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Paralysed with Fear a Literature Review on Aspects of Pregnancy in Polio Survivors

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Authors' contributions

'This work was carried out in collaboration between both authors. Author TP designed the study, wrote the review in stepwise manner and wrote the first draft of the manuscript. Author PW managed the literature searches and proof reading of the drafts. Both authors read and approved the final manuscript.

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ABSTRACT

After several decades of stability, female polio survivors often experience new signs and symptoms of their condition, characterized by global and muscular fatigue, decreased muscular strength and pain along with secondary changes in body anatomy and physiology with respect to pregnancy. Problems of ante-partum care and delivery of women who have been victims of poliomyelitis are fortunately rarely encountered. These women have a higher occurrence of pre-eclampsia, gestational proteinuria, renal disease prior to pregnancy, vaginal bleeding and urinary tract infection during pregnancy. Deliveries complicated by obstruction of the birth process are more common in the polio group, and cesarean section is performed at a higher rate throughout the time period. The prognosis of the disease when it occurs during pregnancy may be less predictable, but it is generally good for both mother and infant. Although the incidence of abortion is relatively high, if the pregnancy goes to term parturition is expected to be normal. An amalgamation of good antenatal assessment & care, psychological counselling and support groups have been found to be successful in providing them with the best possible outcome. This paper reviews what is currently

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known about disabled survivors of polio and highlights areas of need in public health research, policy and programming along with the effects of post-polio syndrome on pregnancy and possible interventions to achieve symptomatic relief & aid in better quality of life.

Keywords: Polio; pregnancy; post-polio syndrome; disability; rehabilitation.

ABBREVIATIONS

PPS : Post-Polio Syndrome
MMRC: Modified Medical Research Council
SF-36 : Short Form 36
IMT : Inspiratory Muscle Training
KAFO : Knee Ankle Foot Orthosis
QoL : Quality of Life
EMG : Electromyography
NCV : Nerve Conduction Velocity
MRI : Magnetic Resonance Imaging
UTIS : Urinary Tract Infections

1. INTRODUCTION

Paralytic poliomyelitis, a serious clinical outcome, occurs in approximately 0.5% of all infections, when the virus invades the central nervous system, causing inflammation and destruction of motor neurons leading to muscle weakness and paralysis [1]. The severity of the disease depends largely on the site of this destruction, with highest morbidity and mortality resulting from respiratory or brain steam involvement [2].

Female polio survivors have a higher occurrence of pre-eclampsia, gestational proteinuria, renal disease prior to pregnancy, vaginal bleeding, and urinary tract infection during pregnancy [3]. Deliveries complicated by obstruction of the birth process are more common in the polio survivors, and cesarean section is performed at a higher rate [4]. Infants of polio mothers have a lower mean birth weight and more often have a birth weight below 2500 g. These sequelae are associated with severity of residual impairment, degree of paralysis during acute illness and a young age of infection.

Individuals disabled through polio confront not only a range of physical disabilities but also significant social, financial and human rights barriers hindering integration and participation in families and communities. These barriers in turn, lead to chronic ill-health, social marginalization, limited access to education and employment, and high rates of poverty. Women are impacted disproportionately, as are individuals from poorer households, minority communities and from rural and urban slum areas [5].

2. AUTHOR'S EXPERIENCE

Added nutritional demands, changes in mineral and vitamin balance, the great stress on all the organs of the body, especially the liver (in estrogen metabolism as in all its functions), increased blood volume and dilution, decreased hemoglobin, serum proteins and non-protein nitrogens are only a few of the physiologic variations which suggest more than endocrine changes as factors in the increased susceptibility to post-polio syndrome during pregnancy.

3. OBSERVATIONS

Survivors who made either a partial or complete recovery from an acute paralytic polio episode with a period of functional stability of at least 10 years can develop PPS. Predictive factors include age, severity of weakness during the acute polio episode, muscle and joint pain on activity, and recent weight gain.

Musculoskeletal changes include muscle atrophy, fasciculation, decreased limb and trunk strength, and aching musculoskeletal pain after light activities [6,7].

Difficulty in breathing is associated with chronic alveolar hypoventilation caused by respiratory muscle weakness and fatigue especially during pregnancy when the diaphragm is pushed upwards. Patients often develop a shallow breathing pattern with a limited ability to take deep breaths due to baby bump. This ultimately leads to the retention of secretions in the lungs because of the impaired ability to cough. In addition, obesity, kyphoscoliosis, anesthesia, prolonged immobility, and medication that depresses respiratory function increase the risk of respiratory difficulty. These are some of the inevitable effects of polio in pregnant survivors. Acute respiratory failure occurs when respiratory muscles weaken, causing a reduction in vital capacity, compliance, and tidal volume.

Inadequate sleep may be the result of pain, restless legs, or nocturia. There is also a high incidence of sleep-related breathing disorders (including central sleep apnea, obstructive sleep apnea, and hypoventilation) among patients with a history of acute bulbar polio, especially those who required mechanical respiratory support during the acute polio episode and those with coexisting pulmonary diseases. Decreased diaphragm and chest wall muscle strength can result in hypoventilation that becomes severe during sleep.

Survivors of acute bulbar polio might develop difficulty swallowing because of the affected nerves that innervated the muscles used for swallowing and chewing. Patients with PPS can develop laryngospasm (spasmodic closure of the glottic aperture) and have difficulty chewing and swallowing liquid and solid foods. This can cause malnutrition, dehydration, and aspiration pneumonia. Facial, oropharyngeal, and vocal cord weakness impairs phonation and vocal modulation can cause vocal hoarseness [7].

Urologic symptoms may include difficulty emptying the bladder, increased severity of urinary incontinence, and nocturia which is aggravated during pregnancy. A chronically weak detrusor muscle often causes hesitancy, decreased force of the urinary stream, and incomplete bladder emptying mainly because of sustained pressure of the heavy uterus and baby on the bladder. Incontinence is related to weakened pelvic floor muscles or the inability to get to the bathroom in time [8,9].

Problems of ante-partum care and delivery of women who have been victims of poliomyelitis are fortunately rarely encountered. Short stature following poliomyelitis is expected, being associated with a degree of pelvic contracture. Patients with severe post-polio sequalae with kyphoscoliosis and below waist paralysis demonstrate respiratory difficulties in the last few weeks of pregnancy, sufficient to merit admission to hospital for rest, their problem appearing to be one of uterine enlargement taking up so much abdominal space that diaphragmatic excursion was restricted and their lung function, already impeded by scoliosis, was worsened.

Vaginal delivery in the paralysed patient is possible but the factors listed above would appear to play an important part in patients paralysed following poliomyelitis [10].

The patient in whom poliomyelitis occurred earliest in the second trimester and in whom the involvement was extensive was transferred to our hospital, after termination of the pregnancy, with extensive paralysis of four extremities, the trunk, and muscles of respiration. Abortions have been observed in the fourth week of illness, while the patient was still in the respirator, by the insertion of an intra-uterine catheter. This causes such profuse hemorrhage that two transfusions of blood become necessary [11].

Bed-ridden patients and those who walk with crutches and bear little or no weight on their legs maintain a large and fairly symmetrical pelvis. True pelvic symmetry occurs if the following factors are present for any length of time (1) associated lumbo-sacral scoliosis; (2) unilateral weight bearing, especially as influenced by the use of external appliances and reconstructive procedures; (3) the shortening of a leg; (4) muscle imbalance, especially with paralysis of the pelvifemoral and pelvispinal muscles; (5) paralysis of muscles below the hip [2].

Psychological fatigue reported by several patients and some authors could have a pathophysiological component related to the lesions of the reticulating activating system, as observed with MRI in 55% of patients suffering from severe PPS. These patients are especially affected by attention disorders, difficulties in concentrating and even recent memory and consciousness disorders, even if they did not report any changes in their cognitive abilities. Abandonment anxiety, fear of death (common rooms with iron lungs in which children were dying and could see others dying as well) and sometimes even physical abuse were awful daily companions for these survivors. Prevalence of psychosomatic pain is also high in these females [12,13].

4. ASSESSMENT

A. Subjective assessment :

1. Pain & discomfort during pregnancy –

Site, onset, character, severity on visual analogue scale (VAS) or numerical rating scale (NRS), radiation, stability, diurnal variations, exacerbating and relieving factors must be noted.

2. Quality of life –

Needs to be taken when the female is expecting and complains of secondary restrictions in daily

life due to post-polio residual paralysis.

The hope scale or SF-36 scale can be used to assess QoL in these patients [14].

B. Objective Assessment :

1. Posture & Gait –

When the female is pregnant, her body changes its anatomical and physiological mechanics due to which certain postural changes occur.

Alignment of body segments with vertical axis and possible deviations such as pelvic asymmetry, kyphoscoliosis, calcaneal varus or valgus, uneven weight bearing must be noted.

Tragus to wall distance, cobb's angle must be measured to rule out spinal postural deviations.

Clinical assessment of unilateral weight-bearing is difficult in the patient who is not confined to a wheelchair and appears quite mobile. The simplest test to assess this problem is to ask the patient to stand and bear weight first on one leg and then on the other. Inability to do so is associated with pelvic asymmetry, the asymmetry being on the other half of the pelvis to the one with the 'weak' limb.

Spatial (stride length, step length, base of support, angle of toe out) & temporal (stride and step duration, cadence, velocity) parameters of gait should be assessed.

Deviations commonly observed are increased lateral lean of trunk, extensor thrust, foot slap or high steppage gait and pelvic hiking.

2. Range of Motion and Manual Muscle Testing –

Muscle length & contracture assessment is must before recommending an orthosis to the patient [15].

Passive and active range of motion must be assessed using universal goniometer.

Manual muscle testing should be done to assess real time strength of muscles, especially lower limb, core and pelvis.

Grade the strength using MMRC scale.

Girth measurement should be done to assess level of muscle wasting or muscle atrophy.

These parameters can be assessed before the woman is conceived as muscle testing can impose additional stresses on her joints which she might not be able to tolerate.

3. Balance & equilibrium –

Static and dynamic balance in all ergonomic postures must be assessed. Use sensory and motor strategies for the same.

Timed up & go test can be done to assess dynamic balance and walking speed.

To be assessed prior to conception as it imposes a risk of fall.

4. Sensory examination –

Superficial e.g. touch, pain, temperature, pressure and deep sensations e.g. proprioception, kinesthetic awareness must be assessed according to the dermatomes to rule in or out possible sensory loss.

5. Cardiorespiratory assessment –

Most important aspect of evaluation, following points must be assessed: Chest shape & symmetry, breathing pattern and respiratory rate, vital parameters including oxygen saturation, blood pressure and heart rate, chest excursion & expansion.

Spirometry parameters must be obtained to assess degree of restriction by kyphoscoliosis if present.

Cardiorespiratory fitness can be assessed in early trimester or before pregnancy using 2 minute walk test or incremental shuttle walk test.

Fatigue can be monitored using outcome measures such as Functional Assessment of Chronic Illness Therapy (FACIT) or Fatigue Severity Scale (FSS) [16].

6. Body temperature –

To assess cold intolerance.

Core body temperature is usually normal, but atrophic limbs are cold to touch with bluish discoloration with variable amount of swelling.

7. EMG & NCV –

When the couple is planning to conceive it is better to assess EMG & NCV findings to have clear clinical picture of anterior horn cell disease.

It shows occasional fibrillations & increased amplitude & duration of motor unit action potentials.

5. MANAGEMENT

Patient education and counselling – convey the importance of an amalgamation of good antenatal care, physical therapy and support groups to provide them with the best possible outcome [17,18].

In case of acute poliomyelitis Kenny packs can be started immediately to the extent permitted by pain and spasm.

Chemotherapy can be used prophylactically when repeated catheterization is necessary and for treatment of urinary tract infections.

Threatened or concurrent pneumonia can be treated with penicillin.

Supplemental protein, carbohydrate, electrolytes, vitamins and minerals can be given orally or intravenously in quantities sufficient to care for the increased demands of pregnancy [19].

Energy conservation to reduce fatigue – activity & rest can be balanced with one or two daily planned naps or rest periods lasting at least 15 min. Assistive devices such as canes, crutches, manual wheelchairs, and motorized scooters can reduce weakness and fatigue. Weight loss is an effective strategy to reduce global fatigue [16].

Posture correction including back care, neutral pelvis and emphasis on good ergonomics is essential to avoid pain and muscle imbalances e.g., lower cross syndrome secondary to PPS and pregnancy [20].

Pain reduction techniques include resting muscles and joints, using braces to reduce strain, using a transcutaneous electrical nerve stimulation unit, and applying ice or heat. Nonpharmacologic techniques to reduce pain, such as biofeedback, relaxation, distraction, and massage, may also be helpful [21]. Gentle mobility exercises of upper and lower extremity may improve peripheral oxygen consumption thereby reducing fatigue causing conditioning [22].

Airway management for respiration includes frequently auscultating breath sounds to monitor retained secretions and ensure adequate fluid intake to prevent mucus plugs. Deep breathing, incentive spirometry, and intermittent positive pressure breathing treatments help maintain clear breath sounds. Pulmonary function testing and arterial blood levels determine CO_2 retention [23].

Since the diaphragm is pushed upwards during pregnancy, its length-tension relationship gets altered because of which the mother can have breathing difficulties. Threshold IMT training can be started as early as possible during pregnancy to ensure good respiratory mechanics and ventilation perfusion match.

To achieve sleep improvement patients should avoid foods and beverages that contain caffeine. Help make the patient's environment more conducive to sleep and encourage warm nighttime baths. If the patient has sleep-related breathing disturbances, mechanical ventilation during sleep will rest the respiratory muscles well. Obstructive sleep apnea is most effectively treated with continuous positive airway pressure, which uses pneumatic pressure to splint open the airway [24].

Ventilation with bilevel assisted positive airway pressure is an alternative if hypoventilation or central apnea predominate.

Problems in swallowing may be reduced by encouraging the patient to take small mouthfuls of food and sips of liquids. The risk of aspiration can be reduced by sitting the patient upright and eschewing the use of straws. If fatigue is causing inadequate nutritional intake, encourage frequent small, high-protein meals. A feeding tube may be indicated if the individual is unable to obtain adequate intake orally or if a study demonstrates possible aspiration while swallowing [25].

To overcome psychological conflicts and symptoms of depression, one can indulge in workshops and support groups to gain confidence and social security. Warm water hydrotherapy promotes relaxation of mind and body [13].

Urinary problems can be resolved by intermittent catheterization if the patient has a high post-void residual volume, overflow incontinence, or frequent urinary tract infections caused by incomplete emptying of the bladder. Persons who void two or more times a night need to be assessed for obstructive sleep disorder. A bedside commode or urinal may be used if there

is a risk of falling. Kegel's Exercises have shown great improvements in pelvic floor strength and symptomatic relief from incontinence [26,18].

Orthotic support – primary aim is to compensate for weak musculature and protect painful joints in order to provide mobility and function. Conventional KAFO can prevent knee from collapsing while walking due to weak thigh and calf muscles. Motorized wheelchairs or electric scooters are also helpful to aid locomotion in pregnant females [27].

6. CONCLUSION

Post-polio syndrome can precipitate in all trimesters of pregnancy. Multidimensional approach of managing these individuals has shown a great effect in reducing the number of associated complications such as pre-eclampsia, vaginal bleeding and UTIs while providing them with better health related quality of life.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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