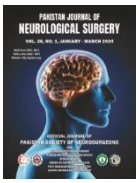

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Original Research

The Prevalence of Post-operative Complications Following Meningomyelocele Repair

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ABSTRACT

Objective: To assess the incidence of post-operative complications after meningomyelocele repair in patients presenting with Meningocele.

Materials & Methods: All the patients presenting with meningocele and myelomeningocele, age between 1 day to 5 years, both genders and patients with ASA grade I and II were included. All the baseline /routine hospital investigation was done, the lesions were assessed for age, size duration of symptoms, and location and were checked for cerebrospinal fluid leaks. The presence of associated abnormalities was evaluated. The patients were given antibiotics as per protocol before and after surgery to prevent infection. All patients were observed closely in the post-operative period for development and timely management of any complications.

Results: Among 145 children, 9% of children had defects in the cranio cervical and 91% of children had defects in the lumbosacral. 15% children had myelomeningocele size ≤3 cm while 85% of children had myelomeningocele size >3 cm. 83% of children were male and 17% of children were female. 18% of children had wound infection, 6% of children had wound dehiscence and 26% of children had CSF Leak. Stratification of postoperative complications concerning age, gender, location of NTD (cranio cervical/lumbo sacral), size (≤ 3 cm & > 3 cm), duration of symptoms (≤ 1 month & 1 month), malnourished (yes/no) showed the insignificant differences.

Conclusion: The frequency of post-operative complications i.e. wound infection was 18%, wound dehiscence was 6% and CSF Leak was 26% after meningomyelocele repair in patients presenting with Meningocele.

Keywords: Post-Operative Complications, Wound Infection, Wound Dehiscence, CSF Leak, Myelomeningocele, Meningocele.

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INTRODUCTION

Neural tube anomalies are among the most common congenital birth disorders, causing a wide range of physical, mental, and social problems throughout early life. The frequency of these abnormalities is quite high in the impoverished world, whereas in the western countries, it has reached a constant level where no reduction is detected despite extensive study into their prevention.[1-2] The purpose of this study was to establish the frequency of common post-operative problems when neural tube abnormalities are repaired in our setting. As no similar study has been undertaken in our setting in the previous three years, this research will provide us with up-to-date information on the prevalence of post-operative problems following postnatal surgical correction of myelomeningocele and meningocele in our setting. The study's findings will be shared with all other clinicians and utilized to determine the scope of the problem and its cause, as well as for future recommendations, management, and research. The study aims to investigate the prevalence of postoperative complications after meningomyelocele treatment in individuals presenting with Meningocele.

These abnormalities are the most disabling of all structural deformities, having a significant influence on the functioning of individuals, families, and societies as a whole. Families with lower socioeconomic levels are more vulnerable, as are those with poor food quality and hygiene.[4] Myelomeningocele (MMC) is the most common central nervous system abnormality, occurring in up to 71% of babies.8 The incidence is reported to be between 3 and 6 per 1000 live births.[5] In the United States, NTD affects one in every thousand people. The worldwide prevalence of myelomeningocele has been estimated to be 0.8-1 per 1,000 live births. In Pakistan, the incidence of NTDs is 13.90 per 1000 births, with meningocele at 15.8% and meningomyelocele at 5.3%. The predicted lifetime expenses are more than $250,000 per individual with typical severe spina bifida, reflecting a substantial load on the healthcare system.[6-8]

Hydrocephalus (67.4%), Chiari-II malformation (58.4%), renal abnormalities (9%), scoliosis (24.4%), inspiratory stridor (1.5%), and leaky MMC (19.3%) are among the associated conditions. Spina bifida requires rapid surgical correction after delivery, with an estimated 860 myelomeningocele repair surgeries performed per year. In 80% of neonates, the repair is done within 72 hours following delivery. One and 56.6% of patients require shunt implantation during the same hospital stay. Following surgery, there is a motor improvement (30.5%), sensory (22.9%), and sphincteric function (14.1%).[2-5] The most common post-operative complications are meningitis/shunt infection (16.4%), surgical wound infection (11%), and wound dehiscence (8.3%). Other investigations found that 21 patients (13.5%) exhibited evidence of surgical site infection, 135 patients (86.5%) had wounds that healed effectively, 37 patients (23.7%) experienced CSF leaking, and 119 patients (76.3%) recovered entirely.[9-10]

Spina bifida is a curable spinal cord disorder that comes in varying degrees of severity. Delegated a neural tube malformation (i.e., the embryonic structure that grows into the spinal cord and mind), it was believed to be 4000 years old. Spina bifida has also been referred to as myelodysplasia. Neural tube malformations can show in a variety of ways, ranging from stillbirth to incidental radiography discovery of spina bifida occulta. Myelomeningocele, a kind of spina bifida, is visible during birthing. Patients with myelomeningocele present with a variety of impedances, but the important practical inadequacies are lower appendage loss of motion and perceptible hardship, bladder and stomach brokenness, and psychological brokenness.[7] Treatment advancements have enabled an increasing number of people with neural tube defects to participate in and benefit from mainstream society. Nonetheless, pharmaceutical, surgical, and recuperation complications arise in

the patient with myelomeningocele, from infancy to maturity.[8] In modern spina bifida therapy, a group technique is seen as necessary. Uniting numerous medical and surgical professionals can spare guardians the stress and effort of organizing with separate doctors while also ensuring the accessibility of critical services. Enhanced survival rates in people with spina bifida might be typical with treatment; personal happiness is at any rate mostly reliant on the pace, efficiency, and comprehensiveness of that care from birth.[9-10] Myelomeningocele is associated with aberrant cranial neural tube development, which causes several distinct CNS disorders. Chiari type II distortion is characterized by cerebellar hypoplasia and varying degrees of caudal displacement of the lower brainstem into the upper cervical trench via the foramen magnum. This deformity impedes the flow and retention of cerebrospinal fluid (CSF) and produces hydrocephalus, which occurs in more than 90% of newborn children with myelomeningocele .[11]

Cerebral cortex dysplasia, which includes heterotopias, polymicrogyria, atypical overlay, merged thalami, and corpus callosum variances from the norm, occurs often. Furthermore, mesodermal structures around the neural tube, such as the vertebrae and ribs, may be deformed.[17] Unprotected neurological components are in grave danger during transit. The consequences of the neural tube defect stem directly from the lack of insurance, which occurs mechanically or as a result of drying up, scarring with conclusion, and/or a lack of vascular support, or from other affronts to the fragile neural components. Most neurologic injuries result in a neurogenic entrail and bladder, which causes incontinence. With an absence of neural information, a confined bladder creates hydronephrosis, accompanying illnesses, and renal disappointment, which might be the primary predictor of life duration in people with spina bifida.[11]

Neurosurgical follow-up is essential to identify the complications of hydrocephalus or a possible knotted rope, as well as to screen for probable causes of seizure activity. Furthermore, urologic evaluation is essential for developing a bladder regimen to avoid further urologic disorders, as well as detecting and treating early, probable hydronephrosis or other causes of renal injury that can limit future growth. Perioperative complications include injury contamination, CNS illness, delayed wound healing, CSF spilling, further neurologic damage to the cauda equina, and severe hydrocephalus. Long-term confusions include line tying and dynamic hydrocephalus. Even though hydrocephalus might develop abruptly in a few cases, 80-90% of children with myelomeningocele eventually require shunting. Ventriculoperitoneal shunting is the preferred approach. Options include ventriculoatrial and ventriculopleural shunting. Perioperative complications include intracerebral and/or intraventricular drain, gastrointestinal aperture, and illness. Long-term complications include illness, overdrainage or underdrainage, and obstruction of the shunt system. Shunt failure, which can result in an acute or continuous increase in intracranial weight, occurs more frequently during the first two years of life.[12]

MATERIALS AND METHODS

Study Design & Setting

A Descriptive study was conducted at the Neurosurgery Department, Lady Reading Hospital, Peshawar. A study was conducted for six months from 11th January 2020 to 11th July 2020. The investigation was carried out after receiving clearance from the hospital's ethics and scientific council. All patients who met the inclusion criteria, i.e., those with open neural tube lesions, were included in the research through the OPD and Neurosurgery Department at Lady Reading Hospital in Peshawar. Written informed permission was obtained at the time of admission.

Inclusion Criteria

All the patients presenting with meningocele and myelomeningocele, age between 1 day to 5 years, both genders (male/female), and patients with ASA grade I and II were included.

Exclusion Criteria

All the patients associated life life-threatening congenital anomalies, closed neural tube defects, already infected meningo/myelomeningocele, and Lipomeningocele were excluded because they had acted as confounding factors and if included had introduced Bias in the study results.

Clinical Management & Data Collection

We considered the wound infection as a local redness with purulent wound discharge and fever of more than 100F on the 7th post-operative day, and wound dehiscence as an inability of wound edges union on the 10th post-operative day. A CSF leak includes a clear watery discharge from the wound on the 2nd or 3rd post-operative day. All the baseline/routine hospital investigation was done, the lesions were assessed for age, size duration of symptoms, and location and were checked for cerebrospinal fluid leaks. The presence of associated abnormalities was evaluated.

To avoid infection, the patients received antibiotics as prescribed before and after surgery. In the post-operative period, all patients were thoroughly monitored to ensure that any issues developed and were managed on time. All the surgeries were conducted under the supervision of an expert consultant neurosurgeon having at least five years of experience. All patients were observed closely in the post-operative period for development and timely management of any complications. All the above information i.e. age, gender, size, duration of symptoms, location of NTD, residence, mother education, education level, Malnourished, and place of delivery were recorded in a pre-designed attached proforma.

Data Analysis

All the recorded information was entered into the statistical software SPSS ver 23. The calculations were done for quantitative variables like age, size, and duration of symptoms. Frequency and percentages were computed for categorical variables like gender, location of NTD (neural tube defect), residence, mother education, education level, Mal nourish, place of delivery, and post-operative complications. Post-operative complications were stratified with age, gender, size, duration of symptoms, location of NTD, residence, mother education, education level, Mal nourish, and place of delivery to see effect modification. Post-stratification chi-square test was applied.

RESULTS

Age Distribution

In this study age distribution among 145 children was analyzed as 109(75%) children were in the age range of 1 day to 2 years and 36(25%) children were in the age range of 3 – 5 years. The mean age was 3 years with SD ± 1.91.

Gender Distribution

Among 145 children was analyzed as 120(83%) children were male and 25(17%) children were female.

Clinical Background Information

The location of defects was analyzed as 13(9%) children had defects on cranio cervical and 132(91%) children had defects on lumbo sacral **(Table 1)**. Size of myelomeningocele was analyzed as 22(15%) children had myelomeningocele size ≤3 cm while 123(85%) children had myelomeningocele size >3 cm. The mean myelomeningocele size was 3 cm with SD ± 3.77 **(Table 2)**. Duration of symptoms was analyzed as 70(48%) children had a duration of symptoms ≤ 1

month while 75(52%) children had a duration of symptoms >1 month. The mean duration of symptoms was 1 month with SD ± 2.47 **(Table 3)**. 128(88%) children were malnourished and 17(12%) children were not malnourished **(Table 4)**.

Table 1: Location of NTD.

Location	Frequency	Percentage
Cranio cervical	13	9%
Lumbo sacral	132	91%

Table 2: Size.

Size	Frequency	Percentage
≤ 3 cm	22	15%
> 3 cm	123	85%
The mean myelomeningocele size was 3 cm with SD ± 3.77.		

Table 3: Duration of Symptoms.

Duration of Symptoms	Frequency	Percentage
≤ 1 month	70	48%
> 1 month	75	52%
Mean symptoms were 1 month with SD ± 2.47.		

Table 4: Malnourished.

Malnourished	Frequency	Percentage
Yes	128	88%
No	17	12%

Socio-Economics Factors

Status of residence was analyzed as 116(80%) parents were from rural areas and 29(20%) patients were from urban areas **(Table 5)**. The status of mother education was analyzed as 104(72%) mothers were illiterate while 41(28%) mothers were educated **(Table 6)**. Education level was analyzed as 19(13%) mothers had primary education, 17(12%) mothers had secondary education and 5(3%) mothers had higher education level **(Table 7)**. Place of delivery among 145 children was analyzed as 90(62%) children were delivered in a hospital and 55(38%) children were delivered at home. (**Table 8**).

Post-Operative Complications

26(18%) children had wound infection, 9(6%) children had wound dehiscence and 38(26%) children had CSF Leak **(Table 9)**.

Table 5: Residence.

Residence	Frequency	Percentage
Rural	116	80%
Urban	29	20%

Table 6: Mother Education.

Mother Education	Frequency	Percentage
Illiterate	104	72%
Educated	41	28%

Table 7: Education Level.

Education Level	Frequency	Percentage
Primary	19	13%
Secondary	17	12%
Higher	5	3%

Table 8: Place of Delivery.

Place of Delivery	Frequency	Percentage
Hospital	90	62%
Home	55	38%

Table 9: Postoperative Complications.

Postoperative Complications	Frequency	Percentage
Wound infection	26	18%
Wound dehiscence	9	6%
CSF Leak	38	26%

Stratification of Postoperative Complications

Stratification of postoperative complications (wound infection/wound dehiscence/CSF leak) concerning age (1 day-2 years/3-5 years), gender (male/female), location of NTD (cranio cervical/ lumbo sacral), size (≤ 3 cm & > 3 cm), duration of symptoms (≤ 1 month & 1 month), residence (rural/urban), mother education (illiterate/ educated), education level (uneducated/primary/ secondary/higher), malnourished (yes/no), place of delivery (hospital/home) is given in **Tables 10-20**. Insignificant differences exist between each variable's subgroups.

Table 10: Stratification of Post-Operative Complications Concerning Age Distribution.

Postoperative Complications		1 Day – 2 Year	3 – 5 Years	Total	P Value
Wound infection	Yes	19	7	26	0.7848
	No	90	29	119	
Total		109	36	145	
Wound dehiscence	Yes	6	3	9	0.5419
	No	103	33	136	
Total		109	36	145	
CSF Leak	Yes	28	10	38	0.8047
	No	81	26	107	
Total		109	36	145	

Table 12: Stratification of Post-Operative Complications Concerning Gender Distribution.

Post-Operative Complications		Male	Female	Total	P Value
Wound infection	Yes	21	5	26	0.7669
	No	99	20	119	
Total		120	25	145	
Wound dehiscence	Yes	7	2	9	0.6829
	No	113	23	136	
Total		120	25	145	
CSF Leak	Yes	31	7	38	0.8226
	No	89	18	107	
Total		120	25	145	

Table 13: stratification of post-operative complications concerning the location of NTD.

Post-Operative Complications		Cranio Cervical	Lumbo Sacral	Total	P Value
Wound infection	Yes	3	23	26	0.6122
	No	10	109	119	
Total		13	132	145	
Wound dehiscence	Yes	1	8	9	0.8160
	No	12	124	136	
Total		13	132	145	
CSF Leak	Yes	4	34	38	0.6950
	No	9	98	107	
Total		13	132	145	

Table 14: Stratification of Post-Operative Complications Concerning Size.

Post-Operative Complications		≤ 3 cm	> 3 cm	Total	P Value
Wound infection	Yes	4	22	26	0.9734
	No	18	101	119	
Total		22	123	145	
Wound dehiscence	Yes	1	8	9	0.7258
	No	21	115	136	
Total		22	123	145	
CSF Leak	Yes	6	32	38	0.9017
	No	16	91	107	
Total		22	123	145	

Table 15: Stratification of Operative Complications Concerning Residence.

Post-Operative Complications		Rural	Urban	Total	P Value
Wound infection	Yes	21	5	26	0.9138
	No	95	24	119	
Total		116	29	145	
Wound dehiscence	Yes	7	2	9	0.8633
	No	109	27	136	
Total		116	29	145	
CSF Leak	Yes	30	8	38	0.8502
	No	86	21	107	
Total		116	29	145	

Table 16: Stratification of Operative Complications Concerning Mother Education.

Post-Operative Complications		Illiterate	Educated	Total	P Value
Wound infection	Yes	19	7	26	0.8657
	No	85	34	119	
Total		104	41	145	
Wound dehiscence	Yes	6	3	9	0.7279
	No	98	38	136	
Total		104	41	145	
CSF Leak	Yes	27	11	38	0.9147
	No	77	30	107	
Total		104	41	145	

Table 17: Stratification of Operative Complications Concerning Education Level.

Post-operative complications		Uneducated	Primary	Secondary	Higher	Total	P Value
Wound infection	Yes	19	3	3	1	26	0.9938
	No	85	16	14	4	119	
Total		104	19	17	5	145	
Wound dehiscence	Yes	6	1	1	1	9	0.6368
	No	98	18	16	4	136	
Total		104	19	17	5	145	
CSF Leak	Yes	27	5	4	2	38	0.9059
	No	77	14	13	3	107	
Total		104	19	17	5	145	

Table 18: Stratification of Post-Operative Complications Concerning Duration of Symptoms.

Post-Operative Complications		≤ 1 Month	> 1 Month	Total	P Value
Wound infection	Yes	12	14	26	0.8110
	No	58	61	119	
Total		70	75	145	
Wound dehiscence	Yes	4	5	9	0.8122
	No	66	70	136	
Total		70	75	145	
CSF Leak	Yes	18	20	38	0.8963
	No	52	55	107	
Total		70	75	145	

Table 19: Stratification of Post-Operative Complications Concerning Malnourishment.

Post-Operative Complications		Yes	No	Total	P Value
Wound infection	Yes	23	3	26	0.9740
	No	105	14	119	
Total		128	17	145	
Wound dehiscence	Yes	8	1	9	0.9529
	No	120	16	136	
Total		128	17	145	
CSF Leak	Yes	33	5	38	0.7491
	No	95	12	107	
Total		128	17	145	

Table 20: Stratification of Operative Complications Concerning Place of Delivery.

Post-Operative Complications		Hospital	Home	Total	P Value
Wound infection	Yes	16	10	26	0.9509
	No	74	45	119	
Total		90	55	145	
Wound dehiscence	Yes	5	4	9	0.6775
	No	85	51	136	
Total		90	55	145	
CSF Leak	Yes	24	14	38	0.8720
	No	66	41	107	
Total		90	55	145	

DISCUSSION

The mean age was 3 years. 83% of children were male and 17% of children were female. 13(9%) children had defects on cranio cervical and 132(91%) children had defect on lumbo sacral. 22(15%) children had myelomeningocele size ≤3 cm while 123(85%) children had myelomeningocele size >3 cm. The mean myelomeningocele size was 3 cm with SD ± 3.77. 116(80%) parents were from rural areas and 29(20%) patients were from urban areas. 104(72%) mothers were illiterate while 41(28%) mothers were educated. 19(13%) mothers had primary education, 17(12%) mothers had secondary education and 5(3%) mothers had higher education level. 70(48%) children had duration of symptoms ≤ 1 months while 75(52%) children had duration of symptoms >1 month. The mean

duration of symptoms was 1 month with SD ± 2.47. 128(88%) children were malnourished and 17(12%) children were not malnourished. 90(62%) children were delivered in hospital and 55(38%) children were delivered in home. 26(18%) children had wound infection, 9(6%) children had wound dehiscence and 38(26%) children had CSF Leak.

Similar findings were reported in another research by Khan et al,[13] in which the mean age of presentation for patients was 58.58 days. 56.4 percent were men and 43.6% were women. There were 79 individuals with defects less than 5 cm, 68 with defects between 5 and 10 cm, and 9 with defects larger than 10 cm in size. 13.5% of wounds had symptoms of surgical site infection, whereas 86.5% of wounds healed well. 23.7% experienced CSF leaking, whereas 76.3% healed entirely. 90.4% of patients reported postoperative pyrexia, whereas 9.6% remained afebrile. Post-operative hydrocephalus was found in 22.4% of patients, compared to 77.6% who did not have hydrocephalus, wound dehiscence occurred in 7%, and CSF leak was in 21%.

Another research conducted by Rehman et al. [14] found that 150 youngsters were assessed, with 55.3% boys and 44.7% girls. All belonged to a poor socioeconomic group, and prenatal maternal folate consumption as a risk factor was positive in 68.7% of cases. The mean head circumference was 37.4 cm. According to their location, 55% of the abnormalities were lumbosacral, 25.4% lumbar, 10.7% thoraco lumbar, 6.7% thoracic, and 2% cervical. According to related anomalies, 65.3% of neonates had hydrocephalus, 9% had clubfoot, 2.7% had diastematomyelia, and 2% had a tethered cord. 58% of patients exhibited neurological abnormalities before surgery, whereas 5.4% of those with normal power deteriorated after surgery, with 3.3% acquiring paraplegia and 2% having paraparesis. The most common consequence was CSF leak, which affected 11% of patients, followed by meningitis in 5%, with an overall death rate of 2.6%. Singh et al,[15] reported the related disorders were hydrocephalus (67.4%), Chiari-II malformation (58.4%), renal abnormalities (9%), scoliosis (24.4%), inspiratory stridor (1.5%), and leaky MMC (19.3%).

Spina bifida requires rapid surgical correction upon delivery, with an estimated 860 myelomeningocele repair surgeries performed each year. In 80% of babies, the repair is completed within 72 hours of delivery, and 56.6% require shunt installation during the same hospital stay. Following surgery, there is a motor improvement (30.5%), sensory (22.9%), and sphincteric function (14.1%).[16-17] The overall rate of problems is 16.7%. Meningitis/shunt infection (16.4%) and surgical wound infection (11%), wound dehiscence (8.3%), intraoperative cardiac (15.6%) and respiratory (11.1%) problems, postoperative ventilation (8.9%), and an average annual in-hospital mortality rate of 1.4% are among the most common post-operative complications. Shunt-related problems are common, with 51%-55% of individuals requiring shunt revision during infancy [18-19]

Children with myelomeningocele ought to be planned for consistent subsequent visits in the multidisciplinary facility like clockwork all through youth and yearly from there on. More incessant visits with specific pros might be important, contingent upon the extraordinary therapeutic and surgical issues that present at various times amid the youngster's advancement. Since muscle unevenness causes dynamic, safe distortions, the patient with spina bifida must be assessed as often as possible by individuals from his or her bolster group. Along these lines, they can survey muscle bunches, underscore the requirement for parity to anticipate deformations, and serially record changes that may come about because of a fastened rope, hydrocephalus, or other related confusions (e.g., seizure issue). Incessant survey of spina bifida emotionally supportive networks, forceful shunting of hydrocephalus, the collaboration and accomplishment of patients in active recuperation, and appraisal of the status of patients' props, bolsters, or wheelchairs are essential for expanding capacity in a

multidisciplinary setting. Contemplates showing a lessening in the recurrence of spina bifida with folic corrosive supplementation amid pregnancy are aggregating, with diminishment giving an account of the request of 50%. High admission of folic corrosive may veil the pallor of vitamin B-12 inadequacy and permit neurologic harm to advance untreated, so across the board, folic corrosive supplementation has been suggested with an alert, however in pregnancy, it has had satisfying advantages.

CONCLUSION

In patients presenting with meningocele, the prevalence of post-operative sequelae, such as wound infection/dehiscence, and CSF leak, was 18%, 6%, and 26%, respectively.

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AUTHORS' CONTRIBUTION

S #	**Authors Full Name**	**Intellectual Contribution to Paper in terms of:**
1.	Sahibzada Haseeb Ahmed	Study design and methodology.
2.	Adnan Khan	Literature review and referencing.
3.	Maria Nisar	Final review and approval.
4.	Muhammad Daud	Data collection and calculations.
5.	Muhammad Hassan Abid	Interpretation of results.
6.	Muhammad Kashif	Analysis of data.