	Coefficient of Pearson Correlation	0.359*	0.474**	0.327**	1	0.664**	-0.521**
	Sig. (2-tailed)	0.039	0.001	0.008		0.001	0.000
<b>Environment</b>	Coefficient of Pearson Correlation	0.224**	0.418**	0.673**	0.664**	1	-0.280**
	Sig. (2-tailed)	0.000	0.000	0.000	0.001		0.000
<b>Lower Back Pain</b>	Coefficient of Pearson Correlation	-0.551**	-0.505**	-0.463**	-0.521**	-0.280**	1
	N	159	159	159	159	159	159

\*\* . Correlation is significant at the 0.01 level

\* . Correlation is significant at the 0.05 level

**Table 4:** Paired Sample T-Test on Quality of Life and Lower Back Pain Among Pre-Op and Immediately Post-Op Followed by Comparison Immediate Post-Op and Three Months after Surgery among Patients.

Sr. #	Variables	Pre-Operation M	n=159 SD	Post-Operation M	n=125 SD	p-values
<b>Quality of Life</b>						
1.	Physical Health	15.83	2.56	24.62	1.56	0.01*
2.	Psychological Health	10.01	2.84	11.04	3.75	0.01*
3.	Social Relationships	8.35	2.78	10.56	2.04	0.02*
4.	Environment	19.21	3.41	20.01	2.56	0.03*
<b>ALBPS (Aberdeen Lower Back Pain Scale)</b>						
1.	Low Back Pain	20.01	2.34	13.75	4.63	0.02*
	Variables	Post-Operation M	n=125 SD	Three Months after Surgery M	n=92 SD	p-values
<b>Quality of Life</b>						
1.	Physical Health	24.62	1.56	20.56	2.15	0.01*
2.	Psychological Health	11.04	3.75	17.69	2.91	0.01*
3.	Social Relationships	10.56	2.04	11.97	2.01	0.05*
4.	Environment	20.01	2.56	21.05	2.98	0.05*
<b>ALBPS (Aberdeen Lower Back Pain Scale)</b>						
1.	Low Back Pain	13.75	4.63	15.38	2.12	0.02*

\*significant associations

between physical health and psychological health is strongly positively correlated as the correlation value is above 0.7. The table further shows a significant inverse correlation among domains of QoL and lower back pain. The inverse values lying between -0.3 to -0.5 indicate moderate negative correlations. The findings are supporting hypotheses 1 and 2.

The paired t-test was used to determine whether the mean differences between paired observations were significantly different. Table 4 supports hypothesis number 3. According to the findings, lumbar discectomy improved quality of life, which is consistent with findings from past research. Immediately post-op the patients had highly improved physical health as per their subject rating attributable to the fact that the patients felt an instant relief in lower back pain due to the discectomy and they also were taking sedatives and had some effects of anesthesia too. Whereas in the third point time three months after surgery, although the subjective reporting on physical health was significantly lower than time point two, still it was noticeably greater than

time point one reflecting the efficacy of the procedure. The psychological health can also be seen significantly improved at  $p < .01$  as evident from point two and point three measurements. Social relations and environment perception of the patients were relatively stable across time with little changes across time point one and time point two. Pain immediately after surgery was relieved at a significant level and across point time two and three there was relatively less variation in the subjective perception of pain among the patients. The usefulness of lumbar discectomy as a therapy option for LDH patients is further supported by the decrease in lower back pain seen following surgery at p-values less than .05 thus showing the efficacy of lumbar discectomy.

## DISCUSSION

Quality of life is a broad domain encompassing personal health including mental health, spiritual health, and physical health alongside education level, relationships, work environment, wealth, a

sense of safety and security, freedom, autonomy in decision-making, social belonging, and their physical surroundings.<sup>13,14,15</sup> Quality of life in herniated lumbar disc patients is already compromised as these people have continuous or intermittent, acute or chronic low back pain. Acutely excruciating pain or the pain that can go into chronicity is one of the leading causes of disability, anxiety, depression, impaired quality of life with consumption of analgesics, antidepressants, anxiolytics, muscle relaxants, and more health care utilization, financial burdens, fear of dependency and work-related issues.<sup>17,18</sup> It can also be accompanied by a disability or urinary or fecal incontinence. A normally healthy walking patient after a ruptured disc can get bed-bound for months if not treated surgically and can get prone to a permanent neurological deficit. Similarly, patients with Cauda Equina Syndrome if not treated in early 8 to 24 hours can become disabled lifelong. Erectile dysfunction is also seen in patients with herniated Lumbar discs which impacts mental health adversely.<sup>19</sup>

After the surgery was done for the herniated lumbar disc the pain of most of the patients improved significantly immediately postoperatively while the neurological deficit before the surgery improved slowly in some patients. As shown in Table 4 after 3 months of the surgery quality of life was re-assessed to see the improvement of neurological deficits. Adequate post-op care that includes wound care, modified lifestyle activities, and appropriate bed rest improves the quality of life significantly. A few of the patients of low socioeconomic class who went to work early postoperatively and did not have adequate bed rest again came to the OPD with pain and almost the same reduced quality of life before surgery. Similarly, the patients who underwent complications like post-op wound infection, CSF leakage, or discitis had a prolonged hospital stay that affected their quality of life.<sup>19</sup> Recent empirical evidence strongly supports the assertion that comprehensive

postoperative care, encompassing meticulous wound management, modification of daily activities, and careful bed rest, plays a pivotal role in significantly enhancing the quality of life (QOL) following lumbar discectomy. Recent research findings reveal that patients, particularly those from low socioeconomic backgrounds, who returned to work prematurely and failed to observe adequate bed rest, experienced a recurrence of pain and a deterioration in their QOL to levels akin to those experienced before the surgical procedure.<sup>20</sup> Moreover, patients who encountered complications such as postoperative wound infections, cerebrospinal fluid (CSF) leakage, or discitis had lengthy hospital stays, which had a detrimental impact on their overall QOL.<sup>20,21</sup> Patients in the current study were re-evaluated after 3 months once their complications subsided after treatment and it was also observed that they had significant ( $p < .05$ ) improvement and their quality of life got better as well. The findings suggest that lumbar discectomy is an effective treatment option for patients with lumbar disc herniation. It leads to significant improvements in physical and psychological health, as well as pain relief, immediately after the operation, and these benefits are sustained over three months. This study provides empirical evidence to support the positive impact of discectomy on the quality of life for LDH patients. Similarly, the erectile dysfunction in most of the patients significantly improved having a good quality of life as shown by previous studies as well. Current literature also demonstrated significant improvements in quality of life after lumbar spine surgeries especially an upward trend in physical health and social relationships as demonstrated by the study done by Lin EY, Chen PY, Tsai PS, Lo WC, Chiu HY et al.<sup>22</sup> Similar findings have been reported by Wagner et al that there is a significant improvement in psychological health and improvement in pain and ability after lumbar spine surgery.<sup>23</sup>



## CONCLUSION

In the surgically indicated patients of lumbar disc herniation early surgery can improve the quality of life. In the immediate post-operative interval, most of the patients have a markedly improved pain status as seen in the study measured by ALBPS. Similarly, the quality of life measured by the WHO-QOL BREF scale before the surgery and after the surgery in two intervals has a significant impact of the surgery on the quality of life.

## LIMITATIONS AND RECOMMENDATIONS

A few limitations should be noted, though. First, the study's sample size is a bit small, which would prevent the conclusions from being applied to a larger population. The findings need to be validated and strengthened by more research with larger sample sizes. Second, the study only evaluated QoL and lower back pain three months after surgery and shortly thereafter. The consequences of lumbar discectomy on QoL over the long term might be better understood with longer-term follow-up assessments. Additionally, because the study only included patients from one hospital, there may have been selection bias, which reduced the findings' external validity. The generalizability of the findings would be improved by multicenter trials encompassing a variety of patient demographics.

## REFERENCES

1. Mark DB, Anstrom KJ, Sheng S, Piccini JP, Baloch KN, Monahan KH, Daniels MR, Bahnson TD, Poole JE, Rosenberg Y, Lee KL. Effect of catheter ablation vs medical therapy on quality of life among patients with atrial fibrillation: the CABANA randomized clinical trial. *Jama*. 2019;321(13):1275-85.
2. Ruschel LG, Agnoletto GJ, Aragão A, Duarte JS, de Oliveira MF, Teles AR. Lumbar disc herniation with contralateral radiculopathy: a systematic review on pathophysiology and surgical strategies. *Neurosurgical Review*. 2021;44:1071-81.
3. Chen F, Yang G, Wang J, Ge Z, Wang H, Guo Y, Yang H, Jing X, Liu X, Cui X. Clinical Characteristics of Minimal Lumbar Disc Herniation and Efficacy of Percutaneous Endoscopic Lumbar Discectomy via Transforaminal Approach: A Retrospective Study. *Journal of Personalized Medicine*. 2023;13(3):552.
4. Zielinska N, Podgórski M, Haładaj R, Polguj M, Olewnik Ł. Risk factors of intervertebral disc pathology-A point of view formerly and today-A review. *Journal of clinical medicine*. 2021;10(3):409.
5. Yoon WW, Koch J. Herniated discs: when is surgery necessary? *EFORT Open Reviews*. 2021Jun;6(6):526.
6. Arts MP, Kuršumović A, Miller LE, Wolfs JF, Perrin JM, Van de Kelft E, Heidecke V. Comparison of treatments for lumbar disc herniation: systematic review with network meta-analysis. *Medicine*. 2019;98(7).
7. Rickers KW, Pedersen PH, Tvedebrink T, Eiskjær SP. Comparison of interventions for lumbar disc herniation: a systematic review with network meta-analysis. *The Spine Journal*. 2021;21(10):1750-62.
8. Jarebi M, Awaf A, Lefranc M, Peltier J. A matched comparison of outcomes between percutaneous endoscopic lumbar discectomy and open lumbar microdiscectomy for the treatment of lumbar disc herniation: a 2-year retrospective cohort study. *The Spine Journal*. 2021;21(1):114-21.
9. Brintz CE, Coronado RA, Schlundt DG, Jenkins CH, Bird ML, Bley JA, Pennings JS, Wegener ST, Archer KR. A Conceptual Model for Spine Surgery Recovery: A Qualitative Study of Patients' Expectations, Experiences, and Satisfaction. *Spine*. 2022;10-97.
10. Takara KS, Alaminio Pereira de Viveiro L, Moura PA, Marques Pasqual A, Pompeu JE. Roland-Morris disability questionnaire is bidimensional and has 16 items when applied to community-dwelling older adults with low back pain. *Disability and Rehabilitation*. 2022:1-7.
11. Yamato TP, Maher CG, Saragiotto BT, Catley MJ, McAuley JH. The roland-morris disability questionnaire: one or more dimensions?. *European Spine Journal*. 2017;26:301-8.
12. Ilić I, Šipetić-Grujičić S, Grujičić J, Živanović Mačužić I, Kocić S, Ilić M. Psychometric properties of the world health organization's quality of life

- (WHOQOL-BREF) questionnaire in medical students. *Medicina*. 2019;55(12):772.
13. Kalfoss MH, Reidunsdatter RJ, Klöckner CA, Nilsen M. Validation of the WHOQOL-Bref: Psychometric properties and normative data for the Norwegian general population. *Health and Quality of Life Outcomes*. 2021;19(1):1-2.
  14. Pomeroy IM, Tennant A, Mills RJ, TONiC Study Group, Young CA. The WHOQOL-BREF: a modern psychometric evaluation of its internal construct validity in people with multiple sclerosis. *Quality of Life Research*. 2020;29:1961-72.
  15. Kim S. World Health Organization quality of life (WHOQOL) assessment. *Encyclopedia of quality of life and well-being research*. 2020:1-2.
  16. Casamali FF, Schuch FB, Scortegagna SA, Legnani E, De Marchi AC. Accordance and reproducibility of the electronic version of the WHOQOL-BREF and WHOQOL-OLD questionnaires. *Experimental gerontology*. 2019;125:110683.
  17. Vaegter HB, Christoffersen LO, Enggaard TP, Holdgaard DE, Lefevre TN, Eltved R, Reisenhus CH, Licht TW, Laustsen MM, Hansson SH, Jensen PF. Socio-demographics, pain characteristics, quality of life and treatment values before and after specialized interdisciplinary pain treatment: results from the Danish clinical pain registry (PainData). *Journal of Pain Research*. 2021;12:15-30.
  18. Juneyoung LY, Porucznik CA, Gren LH, Guan J, Joyce E, Brodke DS, Dailey AT, Mahan MA, Hood RS, Lawrence BD, Spiker WR. The impact of preoperative mindfulness-based stress reduction on postoperative patient-reported pain, disability, quality of life, and prescription opioid use in lumbar spine degenerative disease: a pilot study. *World neurosurgery*. 2019;121:e786-91.
  19. Panneerselvam K, Kanna RM, Shetty AP, Rajasekaran S. Impact of acute lumbar disk herniation on sexual function in male patients. *Asian Spine Journal*. 2021;16(4):510-8.
  20. Lenschow M, Perrech M, Telentschak S, Von Spreckelsen N, Pieczewski J, Goldbrunner R, Neuschmelting V. Cerebrospinal fluid leaks following intradural spinal surgery—Risk factors and clinical management. *Frontiers in Surgery*. 2022;9:959533.
  21. Li WS, Li GY, Yan Q, Chen WT, Cong L. The effectiveness and safety of annulus closure device implantation in lumbar discectomy for patients with lumbar disc herniation: a systematic review and meta-analysis. *European Spine Journal*. 2023;3:1-0.
  22. Lin EY, Chen PY, Tsai PS, Lo WC, Chiu HY. Trajectory of health-related quality of life and its determinants in patients who underwent lumbar spine surgery: a 1-year longitudinal study. *Quality of Life Research*. 2018;27:2251-9.
  23. Wagner A, Shiban Y, Wagner C, Aftahy K, Joerger AK, Meyer B, Shiban E. Psychological predictors of quality of life and functional outcome in patients undergoing elective surgery for degenerative lumbar spine disease. *European Spine Journal*. 2020;29:349-59.

## Additional Information

**Disclosures:** Authors report no conflict of interest.

**Ethical Review Board Approval:** The research was a retrospective study.

**Human Subjects:** Consent was obtained by all patients/participants in this study.

**Conflicts of Interest:**

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

**Financial Relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

**Other Relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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### **AUTHOR CONTRIBUTION**

<b>Author's Full Name</b>	<b>Intellectual Contribution to Paper in Terms of:</b>
1. Murtaza Ahmed Khan	Study Design, Article Writing, and Data Collection.
2. Abdul Hameed	Final Review and Approval.
3. Haleema Saadia Khan	Data Analysis and Interpretation of Results.
4. Tahira Hameed	Literature Review and Referencing.
5. Abdul Qadeer Khan	Methodology and Literature Review.