



A Meta-analysis: Incidence Rate of Spontaneous Resorption in Patients with Lumbar Disc Herniation

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Abstract. The most frequent cause of degenerative diseases of the lumbar spine is *Lumbar Disc Herniation* (LDH), covering 3% of the population. Lumbar Disc Herniation (LDH) can be recovered with conservative treatment, and this can occur due to a spontaneous resorption process in the intervertebral disc tissue. This research, therefore, aims to determine the incidence rate of spontaneous resorption in LDH, how the process occurs, and whether conservative treatment can improve recovery in patients with LDH. The researchers searched using pertinent references and several publications chosen in accordance with the requirements; the researchers evaluated the study's quality (risk of bias) using the QUADAS-2 method and subsequently obtained the study through PubMed, Google Scholar, Science Direct, and Scopus databases and utilizing RevMan Version 5.4 software in the meta-analysis. Subgroup analysis was also carried out to filter the titles and abstracts of the articles taken. The data collected gave the overall result of spontaneous resorption after LDH of 67% (95% CI 54%–79%), and this meta-analysis also revealed results divided into subgroups, that the incidence of spontaneous resorption on the European continent was 70% (95% CI 49%–91%), while in Asia, it was 64% (95% CI 58%–70%). Hence, the researchers conclude that the incidence rate of LDH reabsorption is generally around 67%. On the Asian Continent, the resorption rate was found to be 64%, which is approaching the average rate, while on the European Continent, the frequency was considerably higher at 70%. The likelihood of LDH reabsorption with conventional therapy may be impacted by the clinical standards in these nations, as in Continental Europe, a developed country with a superior health care system. Hence, it becomes one factor in increasing the incidence rate of resorption.

Keywords: disc herniation · Lumbar · conservative treatment · incidence · spontaneous resorption · meta-analysis · study designs · observational studies · systematic review

1 Introduction

The condition known as Lumbar Disc Herniation (LDH) is brought on by injury to the annulus fibrosus, which results in the intervertebral disc's nucleus pulposus protruding, usually posterolaterally [1, 2 3]. The most frequent degenerative disc condition is LDH, which is treated with either surgery or non-invasive methods [4, 5, 6]. According to conservative treatment, 60% to 90% of patients with LDH recover; even those with a severely herniated disc or concomitant neurological abnormalities get positive results [7, 8, 9].

According to published research, conservative treatment for LDH offers the benefit of lowering clinical symptoms, which may even go away in a matter of weeks [10, 11, 12]. Additionally, numerous investigations have examined the outcomes of CT and MRI scans to demonstrate this scientific phenomenon [12, 13].

Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) both have revealed since 1990 that conventional therapy enables the herniated disc to resorb [14, 15]. Nevertheless, despite numerous reports, there has been little investigation into the phenomenon's occurrence, and scholars are committed to understanding how resorption occurs. One of the supportive diagnostic methods for LDH is magnetic resonance imaging (MRI). Surgeons advise surgery when the percentage of the protrusion has an LDH > 50%; however, clinical observations show that the higher the percentage of the protrusion, the simpler it is for resorption to take place [16, 17]. After conservative treatment, disc resorption occurs in 20% to 60% of LDH patients [18].

Specifically, this study aims to analyze spontaneous responses to LDH, such as those detected by MRI or CT, using conservative methods in cross-sectional meta-analyses.

2 Method

2.1 Research Design

This research utilized a systematic review and meta-analysis study design.

2.2 Article Search Strategy

Online databases like PubMed, Google Scholar, Science Direct, and Scopus were used for study searches. Using the created PICO formulation, the study search method was executed. The following keywords were employed to find articles in the database: incidence, nation, observational studies, meta-analysis, study designs, systematic review, lumbar disc herniation, spontaneous resorption, and conservative treatment. In 2022, a search for the article was conducted.

2.3 Criteria of Study

All the studies the authors selected utilizing MRI or CT measures to determine were peer-reviewed cohort studies, and the degree of lumbar disc protrusion on conservative treatments of LDH was released up to 2021. The studies should also show the number of patients with LDH, their condition, and the resorption rate. When the study was not written in English, and there were not enough patients, those were the exclusion criteria in this circumstance.

2.4 Data Extraction

Relevant data were obtained from chosen research using a standardized form containing the following details: country, patient age, length of treatment, and the number of patients with LDH who underwent MRI or CT testing.

2.5 Quality of Evidence

Once an article satisfied the requirements, the authors utilized the QUADAS-2 tool to evaluate its quality and bias risk. The QUADAS-2 tool is advised for utilization in systematic reviews to determine the likelihood of bias and studies on applicable primary diagnostic accuracy. The four main QUADAS-2 domains consisted of index testing, patient selection, reference standards, timing, and flow.

2.6 Statistical Analysis

The Cochrane Collaboration's Review Manager Software, version 5.4, was utilized to analyze data. Results are presented as percentage values for categorical variable analysis. Using Review Manager Software Version 5.4 and the inverse variance approach, the 95% confidence intervals for weighted risk ratios (CIs) were computed for all variables, including categorical variables. For each analysis, heterogeneity was calculated using the heterogeneity statistic I^2 and an I^2 . In cases where there was no indication of study heterogeneity, a fixed-effects model was used. In addition, for the meta-analysis, a random effects model was employed if there was evidence of heterogeneity.

3 Results

A preliminary literature review yielded 779 pertinent trials in PubMed, Google Scholar, Science Direct, and Scopus. Due to duplicate data, 304 items were eliminated. Reviewing references turned up two more articles. Twelve articles were chosen to be read in their entirety once the titles and abstracts were read. A handful was disqualified because they listed the total number of patients with spontaneous resorption. As a result, the meta-analysis used ten trials. The PRISMA Flowchart in Fig. 1 summarized the selection procedure when only ten studies out of 779 publications met the inclusion criteria.

3.1 Quality of Evidence Result

Included 566 patients with LDH treated conservatively, a total of 380 participants in the ten investigations experienced resorption. Table 1 displays the studies chosen for meta-analysis. The researchers independently evaluated each study's quality using the QUADAS-2 criteria, and the findings are presented in Table 2. In this instance, there was significant variability but no discernible publishing bias between studies' relevance.

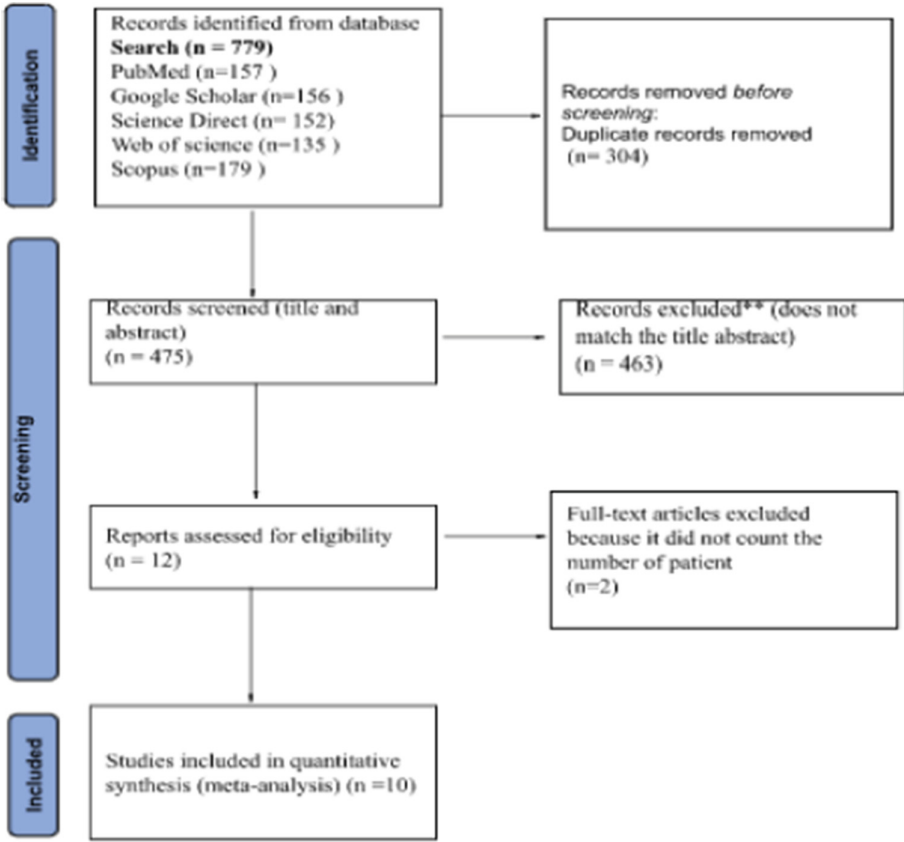


Fig. 1. PRISMA Flowchart

3.2 Meta-analysis Result

As depicted in Fig. 2 in forest plots, this meta-analysis revealed that the prevalence of spontaneous resorption following LDH, in general, was 67% (95% CI 54%-79%). The funnel plot revealed a small amount of publishing bias, and through meta-analysis, the researchers could gauge the absorption rate (Fig. 2).

Overall, ten papers originated from Japan, the UK, France, Italy, and Korea, although most were from Japan and the UK. The meta-analysis uncovered that the incidence of uncontrollable absorption on the continent was 70% (95% CI 49%–91%) (Fig. 4), whereas it was 64% (95% CI 58%-70%) in continental Asia (Fig. 4). The sensitivity analysis’s findings also revealed that after eliminating three low-quality articles, the change went from 92% to 0%. In addition, after LDH, the frequency of spontaneous resorption decreased from 67% to 64%. (Fig. 5). As a result, the results barely altered, showing the validity of the research findings gathered (Fig. 3).

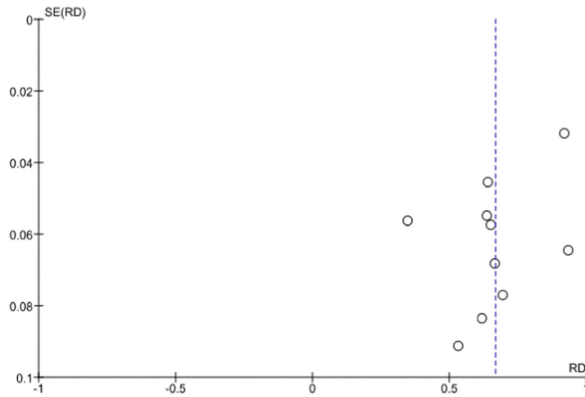


Fig. 2. Funnel Plot for Incidence

4 Discussion

The first report of lumbar disc resorption following conservative therapy was published in 1984 by Guinto et al. [22]. Since then, many experts have reported similar results regarding LDH resorption [23]. Saal et al. (1990) [24] originally described the occurrence of spontaneous resorption as shown by MRI and CT in an article published in Spain in 1990. This example demonstrates that LDH can be treated with caution. The mechanism of this resorption can occur due to three factors. 1) The intervertebral disc's end can stimulate the growth of new capillaries and increase resorption when vascular endothelial growth factor is present [25]. 2) Neoplastic necrosis factor has considerable phagocytic activity, stimulates the release of cytokines, promotes macrophage aggregation, and releases a substantial portion of interleukin, leading to the sequestration of herniated disk tissue [26]. 3) The intervertebral disc tissue is surrounded by the annulus fibrosus and the cartilage endplate, the largest non-blood transport network in the human body. This tissue is isolated from the human immune system and has antigenicity. When the intervertebral disc tissue ruptures through the annulus, an autoimmune reaction occurs to remove the foreign body in the nucleus pulposus. In this process, apoptosis-related factor ligands play an essential role in inducing apoptosis and mediating inflammation [9].

Moreover, LDH is a frequent recurring condition [27, 28]. Its influence on the quality of life is also significant. In general, today's orthopedists agree that an early trial of conservative treatment is preferable to surgery for most individuals with LDH. In this regard, CT and MRI have been demonstrated to be beneficial methods for monitoring LDH sufferers getting conservative treatment. The articles the researchers collected in this meta-analysis contained from two continents: Asia and Europe. The researchers took them because these two continents often provide subscriptions in the form of conservative treatment. Thus, it was very suitable for the data search. After reviewing the selected literature, the researchers concluded that the general incidence rate of LDH reabsorption is about 67%. On the Asian Continent, the resorption rate was found to be 64%, which is about average, while the incidence was much higher on the European Continent, at

Table 1. Accepted Studies

Study	Number of LDH Patients Tested by MRI or CT	Number with Spontaneous Resorption	Continent	Measure Method	Age Range (years)	Review Time	Therapy
Ahn et al.	36	25	Asia	MRI or CT	17 – 74		Bed rest, physical therapy, oral steroids, massage, NSAIDs
Autio et al.	74	68	Europe	MRI	19 – 78	3 – 28 weeks	Conservative
Bozzao et al.	69	45	Europe	MRI	23 – 65	6 – 15 months	Conservative
Bush et al.	111	71	Europe	CT	17 – 72	12 months	Prescribed analgesics, bed rest NSAIDs, manual techniques
Cribb et al.	15	14	Europe	MRI	24 – 73	5 – 56 months	Conservative
Iwabuchi et al.	34	21	Asia	MRI		Every three months	Conservative
Komori et al.	77	49	Asia	MRI	18 – 86	2 – 40 months	Conservative
Komori et al.	48	32	Asia	Gd-MRI	20 – 75	3 – 6 months	Conservative
Splendiani et al.	72	25	Europe	MRI	21 – 68	–	Conservative
Wang et al.	30	16	Asia	MRI	14 – 69	2 – 40 months	Conservative

70%. Further, LDH reabsorption with conservative treatment could be impacted by the clinical standards in these nations. The European Continent, as a developed nation, has a superior health care system. Consequently, conservative treatment can minimize the risk of complications, relieve the patient, minimize financial problems for the patient, and improve their quality of life [29, 30].

Table 2. Modified by QUADAS-2

Study	Was a consecutive or random sample of patients enrolled?	Did the study avoid inappropriate exclusions?	Was the method of imaging tests described?	Were all patients tested with MRI or CT?
Ahn et al.	Yes	Yes	Yes	Yes
Autio et al.	Unclear	Yes	Yes	No
Bozzao et al.	Yes	Yes	Yes	Yes
Bush et al.	Yes	Yes	Yes	Yes
Cribb et al.	Yes	Yes	Yes	Yes
Iwabuchi et al.	Yes	Yes	Yes	Yes
Komori et al.	Yes	Yes	Yes	Yes
Komori et al.	Yes	Yes	Yes	Yes
Splendiani et al.	Unclear	Yes	Yes	Yes
Wang et al.	Yes	Yes	Yes	No

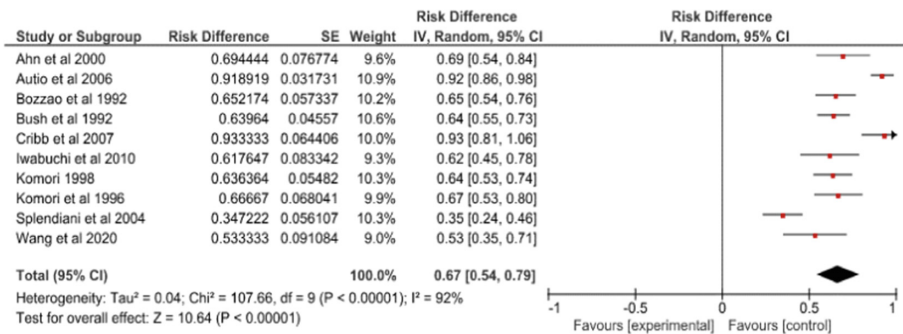


Fig. 3. Forest Plot for Incidence

Because spontaneous resorption occurs at a comparatively high rate in Lumbar Disc Herniation that the researchers have described above, further research is needed regarding spontaneous regression after LDH with conservative treatment. Additionally, this study is superior to previous studies because there were better results in the Continental European subgroup, where the results of the risk difference were 70% (p < 0.00001).

Due to a lack of data sources, either published papers or abstracts, this research was constrained. The discrepancies in inclusion and exclusion criteria and the chosen treatment technique were the clear contributing variables in the absence of any randomized control trials that satisfied the criteria. Therefore, a random-effects model was selected to take into account this variability.

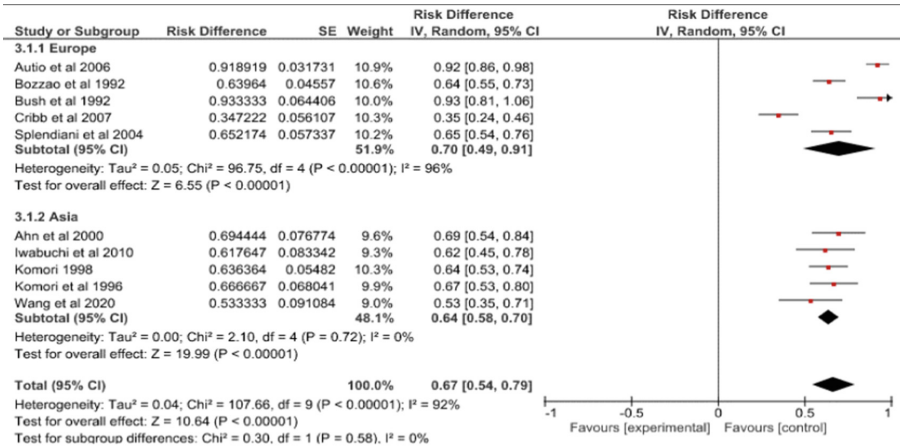


Fig. 4. Forest Plot for Incidence in Various Continents

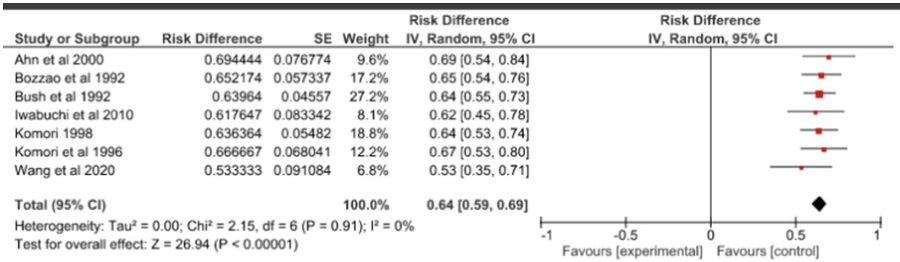


Fig. 5. Forest Plot after Removing Three Low-Quality Studies

5 Conclusion

Regardless of whether LDH should be managed through surgery or conservatively, it is still a contentious issue. This study’s findings support the existence of the phenomena of LDH reabsorption, with a total incidence rate of up to 67%. As a result, the first option for treating LDH can be conservative treatment. Hence, patients and society will benefit from lower healthcare expenses. Then, future research with randomized controlled trials is hoped to be necessary to examine the phenomena of spontaneous resorption in LDH since there have only been a few studies on it.

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Authors’ Contributions. The final paper in this study was authored by all the listed authors. FSS contributed to writing the article, SSP and ANA reviewed the article and provided direction and guidance in writing and overall analysis methods.

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