Review Article

Lumbar disk herniation in pregnancy: its incidence, presentation and management: a systematic review

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Background: Back pain in pregnancy is common, but pain from lumbar disk herniations in pregnancy is rare. This systematic review aims to comprehensively analyse literature on lumbar disk herniation in pregnancy, focusing on risk factors, incidence, clinical presentation, and management.

Methods: We conducted a literature review using PubMed and Web of Science databases, including studies from January 1, 1950, to August 1, 2023. The Critical Appraisal Skills Programme (CASP) checklist for cohort studies and the Joanna Briggs Institute Critical Appraisal Checklist for case-control studies were utilised to assess risk of bias. The review protocol was not previously published.

Results: A total of 41 studies were reviewed, with 6 addressing incidence and risk factors and 35 focusing on clinical presentation and management. Symptomatic lumbar disk herniation during pregnancy was found to be uncommon, with no significant predisposition noted during pregnancy as per magnetic resonance imaging (MRI) findings. However, patients with MRI-detected herniations were more likely to report back pain. Non-surgical management resulted in higher rates of complete symptom resolution (69% *vs.* 50%) and lower rates of cesarean section (57% *vs.* 70%) compared to surgical management. Among surgically treated patients, microdiscectomy showed higher symptom resolution (59%) compared to laminectomy (17%) or a combined approach (33%).

Conclusions: While pregnancy does not inherently increase the risk of herniated lumbar disks, the presence of a prolapsed disk can predispose to back pain during pregnancy. There is poor quality evidence that should be interpreted cautiously. Non-surgical management, in the absence of red-flag symptoms including bowel and bladder dysfunction may be trialled and yield comparatively better symptom resolution. Additionally, surgical management if necessitated has no clear link to pregnancy complications within the scope of this study.

Keywords: Pregnancy; lumbar; disk; herniation

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Introduction

Back pain is common during pregnancy, affecting approximately 49% of expectant mothers (1). This condition arises from a combination of both mechanical and biological factors. From a mechanical standpoint, the anterior shift in centre of gravity of pregnant women increases axial loading on the spine. Concurrently, biological aspects play a role, elevated levels of relaxin—a hormone that facilitates remodelling and softening of connective tissues (2,3).

Most cases of back pain during pregnancy are effectively managed with conservative methods, such as physical therapy and bed rest (4). However, a subset of women experience disabling sciatica and radiculopathies, associated with lumbar disk herniations, requiring more extensive management (5). Current recommendations favour conservative management unless 'red flag' symptoms emerge or non-surgical methods fail. The complexity of these cases lies in balancing the well-being of both the mother and the foetus. Thus, decisions should be made with the most robust available evidence (6).

There are limited studies on symptomatic pregnant women with herniated lumbar disks. Most studies consist of case studies or small case series. While a prior systematic review has been published, it focused solely on management and omitted features including incidence, risk factors, variations in presentation between non-surgically managed and surgically managed patients nor examine outcomes based on surgery type. This study seeks to address this gap in the existing body of research. In particular, our analysis delves into the relationship between pregnancy and the risk of herniation, examining the efficacy of various management, both surgical and non-surgical. The insights gained will be valuable for clinicians in making treatment decisions for women with lumbar disk herniations. We present this article in accordance with the PRISMA reporting checklist (available at https://jss.amegroups.com/article/view/10.21037/jss-24-3/rc).

Highlight box

Key findings

- In the absence of red-flag symptoms such as bowel or bladder dysfunction and neurological symptoms, non-surgical management may yield equal if not better outcomes.
- In these cases, non-surgical management should be trialled first.

What is known and what is new?

- Back pain in pregnancy is common but its aetiology is uncommonly lumbar disk herniation.
- Non-surgical management includes physiotherapy and bed rest.
- Surgical options are performed in the minority of patients, mostly for refractory or red flag symptoms, and include microdiscectomy, laminectomy and a combination, the most common of which is isolated microdiscectomy.
- Nil overt pregnancy complications occurred from surgical management.
- Nil overt effects of surgery on neonates.
- Non-surgical management may yield greater complete symptom resolution (however, this patient cohort may have less severe initial symptoms).

What is the implication, and what should change now?

- Surgical management if required does not seem to increase pregnancy complication rates and is relatively safe.
- Given low quality evidence, management should continue to be made on a case-by-case basis considering both maternal and foetal well-being.
- Further research would be aided by more robust studies or comprehensive databases given the relatively low incidence of lumbar disk herniations in pregnancy.

Methods

A systematic literature review was conducted utilising the PubMed and Web of Science databases. The search was based on key terms: "lower back pain" OR "herniated lumbar disk" OR "disk hernia" OR "disk protrusion" AND "pregnancy". Following initial screening, we explored the reference lists of the included articles to identify additional relevant studies. This research protocol was not previously registered in a review protocol database.

Inclusion and exclusion criteria

Studies between January 1, 1950, to August 1, 2023, analysing asymptomatic or symptomatic cases of herniated lumbar disks in pregnancy were assessed for their eligibility by three independent reviewers (G.T.M., S.R. and N.Y.C.). Studies with discrepancies were evaluated through reviewer discussion. There were no limitations concerning follow-up duration or the pregnancy stage at which the studies were conducted. The databases were last accessed in August 2023.

Studies investigating symptomatic lumbar disk herniation in pregnancy were divided into two primary categories: those involving non-surgical and those involving surgical management. With the surgical category, further sub-classification was based on the type of procedure performed: including microdiscectomy, laminectomy or

both microdiscectomy and laminectomy.

Clinical outcome measures were drawn from studies where treatment occurred during pregnancy by assessors G.T.M., N.Y.C. and S.R. The reporting spanned from point of presentation to post-operative follow-up. The primary outcomes analysed include bladder or bowel dysfunction, neurological symptoms including paraesthesia and weakness, the type of delivery and any delivery complications.

Exclusion criteria included abstracts or reviews from meetings, articles not written in English, and studies involving participants who experienced symptom onset prior pregnancy.

The review was not formally registered and there is no published protocol. Additionally, no amendments were made to the review process post initiation.

Quality assessment

A quality assessment was performed on all included studies by the initial reviewers (G.T.M., S.R. and N.Y.C.) independently. Cohort studies were assessed using the Critical Appraisal Skills Programme (CASP) cohort study checklist consisting of 12 questions. Case reports and series were appraised with the Joanna Briggs Institute Critical Appraisal Checklist was used.

Data extraction and analysis

The studies focusing on the incidence and risk factors for lumbar disk herniation in pregnancy were analysed narratively.

Regarding the presentation and management of lumbar disk herniation in pregnancy, data was extracted on outcomes including bladder or bowel dysfunction, neurological symptoms including paraesthesia and weakness. This data was collected from initial presentation and final reported follow-up. Delivery complication data was also collected. Outcomes not reported or unresolved were marked as 'unknown' and excluded from analysis. Participants were categorised into non-surgical or surgical management groups, with the latter subdivided based on type of surgery: laminectomy, microdiscectomy or combination. Means and percentages across different management strategies and surgical types were calculated. Some basic statistical analysis was completed through SPSS ($\alpha<0.05$) software however, a comprehensive statistical analysis was precluded due to the limited number of studies.

Results

A systematic search of the PubMed and Web of Science databases revealed 1,498 articles, out of which 136 were duplicates. Three further articles were identified via screening of article references.

The article titles were reviewed for inclusion criteria and excluded leaving 86 articles. After review of abstracts a further 27 papers did not to meet the inclusion criteria. The remaining 59 articles were screened using the full texts. Eighteen were excluded, leaving 41 papers for the final review. Forty-one articles were included in the study, 6 studies analysed the prevalence and risk factors of lumbar disk herniation in pregnancy and 35 were case studies and series reporting on the presentation and management of lumbar disk herniation in pregnancy. The selection process is outlined in *Figure 1*.

Prevalence and risk factors for lumbar disk herniation in pregnancy

Symptomatic lumbar disk herniation in pregnancy is uncommon. Laban's 1983 study involving 48,760 consecutive deliveries identified 5 pregnant patients exhibiting signs and symptoms of lumbar disk herniation (incidence of 1:10,000) (5). This aligns with Nyrhi's Finnish retrospective study which reported a similarly low incidence of herniations necessitating discectomy at only 11 operations per 100,000 person-years (7). In contrast, O'Connell's retrospect analysis of 1,100 surgically treated disk protrusions suggested a higher incidence of 42 during pregnancy and 8 during labour (combined incidence 5:100) (8).

Existing literature does not conclusively identify specific risk factors for lumbar disk herniation in pregnancy. Pregnancy itself does not appear to predispose an individual to herniated lumbar disks, although a pre-existing prolapsed disk may increase the likelihood of back pain during this period. Three studies utilising magnetic resonance imaging (MRI) assessments in pregnancy women have reported varying prevalence rates of herniated disks between 6–53% (9-11). Schwarz-Nemec's study on 943 European women observed significant correlation between disk degeneration and displacement ($P<0.001$), yet found no statistical significance with factors such as age, body weight, gestational age or parity (9). Weinreb *et al.* found that rates of bulging or herniation in asymptomatic non-pregnant women were similar to that of pregnant women (54% *vs.* 53%, $P>0.05$) (10). However, Chan *et al.*'s study involving a

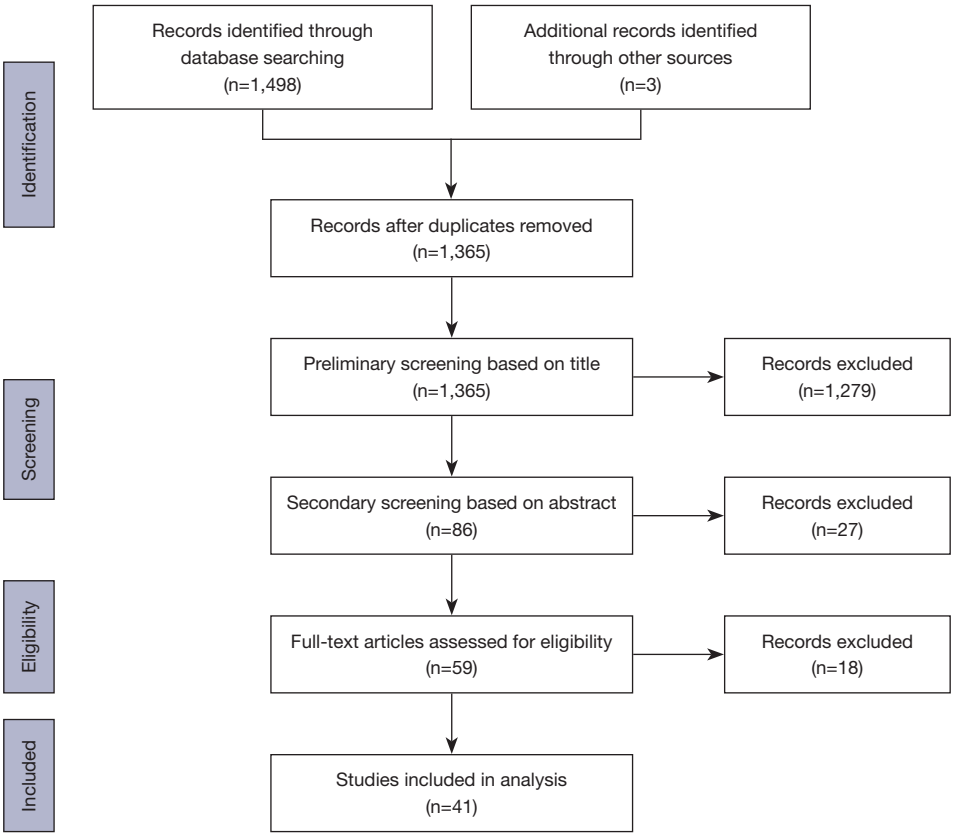

Figure 1 Search strategy used to select the included studies.

cohort of 105 Chinese women, indicated that women with disk bulge or prolapse were more likely to report back pain, suggesting a potential link between disk pathology and pregnancy-related back pain (P=0.02) (11).

Quality of evidence

Thirty-five studies focused on the presentation and management of symptomatic lumbar herniations in pregnancy (12-34). Cumulatively, these explored both operative and non-operative management options (35-46). However, the overall quality of evidence was suboptimal, primarily because studies were either case reports or case series. The quality of each study was examined based upon an eligibility criterion, appropriate measurement of outcomes and adequate follow up. There was a high risk of bias in all areas as can be seen in *Table 1*.

Of the 35 studies, 18 (51%) reported a follow-up greater than 6 weeks, 10 (29%) with less than 6 weeks follow-up and 7 (20%) with no follow-up, 6 (17%) studies did not report the type of delivery or date of delivery, and 10 (29%) did not report on delivery complications.

Presentation of symptomatic herniated lumbar disks

Collectively in the 35 studies, 79 pregnant women were treated for a symptomatic lumbar disk herniation, with an average age of 33 years (range, 24–41 years). The average gestational age at presentation was 25 weeks (range, 4–38 weeks). Twenty-three (29%) women presented with symptoms of cauda equina (urinary retention) and 28 (35%) with sciatica. Twenty-eight women (35%) did not have their presenting symptoms documented. *Figure 2* shows the percentage of the women who presented with specific symptoms.

Management of herniated lumbar disks

Of the 79 women, 23 underwent non-surgical management and 56 underwent surgical management. The only demographic with significant variation (P=0.004) was age whereby surgically managed patients were slightly older

Table 1 Summary of the quality of evidence of the case studies and series included in the analysis of the presentation and management of symptomatic lumbar herniations in pregnancy

Article	Developed and applied appropriate eligibility criteria	Appropriate measurement of outcome and exposure	Incomplete or inadequately short follow up
Abou-Shameh, 2006 (12)	+	+	+
Al-areibi, 2007 (13)	?	+	–
Anton Capitan, 2017 (14)	?	+	?
Ashkan, 1998 (15)	+	?	+
Babici, 2021 (44)	+	+	–
Brown, 2001 (17)	?	+	+
Brown, 2004 (16)	?	+	+
Butenschoen, 2021 (18)	+	+	+
Comlek, 2021 (19)	?	+	+
Curtin, 2007 (20)	+	?	+
Esmaeilzadeh, 2020 (21)	+	+	+
Forster, 1996 (22)	?	+	+
Garmel, 1997 (23)	+	?	?
Geftler, 2015 (24)	?	+	+
Gupta, 2008 (25)	?	?	–
Hakan, 2012 (26)	+	+	+
Hayakawa, 2017 (27)	+	?	+
Kathirgamanathan, 2006 (29)	+	+	–
Kim, 2007 (30)	+	?	?
Kovari, 2018 (31)	+	?	–
Kummer, 2018 (32)	?	+	?
LaBan, 1995 (33)	+	–	–
Look, 2018 (34)	+	+	?
Iyilikçi, 2004 (28)	+	+	–
Martel, 2015 (35)	+	+	+
Matsumoto, 2009 (36)	?	+	–
Mitha, 2021 (45)	+	+	–
O'Laughlin, 2008 (37)	?	+	?
Ochi, 2014 (38)	?	+	+
Opoku, 2021 (46)	?	+	–
Orief, 2012 (30)	+	?	+
S, 2019 (40)	+	+	?
Timothy, 1999 (41)	+	+	+
Viseu Pinheiro, 2018 (42)	+	+	+
Vougioukas, 2004 (43)	+	?	+

+, feature was present in article; –, feature was not present in article; ?, feature could not be adequately assessed.

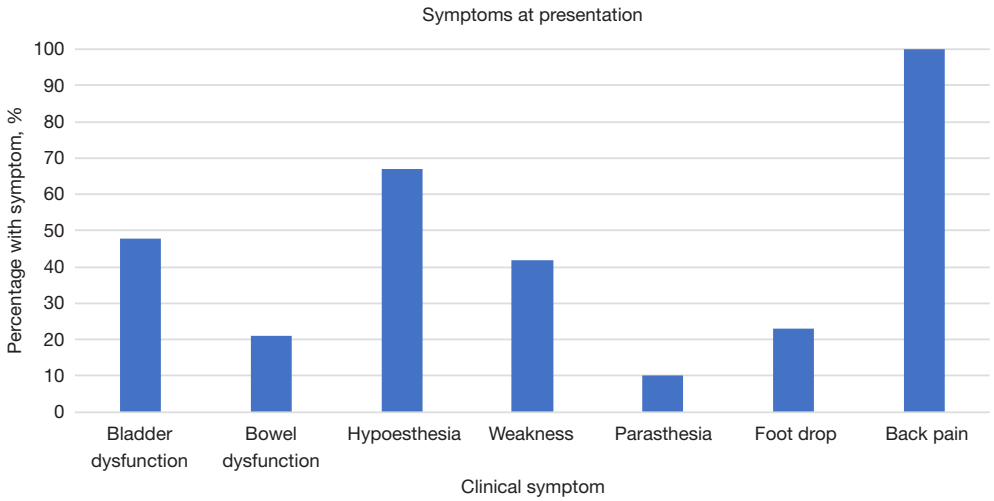

Figure 2 Percentage of each respective symptom reported by women with a symptomatic lumbar disk herniation during pregnancy at presentation (n=48).

Table 2 Demographics of non-surgically managed and surgically managed pregnant women with a symptomatic herniated lumbar disk

Variables	Conservative (n=23)	Surgical (n=56)
Age, years	31 [28–35]	34 [24–41]
Gestation weeks	24 [10–38]	25 [4–38]
Gravity (number of pregnancies)	2 [1–4]	2 [1–5]
Parity (number of births)	1 [0–2]	1 [0–2]

Data are presented as mean [range].

(31 *vs.* 34 years). There were no differences in time of symptom onset (P=0.06), delivery timing (P=0.82), gravity (P=0.89) or parity (P=0.84). The demographics of the two groups are outlined in *Table 2*.

Non-surgical management

Non-surgical management consisted of analgesics, bed rest and physiotherapy in four patients (17%), epidural and intramuscular injections with bed rest and analgesics in 15 patients (65%), and unspecified "conservative" treatment in four patients (17%). There was an average follow-up of 2 months (range, 1–6 months).

Only four patients (three treated with bed rest, physiotherapy and analgesics and one treated with epidural, bed rest and physiotherapy) had follow-up information regarding the resolution of their pain and neurological symptoms. Of these, two had a complete resolution of symptoms.

In 14 patients who underwent epidural or intramuscular injections, only pain was reported. In these patients it was found that pain significantly reduced from presentation at 6 weeks follow-up post-delivery. Thirteen of these 14 patients achieved pain control throughout pregnancy through a single injection, with one requiring a subsequent injection (19).

The percentage of non-surgically managed pregnant women with symptomatic lumbar disk herniations with their respective symptoms at presentation and final follow-up are shown in *Figure 3*. Symptoms of hypoaesthesia (P=0.04), weakness (P=0.01) and pain (P<0.001) were reduced significantly after intervention.

It should be noted that only four patients had post-treatment neurological symptoms assessed (17 patients had pain outcomes reported at follow-up). Of these 4, 3 (75%) had complete resolution. No post-treatment complications were reported.

Surgical management

Surgical management consisted of a discectomy in 29 patients (56%), laminectomy in 8 patients (15%), discectomy and laminectomy in 10 patients (19%), annulotomy in 1 patient (2%), nucleotomy in 1 patient (2%) and sequestrectomy in 3 patients (6%). 92% (48 patients) of the surgeries occurred prior delivery.

Regarding positioning, 22 patients were prone, 6 in left lateral, 1 in right lateral and 27 unknown. There was no significant difference in resolution of outcomes based

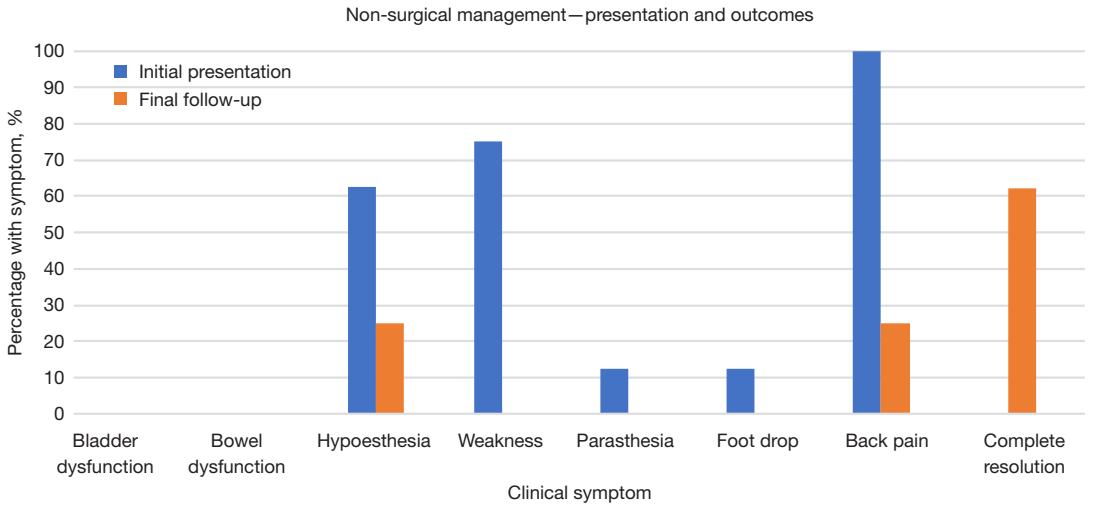

Figure 3 Percentage of non-surgically managed pregnant women with symptomatic lumbar disk herniations (n=4 for neurological symptoms and n=22 for pain) with the respective symptoms at initial presentation (blue) and final follow-up (orange).

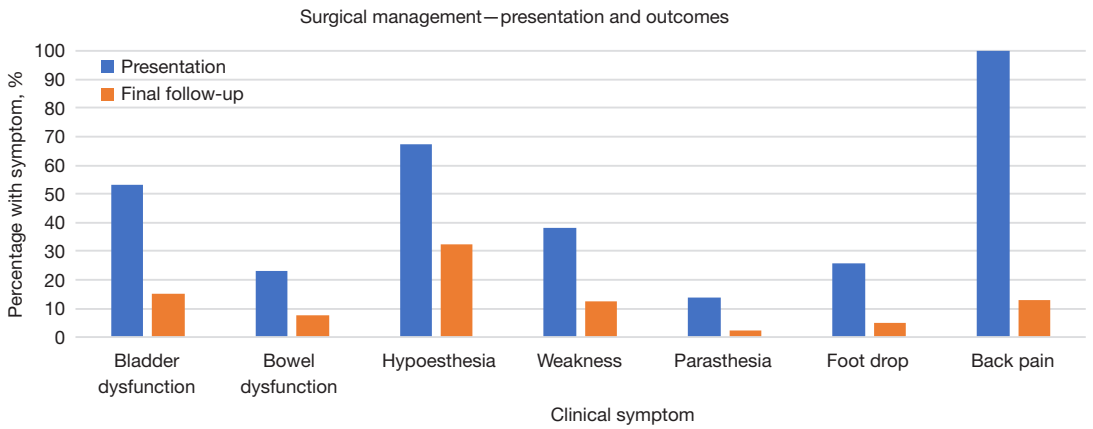

Figure 4 Percentage of surgically managed pregnant women with symptomatic lumbar disk herniations (n=42) with the respective symptoms at presentation (blue) and final follow-up (orange).

upon operative positioning (P=0.30). Patients positioned prone had average symptom onset at 23 weeks gestation (range, 10–30 weeks) whereas the lateral cohort had average symptom onset at 30 weeks gestation (range, 20–36 weeks). Twenty-three of 56 patients (41%) had general anaesthesia, 1 (2%) spinal, 3 (5%) epidural and 27 (48%) unspecified.

There was an average follow-up of 12 months (range, 1 week to 72 months). Forty patients had information regarding the resolution of their pain and neurological symptoms. Of these, 19 (48%) had a complete resolution of symptoms. *Figure 4* demonstrates an overall reduction in the percentage of symptoms reported. Post surgical intervention, there were reduced rates of bladder dysfunction (P<0.001), bowel dysfunction (P=0.02), hypoaesthesia (P=0.002), weakness (P<0.001), foot drop (P=0.01) and pain (P<0.001). However, there was nil significant appreciable reduction in paraesthesia (P=0.11).

Twelve patients did not have individual symptoms reported but at 4-year follow-up they were noted to have partial to complete resolution of neurological symptoms (18). Two complications were reported following surgery, a deep venous thrombosis and need for a subsequent discectomy to remove remnants 1 week later. Both complications resolved

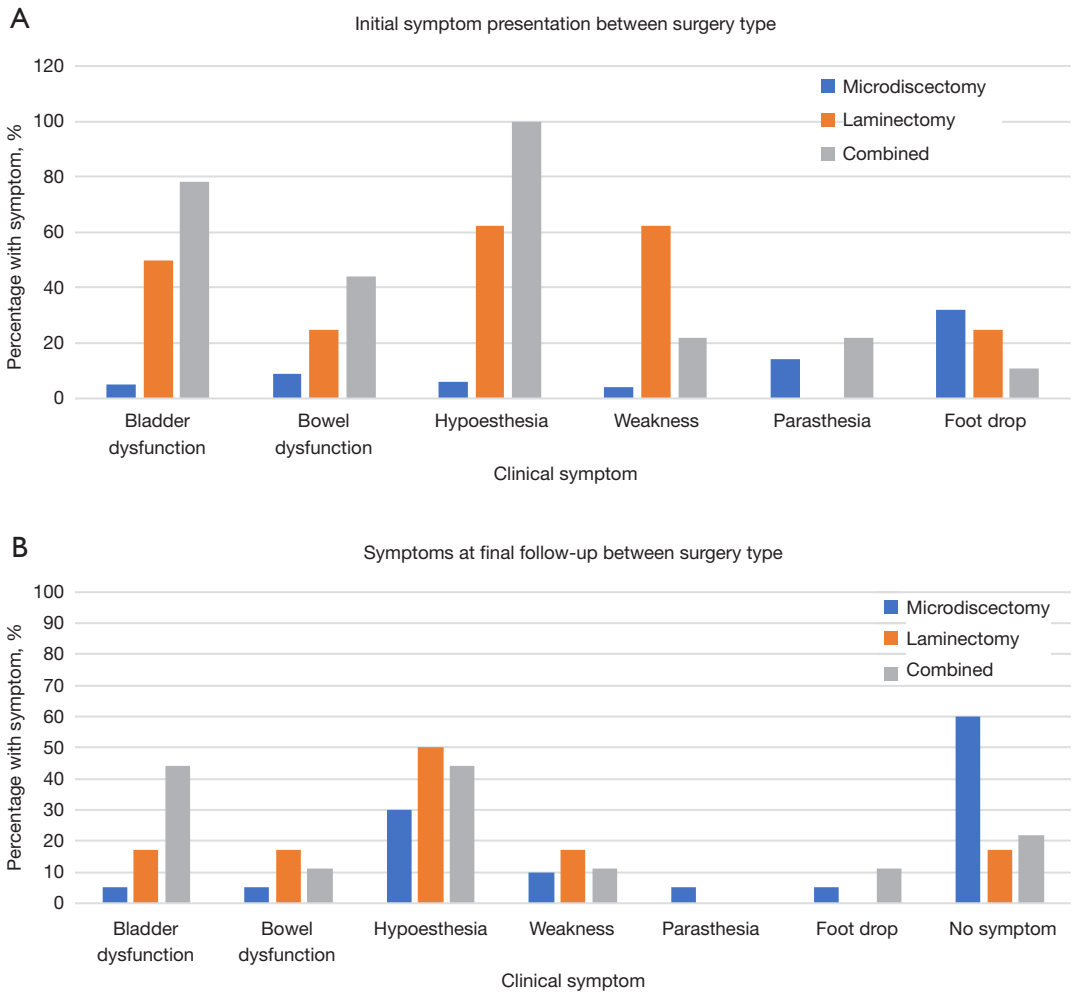

Figure 5 Presenting symptoms (A) and symptoms at final follow-up (B) based on surgery type—microdiscectomy (blue), laminectomy (orange) and combined (grey).

with no long term sequalae.

Delivery and neonatal complications

Non-surgical management had lower rates of caesarean section. Four of eight (50%) women had caesarean sections compared with 27/39 (69%) women who were surgically managed but this was not statistically significant (P=0.34, CI: 0.44–9.79). The average gestational age at delivery was 36 weeks (range, 34–41 weeks) irrespective of management strategy. There were no delivery or neonatal complications in non-surgically managed women (0%). Two women in surgically managed patients had complications (4%), with 1 having a miscarriage at 11 weeks and another having a neonate with hypospadias. There was no statistical significance in the occurrence of complications between operatively and non-operatively managed groups (P=0.56). The neonate with hypospadias was successfully surgically managed. All neonates in both groups had normal development at final reported follow-up.

Surgical subgroup analysis

The three main surgical techniques (microdiscectomy, laminectomy and combined microdiscectomy and laminectomy) were further analysed. The presenting symptoms depending on surgery undertaken is outlined in *Figure 5*. There was no significant difference in the presence of bowel dysfunction (P=0.24), hypoaesthesia (P=0.17), weakness (P=0.56), paraesthesia (P=0.34) nor foot drop

(P=0.69) amongst surgical subgroups pre-operatively. The only symptom that differed on presentation was bladder dysfunction (P=0.048), with highest rates in the combined microdiscectomy and laminectomy group (10/12 =83.3%). All the women who underwent the combined operation also had hypoaesthesia. In comparison, isolated microdiscectomy patients had lower rates of bowel dysfunction than other surgical groups and lower rates of weakness than women that underwent laminectomy.

Women who underwent an isolated microdiscectomy had a higher rate of full resolution of symptoms than (13/22, 59%) than those that underwent isolated laminectomy (1/6, 17%) or combined microdiscectomy and laminectomy (3/9, 33%). However, this was not a significant difference between surgical subgroups (P=0.12).

There were lower rates of caesarean delivery in the isolated laminectomy group than the other surgical groups (57% *vs.* 70%, P=0.38).

Comparison between surgical and non-surgical cohorts

Prior intervention, the presence of bladder dysfunction (P=0.002) and weakness (P=0.03) differed substantially between groups. Other symptoms including bowel dysfunction (P=0.07), hypoaesthesia (P=0.75), paraesthesia (P=0.98), foot drop (P=0.39) however did not. Whilst a greater proportion of non-surgically managed patients had complete symptom resolution compared to surgical counterparts, this was not found to be significant (P=0.568).

Discussion

Our examination of the literature on herniated lumbar disks in pregnancy reveals that whilst pregnancy does not appear to be a predisposing factor for herniated lumbar disks, the presence of prolapsed disks elevates the likelihood of experiencing back pain during pregnancy. Symptoms typically manifest from 25 weeks gestation in onwards, primarily affecting women in their thirties. Back pain is invariable with other neurological symptoms including hypoesthesia and bladder dysfunction being the most common. Management is complex due to considerations for both maternal and foetal health.

Non-surgical management demonstrates superior rates of symptom resolution (75% *vs.* 48%) when compared to surgical interventions, and is also associated with lower rates of cesarean section deliveries (50% *vs.* 69%). However, it should be noted that there is considerable selection bias and minimal follow-up data, with surgically managed patients exhibiting higher rates of all symptoms except muscle weakness when contrasted to the non-surgical patients, along with prolonged average follow up period (average 12 *vs.* 3 months). Consequently, it cannot be concluded that non-surgical management is superior to surgical management. Subgroup analysis of surgically managed patients revealed that patients who underwent isolated microdiscectomy showed greater tendency towards complete symptom resolution than those managed with other surgical techniques. However, surgically managed patients using combined microdiscectomy and laminectomy had higher rates of presentation with cauda equina symptoms than other managed patients, suggesting that in patients with more severe presentation, the combined surgical approach may be preferable.

Irrespective of management, all except one neonate (1%) (miscarriage at 11 weeks) were successfully delivered and exhibited normal development at final follow-up. There were also similar rates of caesarean delivery and complications in neonates were likely not associated with surgical intervention and did not differ significantly between surgically and non-surgically managed women. Thus, in circumstances where surgery is deemed necessary by the treating team, this may be done in a relatively safe manner.

A recent systematic review by Whiles *et al.* examined the management of lumbar disk herniation in pregnancy (6). They similarly found that non-surgical treatment resulted in higher complete symptom resolution in comparison to surgical treatment (62% *vs.* 56%). However, while they did not directly compare pre-treatment symptoms, Whiles *et al.* did acknowledge that selection bias may influence these outcomes. Our systematic review supports this, with nil non-surgically managed patients reporting bowel or bladder symptoms compared with 23% and 53% respectively of surgically managed woman reporting these symptoms. Notably, certain symptoms demonstrated similar frequencies between non-surgical and surgical management during presentation including back pain (100% *vs.* 100%) and hypoesthesia (63% *vs.* 68%). The surgical and non-surgical groups also demonstrated similar symptoms at final follow up: back pain (25% *vs.* 13%) and hypoesthesia (25% *vs.* 33%). While these findings should be interpreted cautiously due to the quality limitations and variation in follow-up periods (3 *vs.* 12 months), it suggests that non-surgical and surgical management offer comparable efficacy in resolving back pain and hypoesthesia associated with lumbar disk herniation.

Interestingly, prone positioning was reported most frequently intra-operatively (51%). While sources do not recommend this position after 12 weeks gestation to reduce the pre-term labour risk, we found that women who were placed in the prone position on average had an onset of symptoms at 23 weeks gestation (range, 10–30 weeks) (16,47). In the women who had surgery performed in the prone position, only two reported deliveries pre-term deliveries (35 and 36 weeks). This supports Whiles *et al.*, and Butenschoen *et al.*, who suggest that if equipment such as Relton Hall laminectomy frame are available, the prone position can be used up to 26 weeks gestation with minimal risk (6,14,18,38). Beyond the 26th week, the left lateral position becomes the preferred choice due to its surgical exposure benefits along with reduced aortocaval compression risk (1,7,22,33,39,48).

Timely diagnosis and management of disc herniation results in more favourable outcomes and prevention of long-term neurological sequelae (6). Surgical management depends on a patient's pathological anatomy and importantly involves neurological decompression (48). Reflecting patterns in the non-pregnancy population discectomy was the most commonly performed surgical procedure (49,50). Similarly, we found that discectomy was the predominant procedure performed in pregnant woman with lumbar disk herniation (56%). While presenting symptoms were unequal between surgical subgroups, notably, microdiscectomy resulted in greater symptom resolution outcomes compared to isolated laminectomy or the combined approach. This suggests that pregnant woman whose pathological anatomy makes them candidates for an isolated microdiscectomy and require surgery may have improved post-operative outcomes relative to those undergoing alternative surgical procedures. This trend may be attributed to the smaller incisions and reduced paraspinal injury associated with isolated microdiscectomy (50).

This review has significant limitations, particularly regarding the management of lumbar disk herniation. Firstly, many studies investigating the management of lumbar disk herniation in pregnancy had small numbers, with the largest being 14 participants. Secondly, the poor quality of available studies and heterogeneity reduces internal validity of the review. Statistical analysis was performed, however given the limited evidence available, results should be interpreted cautiously. Finally, there is risk of bias in purely attributing non-operative management as being more efficacious as surgical candidates likely had a greater symptom burden at onset, necessitating their operative management. Finally, Ideally, more rigorously designed studies would provide stronger and reliable evidence in this area of research. However, this may be hindered by the rarity of lumbar disk herniations in pregnancy and continue to depend on retrospective data.

Conclusions

Pregnancy itself does not increase the likelihood of developing herniated lumbar disks. However, disc prolapse is associated with a greater risk of back pain. Non-surgical management appears to have equal if not superior rates of symptom resolution than surgical management, suggesting in the absence of red-flag signs of bladder or bowel dysfunction, non-surgical management should be trialed. If surgical management is required, microdiscectomy is preferable, ideally in a prone position within the first 26 weeks of gestation, transitioning to the left lateral position thereafter. However, due to the heterogenous and poor-quality evidence, limiting rigorous statistical analysis, findings should be applied cautiously in managing this patient cohort and remain as a case-by-case multidisciplinary approach.

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Footnote

Reporting Checklist: The authors have completed the PRISMA reporting checklist. Available at https://jss.amegroups.com/article/view/10.21037/jss-24-3/rc

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jss.amegroups.com/article/view/10.21037/jss-24-3/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are 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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