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ORIGINAL ARTICLE

Imaging spectrum of spinal dysraphism in pediatric patients in a Tertiary Care Hospital in Sargodha.

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ABSTRACT… Objective: To determine frequency of different types of spinal dysraphism in pediatric patients in a Tertiary Care Hospital in Sargodha. **Study Design:** Retrospective observational study. **Setting:** Tertiary Care Hospital Sargodha. **Period:** January-2024 to December-2024. **Methods:** Medical records of 97 patients with suspected spinal dysraphism who underwent magnetic resonance imaging were included in the study. Radiology records of all these patients who underwent magnetic resonance imaging was assessed to determine ex act etiology and type of spinal dysraphism, based on characteristic imaging findings. Data was analyzed using SPSS version 22. **Results:** Mean age was 3.20 ± 2.02 years. There were 31 (31.96%) male and 66 (68.04%) female patients. Most common type of spinal dysraphism in present study was Spina bifida 27 (27.84%) followed by meningomyelocele 22 (22.68%), diastematomyelia 12 (12.37%), tethered cord 8 (8.25%), sacral agenesis 7 (7.22%), dorsal dermal sinus 7 (7.22%), lipomyelomeningocele 6 (6.19%), myelocele 5 (5.15%), syrinx 2 (2.06%) and filar lipoma 1 (1.03%). **Conclusion:** Most common type of spinal dysraphism was spina bifida while least common was filar lipoma.

Key words: Diastematomyelia, Magnetic Resonance Imaging, Meningocele, Myelocele, Spina Bifida, Spinal Dysraphism.

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INTRODUCTION

Spinal dysraphism comprises broad range of birth-related fusion abnormalities, occurring during antenatal development, in dorsal midline components comprising neural, mesenchymal and osseus tissues.[1,2] These congenital abnormalities can occur either as evident deformity or as occult lesion with mere cutaneous manifestations with a reported prevalence of 2.8%.[3,4] Early recognition and subsequent surgical correction of spinal dysraphism is crucial since it enables the prevention of long-term deficits related to neurological system.[5,6]

Classically, imaging techniques used for detection of these spinal congenital deformities were computed tomography, ultrasound and conventional radiography.[7] However, these imaging modalities lack both sensitivity as well as specificity to diagnose and determine the type of spinal dysraphism, particularly after ossification.[7,8] In comparison to this, magnetic resonance imaging (MRI) is one of the most accurate imaging techniques that can not only diagnose spinal dysraphism but also the type of congenital spinal deformity.[9] Owing to this high accuracy of MRI in making definitive pre-surgery diagnosis of various types of spinal dysraphism, accurately localizing the lesion and providing a non-invasive mode of detailed anatomical exploration; it is imaging modality of choice in this regard.[9]

There are several types spinal dysraphism reported in previous literature being detected with the use of MRI including spina bifida, myelocele, meningomyelocele, diastematomyelia, lipomyelomeningocele, lipomyelocele, syrinx, tethered cord, filar lipoma and dorsal dermal sinus, to name a few.[10] It has been observed that a demographic and geographical difference generally lies regarding the presenting pattern of any disease. Since local studies regarding the distribution of different types of spinal dysraphism are generally lacking, present study was conducted with the aim to determine frequency of different types of spinal dysraphism on MRI among pediatric patients presenting at a tertiary care setup in Sargodha.

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METHODS

This retrospective observational study was conducted at Tertiary Care Hospital Sargodha from January 2024 to December 2024 after taking ethical committee approval (MSF(H)/308/3/1/TRG/JAN2025) of the institution for accessing and assessing the radiology records of the patients who underwent MRI at the institution.

Inclusion Criteria

Male and female pediatric patients, with suspected spinal dysraphism who underwent magnetic resonance imaging were included in the study were included.

Exclusion Criteria

Patients who records were missing, those who had MRI after traumatic injury, suspected transverse myelitis, anencephaly, cerebellar polio, suspected spinal tumor and cerebral palsy were excluded.

At all time principles of World Medical Association Declaration of Helsinki were followed. Once approval was obtained from the ethical committee, radiology records of all the patients meeting the inclusion criteria was assessed. Demographic features of the patients including their age, gender and clinical presentation with which patient presented were documented. At the time of conductance of study, records of around one hundred and seventeen patients was available. Amongst these only 97 had all the patient information and detailed MRI reports available and this constituted the final sample size. Another criteria for selection of patient records to be made part of this study was that the imaging protocol was uniform in all the patients.

A protocol was preset for selection of patient records to be included in the study. All the MRI scans were performed under sedation without the use of intravenous contrast media. Images were obtained in sagittal, coronal and axial planes. In all these planes both T1- and T2-weighted images were obtained. Thickness of the spine for head MRI was set at 5mm, for thoracic &lumbar region at 4mm and for cervical region at 3mm. It was also ensured that all the MRI scans performed for diagnostic evaluation of spinal dysraphism were examined and reported by consultant radiologist with minimum experience of five years in the field. If all these parameters were followed, only then a patient's record was considered eligible to be made part of the study. Through the review of these records, type of spinal dysraphism was determined and documented on the a predesigned proforma approved by the institutional ethical committee.

Data analysis was done through Statistical Package for Social Sciences (SPSS) software version 22.00. Normality of data was checked by Shapiro-Wilk test which showed that age which was the only quantitative variable was normally distributed and was thus represented as mean with standard deviation. Qualitative variables (gender, clinical presentation and type of spinal dysraphism) were represented by using percentage and frequency. Types of spinal dysraphism were stratified by age and gender to deal with effect modifiers and post-stratification, Chi-sqaure test was used with a p-value of ≤ 0.05 taken as statistically significant.

RESULTS

In this study, medical records of 97 patients were evaluated. Mean age of study participants was 3.20 ± 2.02 years. Frequency of patients aged less than one year was 11 (11.34%), 1-5 years was 75 (77.32%) and more than five years was 11 (11.34%). There were 31 (31.96%) male and 66 (68.04%) female patients. Most common clinical presentation was swelling on the back that occurred in 41 (42.27%) patients. These demographic features of study participants are given in Table-I.

TABLE-I

Demographic features of study participants (n = 97)

Demographic feature	Mean ± SD; n (%)
Mean age	3.20 ± 2.02 years
Age groups	
< 1 year	11 (11.34%)
1-5 years	75 (77.32%)
> 5 years	11 (11.34%)
Gender	
Male	31 (31.96%)
Female	66 (68.04%)
Clinical presentation	
Swelling on the back	41 (42.27%)
Weakness of the lower limbs	28 (28.87%)
Tuft of hair on the back	16 (16.49%)
Dimple in the sacral region	7 (7.22%)
Urine incontinence	5 (5.15%)

Most common type of spinal dysraphism detected on MRI in present study was Spina bifida 27 (27.84%) followed by meningomyelocele 22 (22.68%), diastematomyelia 12 (12.37%), tethered cord 8 (8.25%), sacral agenesis 7 (7.22%), dorsal dermal sinus 7 (7.22%), Lipomyelomeningocele 6 (6.19%), myelocele 5 (5.15%), syrinx 2 (2.06%) and filar lipoma 1 (1.03%). This distribution of frequency of different types of spinal dysraphism on MRI among pediatric patients presenting at a Tertiary Care Setup in Sargodha is given below in Table-II:

TABLE-II

Imaging spectrum of spinal dysraphism (n = 97)

Type	n (%)
Spina bifida	27 (27.84%)
Meningomyelocele	22 (22.68%)
Diastematomyelia	12 (12.37%)
Tethered cord	8 (8.25%)
Sacral agenesis	7 (7.22%)
Dorsal dermal sinus	7 (7.22%)
Lipomyelomeningocele	6 (6.19%)
Myelocele	5 (5.15%)
Syrinx	2 (2.06%)
Filar lipoma	1 (1.03%)

Stratification of imaging spectrum of spinal dysraphism by age is given below in Table-III:

Stratification of imaging spectrum of spinal dysraphism by gender is given below in Table-IV:

DISCUSSION

Non-invasive radiological evaluation of the soft tissues is best accomplished by the use of MRI which is a highly advanced radiological technique.[11,12] Present study focused on the spectrum of spinal dysraphism, an umbrella term that encompasses the congenital deformities of neuro-mesenchymal and osseus tissues of spine region[13], being detected with the help of MRI. In present study, over the course of one year there were only ninety-seven patients who were definitively diagnosed with some type of this congenital anomaly. This small number is attributable both to the lack of availability of advanced diagnostic facilities in poorer countries like Pakistan as well as the overall estimated incidence of these anomalies ranging between one to three per thousand live births.[14,15]

Average age of the patients in present study was five years with majority of the patients aged less than five years. This reflects somewhat better picture of healthcare surveillance at research institution allowing recognition of this group congenital anomalies at an earlier age which is essential for ensuring better long term functional outcomes.[6] In the similar vain, most of these congenital anomalies were found in the females which is also coherent with the previous literature reporting predominance of females for having these anomalies.[16,17]

TABLE-III

Stratification of imaging spectrum of spinal dysraphism by age (n = 97)

Type	< 1 years (n = 11)	1-5 years (n = 75)	> 5 Years (n = 11)	P-Value
Spina bifida	3 (27.27%)	23 (30.67%)	1 (9.09%)	0.316
Meningomyelocele	4 (36.36%)	18 (24.00%)	0 (0.00%)	
Diastematomyelia	2 (18.18%)	7 (9.33%)	3 (27.27%)	
Tethered cord	1 (9.09%)	5 (6.67%)	2 (18.18%)	
Sacral agenesis	0 (0.00%)	6 (8.00%)	1 (9.09%)	
Dorsal dermal sinus	0 (0.00%)	4 (5.33%)	3 (27.27%)	
Lipomyelomeningocele	1 (9.09%)	5 (6.67%)	0 (0.00%)	
Myelocele	0 (0.00%)	4 (5.33%)	1 (9.09%)	
Syrinx	0 (0.00%)	2 (2.67%)	0 (0.00%)	
Filar lipoma	0 (0.00%)	1 (1.33%)	0 (0.00%)	

TABLE-IV

Stratification of imaging spectrum of spinal dysraphism by gender (n = 97)

Type	Male (n = 31)	Female (n = 66)	P-Value
Spina bifida	10 (32.26%)	17 (25.76%)	0.575
Meningomyelocele	7 (22.58%)	15 (22.73%)	
Diastematomyelia	2 (6.45%)	10 (15.15%)	
Tethered cord	4 (12.90%)	4 (6.06%)	
Sacral agenesis	1 (3.23%)	1 (1.52%)	
Dorsal dermal sinus	4 (12.90%)	4 (6.06%)	
Lipomyelomeningocele	2 (6.45%)	2 (3.03%)	
Myelocele	1 (3.23%)	1 (1.52%)	
Syrinx	0 (0.00%)	2 (3.03%)	
Filar lipoma	0 (0.00%)	1 (1.52%)	

In terms of spectrum of spinal dysraphism, most common anomaly detected on MRI was spina bifida and meningomyelocele being detected in 27.84% and 22.68% of the patients while the lest common types were syrinx and filar lipoma occurring only in 2.06% and 1.03%, respectively. Compared to this, Hosagavi et al.[10] reported tethered cord and syrinx to be most common while dorsal dermal sinus and myelocele to be least common types of spinal dysraphism. In a study conducted by Chethan et al.[18], myelomenigocele was most common type while syrinx was least common type which was somewhat similar trend being observed in current study. Similarly, another study conducted by Ujala et al.[19] also found myelomenigocele to be the predominant spinal dysraphism type. Mehta et al.[20] reported that Arnold-Chiari malformation was the commonest congenital spinal anomaly. Similar to current study, another study conducted by Yeli et al.[21], spina bifida, was the commonest spinal dysraphism type while dorsal dermal sinus was least frequent.

Present study provides useful insight regarding the spectrum of spinal dysraphism in local target population and shows the common and rarer types of this congenital anomaly. There were few limitations of present study including its retrospective design which could create some bias. In addition, there was a significant variation in the imaging spectrum when compared with that reported in previous studies conducted in different demographics. Another important limitation of present study was lack of follow up of the patient outcomes after they underwent operative correction of their structural anomalies.

CONCLUSION

Assessment of imaging spectrum of spinal dysraphism by MRI shows that most common anomalies were spina bifida and meningomyelocele while least common were syrinx and filar lipoma.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Fakhar Tariq:** Data collection.
2	**Salahuddin Balooch:** Drafting.
3	**Rida Fatima Baloch:** Literature search.
4	**Mubashir Iqbal:** Data entry.
5	**Shabana:** Data analysis.
6	**Mohsin Ali Raza:** Revisions.