

Table 24. Menopause in Women With SCI

<b>Author, Year; Country Score Research Design Total Sample Size</b>	<b>Methods</b>	<b>Results</b>
<p><a href="#">Becker et al. 2009</a> USA RCT N=176</p> <p>The Effects of Hormone Therapy Decision Support for Women with Mobility Impairments</p>	<p><b>Objective:</b> To test a decision-support intervention, adapted from O'Connor's work, that teaches women with mobility impairments how to tailor information to their specific risk/benefit profile</p> <p><b>Population:</b> N=176, 37% post-polio, 63% SCI, MS, and other neuromuscular or joint/ connective tissue disability, mean age=53 years, 2/3 menopausal, average age of menopause=49 years Time 1: 23% women were using HT, 30% women past HT users, 47% never used HT</p> <p><b>Methodology:</b> A questionnaire packet was mailed to eligible women included health history, demographics, the Decision Conflict Scale, the knowledge test, and a question about the likelihood of taking HT. Women randomly assigned to the experimental group received the NAMS Menopause Guidebook (2003), which contains latest clinical guidelines for menopausal treatment, and strategies for achieving optimal long-term health, though no specific information re: mobility impairments. Control group received a standard menopause education booklet.</p> <p><b>Outcome Measure:</b> O'Connor's 16-item Decisional Conflict Scale, a 20-item knowledge scale adapted from O'Connor and her colleagues' scale assessed respondents' recognition of the major benefits, risks, and side effects associated with HT use, 11-item Satisfaction</p>	<ol style="list-style-type: none"> <li>1. Both groups significantly improved their knowledge and decreased their decisional conflict and uncertainty about HT use.</li> <li>2. However, 72% of women in the tailored intervention group rated the materials they received as relevant to the concerns of women with physical impairments, compared with 59% in the comparison group (<math>t=1.87, p&lt;.05, 1</math>-tailed).</li> <li>3. The average change observed in both groups of women has clinical significance.</li> <li>4. Women who reported actually seeing their provider during the study had significantly higher scores at the third data collection (<math>t=3.25, p&lt;.001</math>).</li> <li>5. Health care providers need to initiate a dialogue about screenings and other preventive measures for these women at a younger age, and this dialogue should consider broadly how menopausal changes affect the lives of women with disabling conditions.</li> </ol>

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	with Preparation for Shared Decision Making, and decision to Take HT was assessed by an item asking women to rate how likely they were to think about taking HT	
<a href="#">Szlachcic et al. 2014</a> USA Prospective Level 5 Predictors of Subclinical Atherosclerosis in Women with Spinal Cord Injury	<p><b>Objective:</b> To determine which risk factors for CVD are associated with increased carotid intima-media thickness (CIMT), a common indicator of atherosclerosis, in women with SCI.</p> <p><b>Population:</b> 122 females, mean age: 43.1. Post injury 16.4 years. Complete SCI 68, Incomplete SCI 54</p> <p><b>Methodology:</b> Participants were brought in for medical history and physical exam, ECG, and carotid artery ultrasound imaging</p> <p><b>Outcome Measure:</b> Carotid intima-media thickness (CIMT)</p>	<ol style="list-style-type: none"> <li>1. Only age was positively significantly associated with CIMT for women with SCI.</li> <li>2. No significant correlation of CIMT with lipid profile, BMI, or race when using regression analyses.</li> </ol>
<a href="#">Khong et al. 2004</a> UK Survey N=59  Hormone replacement therapy in women with spinal cord injury - a survey with literature review	<p><b>Objective:</b> To examine the current use of hormone replacement therapy (HRT) in a sample of menopausal women with spinal cord injury (SCI).</p> <p><b>Population:</b> N=59, Mean age=28 years, Mean time since injury=31 years, 22 Tetraplegic, 37 Paraplegic, 31 Complete, 28 Incomplete, 50 menopausal, 9 premenopausal</p> <p><b>Methodology:</b> A postal questionnaire was sent to 94 women from the NSIC patient database who were wheelchair dependent, aged 49 years and above, had contact with SCI hospital/agency within the last 3 years.</p> <p><b>Outcome Measures:</b> HRT use</p>	<ol style="list-style-type: none"> <li>1. At the time of the survey, 50 women were menopausal and 11 of them were using HRT, six for menopausal symptoms and five for osteoporosis prevention.</li> <li>2. Another 11 had used HRT, eight for menopausal symptoms and three for osteoporosis prevention, but had discontinued it.</li> <li>3. Main reasons for stopping HRT were side effects and concerns re: increased risk of breast cancer and thromboembolism.</li> <li>4. Of the 28 women who had never been on HRT, 20 had either enquired about it, or had been offered HRT, but decided against it.</li> <li>5. Of the 9 women who were still premenopausal at the time of the survey, 4 would consider using HRT.</li> </ol>
<a href="#">Kalpakjian et al. 2010</a>	<p><b>Objective:</b> To examine menopause transition characteristics and</p>	<ol style="list-style-type: none"> <li>1. Women with SCI experienced greater bother of somatic symptoms (a sub-</li> </ol>

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<p>USA Case-control N=128 62 women with SCI and 66 women without SCI</p> <p>Menopause Characteristics and Subjective Symptoms in Women with and without Spinal Cord Injury</p>	<p>symptom bother in women with spinal cord injury (SCI). <b>Population:</b> N=62, Mean age=51.82, Years since injury=30.76, Age at injury=31.26, 21 Tetraplegia, 42 Paraplegia, 37 complete, 19 Incomplete Comparison group: N=66 women without SCI with intact ovaries, not using hormone therapy and between the ages of 45 and 60 years <b>Methodology:</b> Self-report surveys were collected four times, approximately nine months apart, over the duration of the four-year study <b>Outcome Measures:</b> Age at final menstrual period (FMP); transitions through menopause status classifications; Mid-Life Symptom checklist was used to assess menopause symptom bother (vasomotor, somatic, psychological symptoms).</p>	<p>scale, <math>p \leq 0.001</math>), bladder infections (<math>p \leq 0.001</math>), and diminished sexual arousal (<math>p = 0.012</math>).</p> <ol style="list-style-type: none"> <li>2. Contrary to hypothesis, women without SCI had significantly greater bother of vasomotor symptoms (<math>p=0.020</math>).</li> <li>3. Significant effect of menopause status on vasomotor symptoms (<math>p=0.032</math>) such that women in early post-menopause were significantly more bothered than those in late post-menopause (<math>p=0.032</math>).</li> <li>4. The number of women transitioning through a menopause status classification over the course of the study did not significantly vary by group (<math>p=0.263</math>) nor did age at FMP (<math>p=0.643</math>).</li> </ol>
<p><a href="#">Becker et al. 2002</a> USA Survey N=167</p> <p>The Decision to Take Hormone Replacement Therapy Among Women With Disabilities</p>	<p><b>Objective:</b> Explored the factors that women with physical impairments consider when making decisions about HRT <b>Population:</b> N=167, Average age=52, 26% MS, 23%, joint/connective tissue disorders, 13% post-polio, 10% spinal cord injury, 10% other diagnosis. N=148 menopausal, 50% currently taking HRT, 19% taken HRT in the past, 22% never taken HRT, 9% did not know about HRT, 16% has a medical condition that prevents the use of HRT <b>Methodology:</b> The fliers and letters describing the project were sent to 29 individuals and programs that serve people with disabilities. These</p>	<ol style="list-style-type: none"> <li>1. The intent and prediction to use HRT are significantly correlated to physician's subjective norm, attitude scale, HRT self-efficacy rating, and difficult to decide rating (all <math>p &lt; 0.05</math>)</li> <li>2. Mean score for the 162 respondents who completed the scale was 10, with a range from 0 to 20 and a standard deviation of 4.95</li> <li>3. On the 20-item Knowledge Scale of HRT (scores can range from 0-20), the knowledge score (<math>n=162</math>) had a small, statistically significant correlation with current HRT use (.27) with a mean of 10 but not the intent to take HRT.</li> <li>4. The mean likelihood of women taking HRT to control hot flashes (1.78), decrease osteoporosis risk (1.70),</li> </ol>

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	<p>women were mailed copies of the blank pages and asked to complete and return them to the project.</p> <p><b>Outcome Measure:</b> The Beliefs About Hormone Replacement Therapy Among Women with Disabilities Scale and 20-item Knowledge Scale developed by O'Connor et al. (1998) was used to assess respondents' knowledge of HRT. Belief statements rated from +3 = extremely likely to -3 = extremely unlikely.</p>	<p>reduce uncomfortable symptoms (1.90), reduce mood swings (1.11).</p> <ol style="list-style-type: none"> <li>5. Women reported a mean of 2.01 unlikely to take HRT daily.</li> <li>6. Most women answered 'don't know' ratings to most questions in the questionnaire.</li> </ol>
<p><a href="#">Dannels &amp; Charlifue 2004</a> USA Observational Study N=230</p> <p>The perimenopausal experience for women with spinal cord injuries</p>	<p><b>Objective:</b> This highlights the importance of nurses' understanding of specific health issues such as the perimenopause transition, along with understanding the symptoms and changes that women with SCI may experience throughout the conversion into menopause</p> <p><b>Population:</b> N=230</p> <p><b>Methodology:</b> Women aged 35-55, with an SCI of any level or completeness, and who were treated at an SCI model system hospital in the mountain states were mailed a questionnaire regarding symptoms associated with perimenopause, self-rated severity scores of various symptoms, and different options for treatment of the symptoms related to perimenopause.</p> <p><b>Outcome Measures:</b> Questionnaire for self-rating a variety of perimenopause symptoms and their severities.</p>	<ol style="list-style-type: none"> <li>1. Of the 230 women who responded, 60% reported menstrual cycle changes, 43% reported sleep disturbance, 40% reported night sweats, 39% reported hot flashes, and 38% reported decreased sex drive.</li> <li>2. No significant differences were noted between women with tetraplegia and paraplegia, whether neurologically complete or incomplete.</li> <li>3. Perimenopause is uniquely challenging for women with SCI because the symptoms may mimic or mask other conditions associated with SCI, like autonomic dysreflexia, infections, impaired temperature regulation, and spinal cord cysts</li> <li>4. Care providers, and women with SCI, should carefully monitor their symptoms during perimenopause and the treatment plan should reflect a joint decision between the woman and her provider.</li> </ol>

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<p><a href="#">Jackson &amp; Wadley 1999</a> USA Observational Study N=472</p> <p>A multicenter study of women's self-reported reproductive health after spinal cord injury</p>	<p><b>Objective:</b> This study documents the unique reproductive health conditions, complications, and behaviors in women with spinal cord injury (SCI).</p> <p><b>Population:</b> N=472, Mean age=40, Mean age at injury=32 years, 46% Cervical, 47% Thoracic, 7% Lumbar/Sacral</p> <p><b>Methodology:</b> Following final modification, the self-report, formatted questionnaire extensively examined five aspects of women's reproductive health before and after SCI.</p> <p><b>Outcome Measures:</b> Gynecologic experiences, sexual behaviour, obstetric experience, menopausal issues</p>	<ol style="list-style-type: none"> <li>1. The average age of the women who went through menopause before their injury was 45.5 years (range, 29 to 55 years).</li> <li>2. Although not statistically different, women who stopped menstruating postinjury averaged 43.3 years of age (range, 23 to 61 years).</li> <li>3. Common symptoms of menopause after injury: (69%) hot flashes, (27%) vaginal dryness, (14%) painful intercourse, (52%) emotional liability, (52%) depression, (48%) anxiety, (43%) sleep disturbances, (52%) frequent sweating episodes, (30%) increase spasticity, (14%) AD, (23%) frequent bladder spasms, (14%) others</li> <li>4. No significant difference was noted in any symptom being more likely at a particular time. Mood disorders, however, were reported more frequently after injury.</li> <li>5. Postinjury menopausal symptoms were of low frequency, but more than those reported by women who had undergone menopause before injury.</li> <li>6. Hormone replacement therapy was infrequently used by either preinjury (35%) or postinjury (26%) groups. Half of these women reported that menopausal symptoms were not alleviated by hormone replacement therapy.</li> <li>7. New bone fractures after menopause but before SCI were reported by 2.8% of women</li> <li>8. Postinjury, 4.4% of women had some type of new bone fracture after menopause</li> <li>9. Thirty percent of the postmenopausal women who were injured before menopause had new fractures.</li> </ol>

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<p><a href="#">Garland et al. 2001</a> USA Case-control N=48; 31 women with SCI, 17 women without SCI</p> <p>Regional osteoporosis in women who have a complete spinal cord injury</p>	<p><b>Objective:</b> To study the regional changes in bone mineral density to assess any association with age, body weight, and time since the injury</p> <p><b>Population:</b> N=31 women with SCI, Mean age: 59.4, Time since injury=28.9 years Participants were divided into 3 age groups: 1) 30 years of age or less: N=11; 6 women with SCI (mean age of 25.7 years, mean time from injury 5.7 years) and 5 women without SCI (mean age 27.4 years). 2) Ages 31-50 years: N=23; 16 women with SCI (mean age 41.1 years, mean time from injury 16.1 years) and 7 women without SCI (mean age 47.4 years). 3) Ages 50 years+: N=14; 9 women with SCI (mean age 64.9 years, mean time from injury 28.9 years) and 5 women without SCI (mean age 59.4 years). All of the women in group 3 had reached menopause.</p> <p><b>Methodology:</b> Measurements of bone density were taken every 6 months until 30 months after first measurement.</p> <p><b>Outcome Measures:</b> Bone density. A multivariate analysis of covariance was performed with two between factors (three age-groups and two deficit-groups [injured and controls]) controlling for participant weight. The effects of age, weight, and time since the injury in the patients and the effects of age and weight in the controls were determined with correlation and stepwise multiple regression analyses.</p>	<ol style="list-style-type: none"> <li>1. Using DXA as the imaging method, women with SCI after menopause have been reported to have an increase in L-spine BMD, in striking contrast to non-SCI post-menopausal women</li> <li>2. At the Knee: the mean weight-adjusted bone mineral density in the knees of the injured patients was reduced by 38% in Group 1, 41% in Group 2, and 47% in Group 3 compared with the density values in the corresponding control groups. The difference between the injured patients and the control subjects (in all three age-groups) was highly significant regardless of age (<math>p &lt; 0.0001</math>).</li> <li>3. In the hip region: The mean weight-adjusted bone mineral density in the hips of the injured patients was reduced by 18% in Group 1, 25% in Group 2, and 25% in Group 3 compared with the bone mineral densities in the corresponding control groups. The mean bone mineral density in the hips of the injured group was significantly decreased regardless of age (<math>p &lt; 0.0001</math>).</li> <li>4. In the hip region, stepwise multiple regression analysis showed a significant negative relationship between age and bone mineral density (<math>p = 0.0006</math>).</li> <li>5. In comparison with the values in the corresponding control groups, the weight-adjusted mean bone mineral density in the spine was decreased by 2% in the injured Group-1 patients but was increased by 8% in the injured Group 2 patients and by 15% in the injured Group 3 patients.</li> <li>6. It was also found that the BMD in the spine in the oldest injured patients to</li> </ol>

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		<p>be equal to that in the youngest control individuals. Furthermore, Z-scores decreased with age in the control population whereas they increased with age in the injured groups (p=0.049)</p>
<p><a href="#">Elmelund et al. 2018</a> Denmark Observational Study N=98</p> <p>Pelvic organ prolapse and urogynecological assessment in women with spinal cord injury</p>	<p><b>Objective:</b> The aim of this study was to investigate the occurrence of pelvic organ prolapse (POP) after SCI and to evaluate the need for urogynecological consultations offered to women with SCI. <b>Population:</b> N=98, Mean age=47 years, 58 Menopause, 34 Cervical, 29 Thoracic, 26 Lumbar, 2 Sacral, AIS: 9A/1B/7C/68D <b>Methodology:</b> Any symptoms of POP, urinary/fecal incontinence, or bladder/bowel emptying problems were registered, and POP was classified according to the POP quantification system during a pelvic examination. Differences in baseline characteristics between women with POP stage 0-1 and POP stage <math>\geq 2</math> were investigated. <b>Outcome Measures:</b> Risk of pelvic organ prolapse (POP)</p>	<ol style="list-style-type: none"> <li>1. Fourteen women (14%) reported POP symptoms and 21 women (21%) had anatomical POP stage <math>\geq 2</math>.</li> <li>2. The group with POP stage <math>\geq 2</math> had a significantly higher age, more deliveries, more with vaginal delivery, and more postmenopausal women, but the groups did not differ on median time after injury, neurological level, and completeness of injury.</li> <li>3. A total of 71% experienced urinary incontinence, 27% experienced fecal incontinence, 63% experienced bladder emptying problems, and 70% experienced bowel emptying problems.</li> </ol>
<p><a href="#">Frotzler et al. 2020</a> Switzerland Survey and Case-control N=163 N=18 women with SCI (N=10 with menopause) and 25 men with SCI Comparison group:</p>	<p><b>Objective:</b> To investigate the effect of chronic motor complete spinal cord injury (SCI) and sex on bone densitometry parameters of the hip, femoral neck, tibial epiphysis, and diaphysis and on long bone fractures. <b>Population:</b> N=43 people with SCI – 18 women and 25 men, Mean age=54.7 <math>\pm</math> 12.4 (women) and 53.5 <math>\pm</math> 8.6 years (men). Comparison group: 74 women and 46 men without SCI Mean age=51.0 <math>\pm</math> 13.1 (women) and 50.9 <math>\pm</math> 11.2 years (men) <b>Methodology:</b> Women and men</p>	<ol style="list-style-type: none"> <li>1. The number of women in menopause in the cohort was too small (n=10) to investigate the effect of menopause on bone loss in SCI women.</li> <li>2. Most bone densitometry values were significantly (p<math>\leq</math>0.033) lower in the SCI versus the comparison groups, including total bone mineral density at the distal tibial epiphysis (-58.0% in SCI women and -53.6% in SCI men).</li> <li>3. Osteoporosis was significantly (p &lt; 0.0001) more prevalent in women with SCI (72.2%, 13/18) as well as men with SCI (60.0%, 15/25) compared with the reference groups of the same sex</li> </ol>

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<p>N= 74 women and 46 men without SCI</p> <p>Osteoporosis in the lower extremities in chronic spinal cord injury</p>	<p>with long-term (<math>\geq 7</math> years) motor complete SCI were compared with non-SCI women and men.</p> <p><b>Outcome Measures:</b> Dual-energy X-ray absorptiometry was used to assess bone densitometry parameters at the hip and femoral neck, whereas peripheral quantitative computed tomography was used for the tibial epiphysis and diaphysis</p>	<p>(women 13.5%, 10/74 and men 13.0%, 6/46).</p> <ol style="list-style-type: none"> <li>4. Occurrence of osteopenia was higher in the comparison groups (women 44.6%, 33/74 and men 47.8%, 22/46) versus women (16.7%, 3/18) (<math>p = 0.03</math>) and men with SCI (32.0%, 8/25) (<math>p = 0.2</math>). There was no significant (<math>p = 0.56</math>) difference in the occurrence of osteoporosis and osteopenia between women with SCI and men with SCI.</li> <li>5. The fracture rates per 100 patient-years were 3.17 and 2.66 in women and men with SCI, respectively, compared with 0.85 and 0.21 in able-bodied women and men.</li> <li>6. There were significant (<math>p &lt; 0.001</math>) differences in the time to the first fracture between women or men with SCI and their respective reference group, but no significant (<math>p = 0.14</math>) difference between women with SCI (22.3 years, 95% CI 16.2–28.4 years) and men with SCI (27.3 years, 95% CI 23.1–31.5 years).</li> <li>7. There was a significant (<math>p = 0.002</math>) difference in the time to the first fracture between the sexes in the comparison groups: earlier in women (31.3 years, 95% CI 28.9–33.7 years) than in men (42.0 years, 95% CI 40.5–43.4 years).</li> </ol>
<p><a href="#">Slade et al. 2004</a> USA Case-control N=37 N=17 pre- and post-menopausal women without SCI</p>	<p><b>Objective:</b> The purpose of this study was to compare the effects of SCI and/or menopause on trabecular bone around the knee, the bone type particularly affected by estrogen and loading.</p> <p><b>Population:</b> N=37.</p> <p><b>Methodology:</b> Pre- and postmenopausal ambulatory women (<math>n=17</math>) were selected to be compared to pre- and postmenopausal women with SCI</p>	<ol style="list-style-type: none"> <li>1. Measures of trabecular bone microarchitecture in the distal femur were not different in the postmenopausal versus the premenopausal women, but were different in women with SCI vs. women without SCI; women with SCI had 30.9% lower total trabecular volume and 61% greater total separation (both <math>p &lt; 0.001</math>).</li> <li>2. Measurements in the tibial region were similar; SCI groups had 22% less</li> </ol>

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<p>N=20 pre-and post-menopausal women with SCI</p> <p>Trabecular bone is more deteriorated in spinal cord injured versus estrogen-free postmenopausal women</p>	<p>(n=20). The comparison group participants were selected for similarities in age and years post-menopause.</p> <p><b>Outcome Measures:</b> Trabecular bone volume, trabecular number, trabecular spacing, and trabecular thickness in the distal femur and proximal tibia</p>	<p>total trabecular volume and 5.8% less trabecular thickness (<math>p &lt; 0.001</math> and <math>p = 0.008</math> respectively).</p> <p>3. However, postmenopausal women with SCI had 33% greater trabecular spacing in the tibial area than pre-menopausal women with SCI (<math>p = 0.02</math>; <math>d = 1.45</math>).</p>
<p><a href="#">Rutberg et al. 2007</a> Sweden Prospective Study N=16, N=7 with menopause</p> <p>Amenorrhoea in newly spinal cord injured women: an effect of hyperprolactinaemia</p>	<p><b>Objective:</b> The aim of the present study was to investigate if there was a relationship between s-prolactin and menstrual cycle status following spinal cord injury (SCI).</p> <p><b>Population:</b> N=9, Mean age=44.8, 3 Cervical, 4 Thoracic, 2 Lumbar, ASIA: 2A/3C/5D</p> <p>Menopause group: N=7, Mean age: 61.8, 6 Cervical, 1 Lumbar, ASIA: 3A/2C/2D</p> <p><b>Methodology:</b> S-prolactine and menstrual cycle status were investigated in 16 women with SCI, treated consecutively at the SCI Unit, Sahlgrens University Hospital, Göteborg, Sweden.</p> <p><b>Outcome Measures:</b> S-Prolactine</p>	<p>1. When dividing the group according to fertility status they found hyperprolactinaemia in the women who were in childbearing age (n=9): mean value 1050 mIU/l (s.d.: 678; 95% CI: 607-1493 mIU/ml), whereas it was normal in the group in menopause (n=7): mean value 343 mIU/l (s.d.: 185, 95% CI: 206-480 mIU/l) (<math>p &lt; 0.01</math> when comparing groups).</p>
<p><a href="#">Dirlikov et al. 2019</a> USA Case Series N=27</p> <p>Correlation between thyroid function,</p>	<p><b>Objective:</b> Investigate the association of testosterone and thyroid-stimulating hormone (TSH) levels with depressive symptoms in women after spinal cord injury (SCI).</p> <p><b>Population:</b> N=27, Mean age=44.4, Time since injury= 11.7 years, 6 complete, 14 incomplete, 13 cervical, 6 thoracic, 1 lumbar</p> <p><b>Methodology:</b> Complete hormone</p>	<p>1. Average Total T for the pre-menopausal group was 23.55 ng/dl (SD = 9.67) (normal range: 15–70 ng/dl) and 15.89 ng/dl (SD = 11.1) (normal range: 5–51 ng/dl) for the post-menopausal group.</p> <p>2. Low Total T was observed in four participants (one post-menopausal and post-hysterectomy; three pre-</p>

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testosterone levels, and depressive symptoms in females with spinal cord injury	and questionnaire data <b>Outcome Measures:</b> Total testosterone (Total T) and TSH levels as well as the Center for Epidemiological Studies Depression Scale (CES-D) survey and monthly sexual activity	menopausal without hysterectomy/oophorectomy). 3. Time from injury was significantly associated with TSH ( $r = .536, p = .015$ ), such that greater time from injury was associated with elevated TSH levels. 4. A significant association was found with time from injury and CES-D total score ( $r = -.547, p = .013$ ), such that lower CES-D total scores were associated with greater time from injury.
<a href="#">Broholm et al. 2005</a> Longitudinal N=11  The course of bone mineral density and biochemical markers of bone turnover in early postmenopausal spinal cord-lesioned females	<b>Objective:</b> To evaluate bone mineral density (BMD) and biochemical markers of bone turnover in spinal cord-lesioned females in the early postmenopausal period. <b>Population:</b> N=11, Mean age=52, 3 Lumbar, 4 Thoracic, 4 Cervical <b>Methodology:</b> Using dual energy X-ray absorption, BMD of the lumbar spine, femoral neck, trochanter and proximal tibia was measured every 6 months for 30 months. <b>Outcome Measures:</b> BMD of the lumbar spine, femoral neck, trochanter and proximal tibia	1. An accelerated bone turnover occurs in early postmenopausal SCL females, a significant increase in markers of bone formation in the blood was found and markers of bone resorption in urine tended to increase 2. Fairly large magnitude in bone loss of 7.6% in the femoral neck and 5.7% in the trochanter appears primarily to be the result of menopause 3. SCL subjects seem to lose bone in the femoral neck, but not in the spine and tibia, during and after menopause to the same extent as normal postmenopausal individuals. 4. Biochemical markers of bone turnover increase after the menopause of SCL women
<a href="#">Hosier et al. 2012</a> Case series N=17 women with SCI (11 premenopausal, 6 postmenopausal)  Cardiometabolic Risk Profiles in Pre- Versus Postmenopausal Women with	<b>Objective:</b> To compare the cardiometabolic risk (CMR) profile of premenopausal and postmenopausal women with spinal cord injury (SCI). <b>Population:</b> N=17 Pre-menopausal: N=11. Mean age=32.4, AIS: 5A/6B, 1 Tetraplegic, 10 paraplegic Post-menopausal: N=6, Mean age=56.0, Mean age at menopause: 43.8, AIS: 4A/2B, 3 Tetraplegic, 3 Paraplegic <b>Methodology:</b> Post hoc analysis of	1. Postmenopausal women with SCI had higher concentrations of TC, LDL-C, and TG than their premenopausal cohorts. 2. The premenopausal group had a mean age of 32.4 years compared with 56.0 years in the postmenopausal group. 3. Similar group findings included body mass index (BMI) (22.4 vs 22.2), HDL-C (52.5 vs 53 mg/dL), HbA1c (4.9 vs 5.1%), fasting blood glucose (FBG) (79.3 vs 84.8 mg/dL), and systolic blood pressure (SBP) (104.6 vs 111.8 mm Hg).

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Spinal Cord Injury:	<p>a multicenter cross-sectional study assessing CMR. Data collected included demographic, social, medical, menopausal, hormone use, and menstrual histories. Assessments included physical, anthropometric, and blood pressure measures; fasting serum total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), triglycerides (TG), and hemoglobin A1C (Hb1Ac); calculated low-density lipoprotein (LDL-C); and an oral glucose tolerance test.</p> <p><b>Outcome Measures:</b> physical, anthropometric, and blood pressure measures; fasting serum total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), triglycerides (TG), and hemoglobin A1C (Hb1Ac); calculated low-density lipoprotein (LDL-C); and an oral glucose tolerance test</p>	<p>4. TG, TC and LDL-C were significantly higher in postmenopausal group (55.7 vs 101.8 mg/dL, <math>P = .01</math>; 158.3 vs 191.6 mg/dL, <math>P = .04</math>; 94.7 vs 118.2 mg/dL, <math>P = .04</math>).</p>
<p><a href="#">Furlan &amp; Bracken 2020</a> USA/Canada Case series (Conference Abstract) N=306, N=39 women</p> <p>Sex as a key determinant of survival and neurological recovery after traumatic spinal cord injury: Analysis of the NASCIS-1 database</p>	<p><b>Objective:</b> This study examined the potential effects of sex on injury epidemiology, management, and outcomes after acute traumatic SCI.</p> <p><b>Population:</b> N=306 (39F;267M), mean age=31, 36.6% Paraplegia, 35% Tetraplegia, 11.7% Tetraparesis, 6.2% Paraparesis (No additional data on how many of the women in the study were in which age group)</p> <p><b>Methodology:</b> Motor and sensory (light touch and pin prick sensation) NASCIS scores were used</p> <p><b>Outcome Measures:</b> Survival, motor and sensory recovery</p>	<ol style="list-style-type: none"> <li>1. Motor recovery at 1 year was significantly greater among women in menopause than women in pre-menopause and men (<math>R^2 = 0.09</math>, <math>p &lt; 0.01</math>)</li> <li>2. Pin-prick sensory recovery at 1 year was greater among women in postmenopause than women in premenopause (<math>R^2 = 0.03</math>, <math>p = 0.02</math>). There was a trend for a greater light-touch sensory recovery among women in menopause than women in premenopause (<math>R^2 = 0.05</math>, <math>p = 0.06</math>)</li> </ol>

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<p><a href="#">Hani Abdullah et al. 2023</a> Prospective Controlled Trial (Conference Abstract) N=128</p> <p>Perceptions of Pain in Menopausal Women Undergoing Spinal Cord Stimulation</p>	<p><b>Objective:</b> To ascertain the benefits of spinal cord stimulation (SCS) in older women</p> <p><b>Population:</b> N=128 people with SCI, 23 females younger than 51 years, 43 females older than 51 years, and 62 males.</p> <p><b>Methodology:</b> Outcomes were assessed at baseline and one year after the thoracic spinal cord stimulation procedure. divided into premenopausal and menopausal (above age 51) cohorts, and then compared with male SCS patients.</p> <p><b>Outcome Measures:</b> numeric rating scale (NRS), Oswestry Disability Index (ODI), Beck's Depression Inventory (BDI), McGill Pain Questionnaire (MPQ), and Pain Catastrophizing Scale (PCS).</p>	<ol style="list-style-type: none"> <li>1. Females over 60 were notably different than men and women under 60 in that they had greater improvements in NRS (p = 0.026), ODI (p = 0.045), and BDI (p = 0.041).</li> <li>2. Greater improvement in post-menopausal females when considering age 60 as a cohort.</li> </ol>
<p><a href="#">Harrison and Becker, 2007</a> USA Qualitative N=19 women with disabilities (N=5 with SCI)</p> <p>A Qualitative Study of Menopause Among Women With Disabilities</p>	<p><b>Objective:</b> To examine the ways in which women with disabilities due to mobility impairments understand and react to menopause.</p> <p><b>Population:</b> 19 women; Age range – 42 to 64 years; average age - 53 years. Women were primarily white, non-Hispanic (n = 16); 1 woman was Hispanic, 1 was African American, and 1 was American Indian.</p> <p>Disability types of participants: Spina bifida – 2; Postpolio – 8; Spinal cord injury – 5; Stroke – 1; Diabetic complications – 1; Multiple sclerosis – 1; Fibromyalgia – 1.</p> <p><b>Methodology:</b> Women were recruited from decision-support for HRT in women with SCI study (published as Becker 2009).</p>	<ol style="list-style-type: none"> <li>1. The women stated that it was important to be armed with information; to know and remain aware of your body; to confront or avoid healthcare providers, if needed; to not treat everything as a disease; to take few pre-emptive strikes; and to always put life and death issues first. In other words, the women believed that all medical interventions had the potential to be “wrong” for them; no medical provider or intervention was infallible.</li> <li>2. For women with disabilities, viewing menopause with a balanced perspective meant integrating their experiences as women who live their everyday lives with disabilities with the dominant medical paradigm that defines them as a group at risk for further medical complications.</li> <li>3. The women in this study spoke of the creation of extended networks to communicate with other women</li> </ol>

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	<p>Women were asked questions about their experience with menopause, in the context of their disability, and to what degree they had resources available to support them.</p> <p><b>Outcome Measures:</b> Semi-structured phone interview, with subsequent categorical and thematic analysis.</p>	<p>about menopause; they came together to share knowledge and support each other. The women created networks made up of women both with and without disabilities.</p> <ol style="list-style-type: none"> <li>4. Valuing values – for the women in this study, 15 of the 19 women specifically stated that they valued thoughtfulness in relation to their disability. They wanted their providers to pay attention to their disability needs.</li> <li>5. Survival skills - in this study, a major part of survival among the women with disabilities is having the financial resources needed to act on any decision made.</li> </ol>
<p><a href="#">Pentland et al. 2002</a> Canada Qualitative N=29</p> <p>Women with spinal cord injury and the impact of aging</p>	<p><b>Objective:</b> The objectives of this study were to describe what women with longstanding spinal cord injury (SCI) feel they are experiencing as they age, how they are coping and what they require in order to ensure their continued social and economic participation in society.</p> <p><b>Population:</b> N=29, Mean age=50 years, Mean duration of SCI=12 years, 10 Cervical, 17 Thoracic, 2 Lumbar</p> <p><b>Methodology:</b> A naturalistic approach was taken, incorporating three focus groups (n=10) and key informant interviews (n=19) of women</p> <p><b>Outcome Measures:</b> Impact of aging</p>	<ol style="list-style-type: none"> <li>1. Many of the women in their early 40s have begun experiencing symptoms that may indicate the early stages of menopause.</li> <li>2. The common physical changes and concerns were gynecological/sexual and bowel and bladder issues.</li> <li>3. Socio-emotional changes with age included impact of their age-related changes on important relationships and re-evaluation of personal priorities.</li> <li>4. From the focus group: “As your period starts to become irregular (with menopause), it affects your bowel routine”</li> <li>5. Summary for the focus group “cannot get clear answers from their doctors about whether these symptoms are appropriate for their age, whether the SCI causes early menopause, whether the shock of the SCI to their system may have precipitated atypical hormonal changes, or whether their medications are affecting their hormone balances”</li> </ol>

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		<p>6. Additional resources they need to age successfully include improved environmental accessibility, assistive devices, more flexible and responsive attendant and household support, access to recreation and fitness opportunities and peer and psychological support.</p>