CASE REPORT

Consequences of traumatic spinal cord injury during pregnancy in Pakistan

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INTRODUCTION: Traumatic spinal cord injury (SCI) is one of the major causes for poor outcomes of pregnancy. Injury during pregnancy is uncommon; therefore, outcome data are scarce. This case series presents outcomes of pregnancy in five women who sustained SCI during their pregnancies.

CASE PRESENTATION: Five women who sustained SCIs during pregnancy (age range: 24–38 years) were identified and included in this case series. The causes of SCI in this population were fall from heights (cases 1 and 2), road traffic accidents (cases 3 and 4) and firearm injury (case 5). Two of the females were managed conservatively (cases 1 and 5) and the rest underwent surgical procedures for fixing their spine. Out of these patients, four patients delivered normal healthy babies, while the baby of one patient died within 1 hour after delivery.

DISCUSSION: Limited data about the outcomes of pregnancy in women who sustained SCIs during pregnancy are available in the literature. The outcomes of pregnancy in women who sustained SCIs during the first trimester are not satisfactory, and special attention may be needed to improve the expected outcomes. Data from our study show similar findings to developed countries.

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INTRODUCTION

Traumatic spinal cord injury (SCI) during pregnancy is a major cause of maternal and foetal death.^{1–3} Trauma to pregnant women is a major risk factor for poor pregnancy outcomes.^{2,4,5} In contrast, pregnancy outcomes in women with pre-existing SCI have fewer complications.^{1,6,7} Females who sustained SCIs during pregnancy have been reported to have twice the foetal complications or risk of death.² Risk of foetal death and abnormalities is higher in case of more severe SCIs.^{2,8,9}

It is well known that SCI during pregnancy presents unique challenges to healthcare professionals.^{1,10,11} Most healthcare professionals are not experienced in managing patients who sustained SCIs during pregnancy.^{2,6,11,12} The reason for this is often a lack of an interprofessional team approach to manage women who sustain SCI during pregnancy.^{10,11,13,14} Traumatic SCIs in pregnant females have been associated with malformation or even loss of foetus.^{1,3,11} It is reported that trauma to pregnant women is one of the most important causes of foetal deaths. In cases where foetus survive, other foetal complications for example, low birth weight and prematurity have been reported in the literature.^{2,4,5} The rate of foetal malformation in women who sustained SCI during pregnancy is about 11%.¹⁵ Risks of foetal loss and abnormality are high if injury occurs during first trimester; however, these risks reduce to some extent if injury occurs in later stages of pregnancy.^{1,11,12} Although the chances of SCI in women are highest during childbearing age,^{12,15} to our knowledge outcomes of pregnancy in women who sustained SCIs during pregnancy are limited.^{6,7,10,16} The only available literature on the outcomes of pregnancy in female population who sustained SCIs during pregnancy is in the form of case studies.

In Pakistan, most women who sustain SCIs are of childbearing age.^{17,18} However, limited research work is done regarding

reproductive and gynaecological problems of female who have sustained SCIs. This study was performed to increase the awareness of problems unique to women who sustained a SCI during pregnancy in Pakistan.

CASE PRESENTATION

This case series was conducted at Paraplegic Centre Peshawar, Pakistan. Women admitted to the paraplegic centre from 2013 to 2015, who sustained traumatic SCI during pregnancy, were included. A total of 869 patients were admitted in during the latter period, in which 174 were female while 695 were male. Out of these, only five patients were presented with SCI during pregnancy. Clinical records of these patients were evaluated and telephonic interviews were conducted in October 2016. As the patients were not available at the time of data collection and as follow-up was done through telephonic interview, only limited data were available.

Case report 1

On 19 August 2013, AB, a 30-year-old woman (gravida 6, para 5), 24 weeks' gestational age (GA), sustained a SCI due to fall from height. She was admitted to the spinal unit of a tertiary care hospital, where she was conservatively managed. The patient was admitted to the rehabilitation centre 15 days after the injury. On admission to the rehabilitation centre, her neurological level was T12 ASIA B paraplegia and her spinal cord independence measure (SCIM) score was 16/100. Obstetric ultrasound examination showed a single live normal foetus with cephalic presentation. She underwent spinal rehabilitation including physical therapy, occupational therapy, vocational training and bowel and bladder training. During rehabilitation, there was improvement in motor

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function of the patient (AIS B to AIS C); however, she remained a wheelchair user. Her prenatal course was uncomplicated, and antenatal checkups revealed normal foetal growth. She went into labour at a gestational age of 39 weeks, 2 days. A normal healthy girl was delivered by caesarean section. On discharge, her SCIM score was 64/100 and she was independent in activities of daily livings (ADLs), bed mobility, transfers and wheelchair manoeuvrability.

At follow-up in 2016, her SCIM score was 73/100, and she was able to walk with ankle foot orthosis (AFO's) in a walking frame. The patient developed grade II sacral pressure sores in July 2015, which were managed at home. She was admitted to a hospital in December 2015 where a colostomy was performed. This patient was managing her bladder by self-catheterization.

Case report 2

On 8 July 2014, RB, a 25-year-old woman (gravida 3, para 2), 30 weeks' GA, sustained a SCI due to fall from height (stairs). She was admitted to the spinal unit of a tertiary care hospital where she underwent an anterior cervical discectomy and fusion (ACDF). She was admitted to the rehabilitation centre 17 days after the injury. On admission to rehabilitation, her neurological level was C5 AIS A tetraplegia and her SCIM score was 11/100. No obstetric abnormalities were noted and no other physical complications were present. Psychologically, she was in state of denial. Physical therapy, psychotherapy and nursing care were provided. After 29 days of admission, she was referred to gynae unit for antenatal checkup, where a breech presentation was noted. She was educated regarding manual palpations of uterine contractions. She went into spontaneous labour at a gestational age of 36 weeks, 5 days. A healthy appropriate-for-gestational age boy was delivered by assisted breech vaginal delivery. After a comprehensive inpatient spinal rehabilitation programme, her functional status improved in most areas of self-care. On discharge, her spinal cord independence measure score was 43/100, and she was independent in some ADLs. She required partial assistance in wheelchair manoeuvrability and self-mobilization. Psychologically she was stable, and no other complications were present.

At follow-up in 2016, her SCIM score was 46/100 and there was no improvement in her neurological status. She reported urinary tract infection and bowel abnormalities. She was free from pressure sores and was managing her bladder with a suprapubic catheter. Her baby had achieved age-specific milestones, and paediatric consultation had not reported any complications.

Case report 3:

On 9 August 2014, NJ, a 24-year-old woman (gravida 4 and para 3), 27 weeks' GA, sustained a SCI due to a road traffic accident. She was admitted to a private hospital, where she underwent anterior cervical discectomy and fusion (ACDF). The patient was admitted to the rehabilitation centre 11 days after the injury. On admission to rehabilitation, her neurological level was C7 AIS B tetraplegia and her SCIM score was 12/100. Her antenatal checkup after injury showed no obstetric abnormalities. No history of previous major illness or hospitalization was reported. General physical examination revealed no complications. Physical therapy, psychotherapy and nursing care were started. After 8 days of her admission to rehabilitation, she was referred to medical services for fever, urinary tract infection and flank pain, which were not responding to medications. Ultrasound examination revealed hydronephrosis, and she was appropriately treated. After 19 days of admission, she was referred to the gynae unit for antenatal checkup where cephalic presentation was noted. At the 38th week of pregnancy, she went into labour which was recognized by manual palpation of uterine contractions. A normal health baby girl was born by assisted vaginal delivery with no medical or obstetrical

complications. She underwent a standard spinal rehabilitation programme. There was significant improvement in her motor function (AIS B to AIS D), and she showed significant recovery of function. On discharge, her SCIM score was 72/100 and she was able to walk in a walking frame with single AFO. She was independent in ADLs, bed mobility, transfers and self-mobilization.

At follow-up in 2016, her SCIM score was 87/100, and she was able to walk with crutches with no medical or physical complications. She reported no pressure sores and had normal bladder control. Her baby was reported to be healthy and had an age-appropriate development.

Case report 4:

On 16 April 2015, SB, a 29-year-old woman (gravida 3 para 2), estimated GA 11 weeks by menstrual dates, sustained a SCI due to a road traffic accident. She was admitted to the spinal unit of a tertiary care hospital where she was managed surgically (spine fixation). After 7 days of injury, she was discharged from the hospital. The patient was not referred to the rehabilitation centre after being discharged from the tertiary care hospital. Moreover, due to lack of awareness in Pakistani society about rehabilitation, after discharge from tertiary care hospitals, most of the patients with SCI visit traditional bone healers and shrines of spiritual people for the treatment of their paralysis. Thus, the patient was not admitted to rehabilitation centre until 117 days after her injury, with multiple pressure sores.

Upon admission, she had a grade IV sacral pressure sore, grade IV left trochanter pressure sore and grade III right trochanter pressure sore. On admission to rehabilitation, her neurological level was L1 AIS A paraplegia and her SCIM score was 13/100. She was anaemic (Haemoglobin level 8.1 g dL^{-1}) and required 2 units of blood transfusion. After 21 days of admission to the rehabilitation centre, she was referred to the gynae unit for severe abdominal pain. She went into labour where a 2.2 kg baby boy was delivered by vaginal delivery; however, the baby was admitted to the neonatal intensive care unit (ICU) where he died one hour after delivery. On re-admission to rehabilitation, the patient was having complaints of disturbed sleep, anxiety, nightmares and depression. She underwent a multidisciplinary rehabilitation programme. Her sacral pressure sore and left trochanter pressure sore were managed with flap reconstruction, while her right trochanter pressure sore healed with conservative care. Psychology worked closely with the patient to prepare her for independent activities. On discharge, her SCIM score was 63/100 and she was independent in ADLs, bed mobility, transfers and wheelchair mobility. Psychologically, she was stable.

At follow-up in 2016, her SCIM score was 66/100. She denied medical problems and remained with complete L1 SCI, at the wheelchair level. She had no further pressure sores and she was managing her bladder by self-catheterization.

Case report 5:

On 5 July 2015, FB, a 38-year-old woman (gravida 4 para 3), estimated GA 21 weeks by menstrual dates, sustained a SCI due to a firearm injury. There was no loss of consciousness. She was admitted to a tertiary care hospital where emergency laparotomy was performed. Her spine was managed conservatively. The patient was admitted to the rehabilitation centre 37 days after the injury, with grade I coccygeal pressure sore. On admission to rehabilitation, her neurological level was L2 AIS C paraplegia and her SCIM score was 22/100. She was referred to the gynae unit for an antenatal checkup where cephalic presentation was noted, viable foetus with no complications. She had an uneventful rehabilitation. Her coccygeal pressure sore was managed conservatively. During rehabilitation, there was significant improvement in her motor function (AIS C to AIS D). She went into labour at a gestational age of 37 weeks, 4 days. A normal

Table 1. Table showing demographic details, obstetric and rehabilitation outcomes of the patients

	Case 1	Case 2	Case 3	Case 4	Case 5
Age	30 years	25 years	24 years	29 years	38 years
Education	No education	No education	Middle	No education	Matric
Cause of injury	Fall from height	Fall from height	Road traffic accident	Road traffic accident	Firearm injury
Management	Conservative	ACDF	ACDF	Spinal fixation	Conservative
GA	24 weeks	30 weeks	27 weeks	11 weeks	21 weeks
Neurological level	T12	C5	C7	L1	L1
ASIA score (at admission)	B	A	B	A	C
GA (at the time of delivery)	39 weeks, 2 days	36 weeks, 5 days	38 weeks	30 weeks	37 weeks, 4 days
Delivery method	Caesarean section	Assisted breech vaginal delivery	Assisted vaginal delivery	Vaginal delivery	Normal vaginal delivery
Obstetric outcome	A normal healthy girl was delivered	A normal healthy boy was delivered	A normal healthy girl was delivered	A premature baby was delivered	A normal healthy girl was delivered
ASIA score (at discharge)	C	A	D	A	D
Follow-up in 2016	Walk with AFO in walking frame. Baby developing normally	Wheelchair-dependent. Baby developing normally	Walk with crutches. Baby developing normally	Wheelchair-dependent	Walk without any support. Baby developing normally

Abbreviations: ACDF, anterior cervical discectomy and fusion; AFO, ankle foot orthosis; ASIA, American Spinal Injury Association; GA, gestational age.

healthy girl was delivered by vaginal delivery and there were no complications. On discharge, her SCIM score was 74/100 and she was independent in ADLs and able to walk with crutches.

At follow-up in 2016, her SCIM score was 82/100, and the patient was able to walk without any support. After discharge from rehabilitation, she was free from pressure sores and was managing her bladder by self-catheterization. She complained of bowel and bladder disturbances and generalized weakness. Her baby had achieved age-specific milestones, and paediatric consultation did not report any complications Table 1.

DISCUSSION

Management of pregnant women with SCI presents unique challenges to obstetricians, surgeons and the entire rehabilitation team. In this case series, out of five patients, four delivered normal healthy babies while the baby of one patient died within 1 hour after delivery. These patients were managed by experienced medical doctors, physical therapists, occupational therapists, clinical psychologists, nurses and paramedical staff. Opinions from obstetricians, neurosurgeons, orthopaedic surgeons and paediatricians were obtained when needed. Case 1, case 3, case 4 and case 5 were independent in ADLs, while case 2 was independent in some of the ADLs at discharge from the rehabilitation centre. Although the rehabilitation of the pregnant patients with SCI in this case series was similar to the rehabilitation for other patients with SCI, special precautionary measures were taken because of the growing foetus. Moreover, special attention was given to changing activities according to gestational age.

In addition to the special needs of pregnancy, cultural issues were important during rehabilitation. The included females were ethnically Pashtoons, which is popular for observing strong religious beliefs. The females in the mentioned group are restricted in by large in interacting with male population. Considering the cultural values and traditions of Pakistan, rehabilitation of females by male therapists is sometimes viewed as offensive. In the Paraplegic Centre, Peshwar separate female ward, and female physical therapy gyms were used for the included female patients. All female with SCI were rehabilitated under the supervision of a female physical therapist. Similarly, female psychologists, female nurses and female physical therapy assistants were available for the care of these patients.

One of the major challenges during rehabilitation of these women was denial of their disability, as these patients were not properly educated about disability in the hospitals where they were admitted initially. Fear of foetal loss due to trauma, misconceptions about pregnancy, disability and rehabilitation were some of the factors delaying rehabilitation in these patients. Regular psychology sessions and education about disability and rehabilitation were arranged, which might have increased their level of motivation towards rehabilitation. Despite some of these women reporting 'laziness' due to increase in weight with foetal growth, they all took an active part in their rehabilitation. Length of stay of these patients at the rehabilitation centre ranged from 92 days to 188 days.

Although studies on the outcomes of pregnancy and rehabilitation in females with pre-existing SCI may be found in literature, these works are scarce.^{6,7,10,16} Gotfryd *et al.*¹⁹ reported a case study of a 20-year-old patient who sustained injury to her spinal cord in the twentieth week of pregnancy. The patient delivered a normal healthy girl by normal vaginal delivery at 39 weeks' GA. Similarly, Paonessa *et al.*²⁰ reported a case study of a 27-year-old woman who sustained a SCI during the twenty-second week of pregnancy. At 34 weeks' gestation, the patient delivered a healthy baby by caesarean section. Moreover, Engel *et al.*¹ presented the case study of a 28-year-old patient who sustained a SCI in her twelfth week of pregnancy due to a road traffic accident. The patient delivered a boy baby with arthrogryposis multiplex

congenital by caesarean section at 37 weeks' GA. At 6 years' follow-up, her baby was having severe cerebral palsy and hearing problems. Samuel *et al.* reported a case study of a T4 AIS A woman who sustained SCI by fall from height during the twenty-sixth week of pregnancy. She delivered a 2.6 kg girl baby by means of vaginal delivery at 34 weeks' GA. At 3 months' follow-up, the baby was normal and the patient remained paraplegic.²¹

In our case series, out of five patients, three (cases 2, 3 and 4) were managed surgically while two (case 1 and 5) were managed conservatively. The presence of ongoing pregnancy is not a contraindication for surgical management of unstable spine.^{19,20,22} Patients with unstable spines need to be managed surgically, with the objective of achieving mechanical stabilization of the spine.^{19,23} Pregnant patients with SCI maintain the capacity for vaginal delivery;^{19,24} however, vaginal deliveries are only possible in pregnant patients with SCI when adequate precautionary measures are taken and when no other obstetric complications are present.¹⁶ Females who sustained SCIs during pregnancy must be carefully monitored for the remainder of their pregnancy.² Assisted vaginal delivery is the most recommended route of delivery in these patients.^{24,25}

Pregnant patients with SCI with an injury level above T10 do not feel the normal pain of labour; thus, it is necessary to train these patients to identify their uterine contractions by means of palpation. They can also be educated to report other symptoms suggestive of delivery labour—that is, increased respiratory frequency and spasticity.^{19,24} Two tetraplegic patients (cases 2 and 3) presented in this case series were educated regarding manual palpations of uterine contractions in order to recognize labour.

The most common complications among pregnant patients with SCI are pressure sores, thrombosis and autonomic dysreflexia.^{6,7} Autonomic dysreflexia is the most dangerous complication in pregnant patients with SCI and can occur at any stage in pregnant patients with SCI, but it occurs most commonly during labour and delivery.²² None of the patients presented in this case series developed autonomic dysreflexia. This might be due to the fact that all these patients received analgesia around the time of delivery. It has been reported that analgesia during delivery labour may reduce the risk of autonomic dysreflexia.^{19,24,25}

Although pressure sores are common in patients with SCI in Pakistan,²⁶ only one patient (case 4) presented in this case series had pressure sores. The reason for this may be the proper care and proper education provided by the rehabilitation team, especially nursing staff at the centre. None of the patients presented in this case series were diagnosed with deep venous thrombosis.

Out of a total five patients presented in this case series, four patients delivered healthy appropriate-for-gestational age babies. All these four babies were reported to be developing normally at follow-up in 2016. They had achieved age-specific milestones with no major complications. One patient (case 4) who sustained a SCI during first trimester (11 weeks' GA) of her pregnancy delivered a premature baby at 30 weeks' GA; however, the premature baby did not survive and died within an hour of delivery. Studies report that the risk of foetal loss and abnormality is high if injury occurs during first trimester; nevertheless, the risk is reduced to some extent if injury occurs in later stages of pregnancy.^{1,11,12}

In previous studies, most female patients with SCI reported inadequate knowledge about pregnancy and its complications;^{6,7} however, all patients in this case series had a sound knowledge of gynaecological and obstetric issues during rehabilitation. This cannot be generalized; however, for the whole population of Pakistan, there seems a dire need for clinical attention,

education and further research regarding sexual, reproductive and gynaecological problems of female patients with SCIs in Pakistan.

COMPETING INTERESTS

The authors declare no conflict of interest.

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