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Research Article

Non Dermatomal Somatosensory Deficits (NDSDs) in Chronic Pain Litigants

Angela Mailis[1,2,3*], Nivan Zoheiry[1,2], Maha Alkokani1, S. Fatima Lakha[1], Amol Deshpande[1], Karen Spivak[1,3]

[1]CPP/CIPP, University Health Network, Canada

[2]Centre for the Study of Pain, Toronto, Ontario, Canada

[3]Pain and Wellness Centre, Vaughan ON, Canada

***Corresponding Author:** Dr. Angela Mailis , Pain and Wellness Centre 2301 Major MacKenzie Dr. West, #101 Vaughan ON, Canada, L6A 3Z3, Tel: + 1-800-597-5733/ ext 3; Fax: 1-844-358-9305; Email: angela.mailis@uhn.ca

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Abstract

Objective: The study aims to explore demographic and other characteristics of chronic pain subjects involved in litigation with and without the diagnosis of Non Dermatomal Somatosensory Deficits (NDSDs).

Methods: A cross-sectional descriptive study was conducted on all NDSD subjects referred for medico legal examination (2009-2012) and age-matched controls randomly chosen from the same litigant pool. Data collected included demographics, Short Form of the McGill Pain Questionnaire, Numeric Rating Scale scores, accident circumstances, and pain/ sensory abnormalities documented on body diagrams.

Results: We studied 114 litigants (38 NDSD; 76 non-NDSD). Females outnumbered males (2:1 in non NDSD and 2.5:1 in NDSD litigants). Foreign-born prevalence was higher than that reported in the Canadian population (47.4% in the NDSD and 43.3% in the non NDSD group). NDSDs were found at the site of worst pain. NDSD females reported higher pain than non NDSD females and NDSD males ($p<0.05$). Pain behaviors were observed in 39.5% of NDSD vs 14.5% of the non NDSD group ($p<0.05$). Absence of biomedical pathology coupled with dominant psychological factors were found in 34.2% of NDSD vs 16% of non NDSD litigants ($p<0.05$). Mood, anxiety or PTSD disorders were documented in 44.7% of NDSD vs 15.7% of non NDSD litigants ($p<0.05$). None of the NDSD litigants returned to full-time work as compared to 15.8% of non NDSD subjects ($p<0.05$).

Conclusion: The study confirms previous observations regarding NDSD litigants. However, the preponderance of foreign born and female litigants is a novel finding suggesting that complex biomedical, psychological and psychosocial variables may be at play.

Keywords: Litigation; Litigants; Non Dermatomal Somatosensory Deficits; Personal Injury; chronic pain

Introduction/ Background

Unexplainable hypoesthesia (sensory deficits) not conforming to anatomical boundaries of peripheral nerve or root territories, or myotomal boundaries have often been observed in the context of chronic pain. To date, these widespread areas of decreased sensation in the absence of demonstrable neurological damage in low back pain patients, have been considered one of the five Waddell signs implying that non-organic (i.e., non-physical) or psychogenic issues may be a contributing factor to the patient's presentation [1].

Our chronic pain team coined the term NDSDs (Non Dermatomal Somatosensory Deficits), subsequently adopted by other researchers, to describe this phenomenon of unexplainable hypoethesiae which is characterized by reduced cutaneous sensation to multiple modalities (i.e., pinprick, touch, cold etc.), as well as impairment of vibration sense in large areas not confined to peripheral nerve/root territories [2]. We showed that frequently these sensory deficits are coupled with either reduced or paradoxically increased sensitivity of deep tissues to firm palpation in the same

territory. In some cases, concomitant motor symptoms (weakness, abnormal posturing, gait abnormalities etc.) are observed. We proposed that NDSDs were potentially attributable to central factors and specifically "Maladaptative Neuroplasticity" We went on to demonstrate with functioning imaging that individuals with NDSD have discrete abnormalities in brain activation patterns [3]. Similar findings were reported later with PET scanning by another group of researchers [4].

In the first paper from our group [1] and in several other publications from our group, we provided data that psychotraumatic experiences, ethnocultural factors, and personality profiles were contributing to the generation of NDSD [5]. The contribution of psychological factors to the generation of NDSDs was debated between researchers [6][7], and ultimately agreed that a "strain" factor (physical and/or emotional) was contributing to the onset and/or maintenance of NDSDs. Over the past 18 years, the concept of NDSDs has received international attention with several publications on the subject in peer-reviewed pain journals, even using an image of a patient with NDSD for the cover of PAIN, the official journal of the International Association for the Study of Pain 2012 [8].

With respect to chronic pain and litigation, serious motor vehicle collisions may result in tissue damage, chronic pain and disability. In contrast, chronic pain arising from low impact collisions in the absence of demonstrable tissue damage remains a complex phenomenon. Conditions such as Whiplash Associated Disorders and non-specific low back pain have been shown to be closely linked with several psychological and psychosocial factors [9-11]. Specifically litigation, has been associated with significant pre- and post-accident differences between litigants and non-litigants [12,13]. In our original work [2] we concentrated on a cohort of litigants referred to the senior author for a medicolegal examination and explored the prevalence and characteristics of NDSDs and differences between litigants with and without NDSDs. Specifically, we reported that 25% of the litigants in the specific cohort presented with unexplainable widespread hypoesthesiae and chronic pain, were more likely to be born outside Canada, have abnormal pain behavior, negative investigations, and show poor prognosis for return to employment.

Given the high prevalence of NDSDs (25 to 40%) in chronic pain cohorts [14], and several publications over the course of years from our group and a northern european group, finally NDSD recognition as an important contributor to chronic pain disability has been gaining credibility in medical and legal circles in Ontario, Canada. As an example, the first such case was resolved to the satisfaction of an injured litigant (Ontario Superior Court of Justice, Jury Trial, Belleville, Ontario, November – December 2004; Justice Thomas Lally presiding). The present study aims to explore demographic and other characteristics of a recent cohort of Canadian chronic pain litigants who were involved in motor vehicle accidents, with and without a diagnosis of NDSD, and compare the findings to those of our older study in 2001, in an effort to further understand treatment and prognostic outcomes in these populations.

Methods

This was a cross-sectional, retrospective descriptive study conducted at an academic tertiary care pain clinic, the Comprehensive Pain Program (CPP), at the Toronto Western Hospital/ University Health Network, Toronto, Ontario. Data were collected from a cohort of consecutive litigants with chronic pain referred for a medico-legal consultation to the senior author (AMG) over a period of 4 years (2009-2012). All litigants with NDSD and age matched non NDSD controls randomly chosen using SPSS 16.0.1 were selected from the same pool of litigants (ratio one litigant/ two controls in an effort to increase the power of findings). Age variable was selected to match the controls because it had an extensive range (young to seniors) in both and would allow us to capture differences and similarities between all other variables in both groups. The study received approval from the Institutional Research Ethics Board.

Data collected at the time of the original visit included demographics (age, marital status, education, country of birth), pain diagrams, the Short Form of the McGill Pain Questionnaire (SFMGPQ) and pain ratings on a Numeric Rating Scale (NRS, 0-10) obtained for "pain at the time of the examination". Accident circumstances, clinical information and maps of sensory abnormalities were obtained via a comprehensive history and detailed neuro-musculoskeletal examination. Cutaneous sensation was examined in both affected and unaffected limbs and the whole torso as follows: Light touch was tested via a soft brush; hyperalgesia to pinprick via a standard pinwheel with equal length pins around, disinfected after each use; and gross cold perception via a metal stick that had been placed on ice. In particular, pinprick hypoalgesia was graded in 3 levels: Mild (pinprick feels still "prickly" but less than the control unaffected extremity); moderate (pinprick feels "rolling" or "dull" but not sharp as compared to the control unaffected extremity); and severe (pinprick is not perceived at all in the affected body parts = anesthesia with eyes open and closed). All sensory findings were drawn in a set of body diagrams for each sensory modality. Vibration sense was tested using a 128 Hz tuning fork in multiple bone prominences and each limb (big toes, lateral and medial malleoli, knees, second metacarpal, radial and ulnar styloid, lateral epicondyle and AC joint). Pain arising from deep structures (e.g. muscles, periosteum, etc.) was tested by firm symmetrical manual pressure exerted simultaneously across the symptomatic and asymptomatic limbs. The examination was performed repeatedly for both upper and lower extremities, altering

the order (i.e., affected/unaffected limb followed by unaffected/affected limb). Only consistent response (irrespective which limb was tested first) were considered valid and recordable.The clinical examination is semi-quantitative and practical as it can be applied at the bedside and has been detailed in previous publications [2,5].

Diagnostic classification was based on an empirically derived system that was adapted from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) [15] and then modified by the CPP. The details have been described in previous studies [16-19]. Patients classified as Group I have significant biomedical condition(s) accounting for their pain and disability without excessive psychological influences. Group II patients have underlying biomedical pathology but additionally, psychological factors are deemed to play a significant role in their perceived disability and presentation. Group III patients a) display high levels of disability and pain severity, b) lack detectable biomedical pathology (with the present clinical diagnostic means available such as diagnostic imaging studies, electromyography and nerve conduction studies, surgical findings, etc.) and c) have concurrent psychological factors considered to be fundamental in their presentation. Notably, a Group III diagnosis is not a diagnosis of exclusion, i.e., it is not made solely on the basis of lack of biomedical pathology. Rather, such a diagnosis requires detailed clinical information obtained by history and physical examination combined with an absence of positive biomedical investigations and behavioural observations. The clinical examination seeks to report pain behaviours (verbal or non verbal) and certain signs elicited during distraction or confrontation. Pain behaviours are classified as verbal (moaning, verbalizing pain etc.) or non-verbal (limping, shifting in chair or standing up frequently, rubbing painful part, fear of movement etc.) and absent or present. Straight Leg Raise (SLR) is tested in a seated position (under distraction) and while supine (under confrontation). Differences greater than 30^{o} between sitting SLR versus supine SLR are considered indicative of non-organic pathology.

Statistical analysis was performed using SPSS 16.0.1 for Windows (SPSS, Chicago, IL, USA). Categorical and continuous variables were analyzed using chi-square and independent sample t test, respectively. At a 95% confidence interval, the level of statistical significance was set at $p < 0.05$ (2 tailed).

Results

A total of 114 litigants were included in the study, 38 with NDSD and 76 without NDSD. Females outnumbered males in both groups (2:1 in non NDSD and 2.5:1 in NDSD litigants). The results of demographic characteristics are shown in Table 1.

Summary of demographic data		NDSD group (n=38)	Non-NDSD group (n=76)
Age	Mean(range)	44.1 years (25-69)	45.6 years (24-75)
Gender	Male	28.9% (11)	32.9% (25)
	Female	71.1% (27)	67.1% (51)
Marital status	Married	68.4% (26)	50% (38)
	Single	15.8% (6)	26.8% (20)
	Divorced	13.2% (5)	6.6% (5)
	Common low	2.6% (1)	7.9% (6)
	Widow	--	2.6% (2)
	NA	--	6.6% (5)
Country of birth	Canadian born	52.6% (20)	56.6% (18)
	Foreign born	47.4% (43)	43.3% (33)
***Country of birth for foreign born**	Non- European	83.3% (31)	51.6% (43)
	European	16.7% (7)	48.4% (33)
****Education**	None	2.6% (1)	1.3% (1)
	College & University	28.9% (11)	61.8% (47)
	High school	57.9% (22)	23.7% (18)
	Grade school	10.5% (4)	11.8% (9)
	NA	--	1.3% (1)
Employment before injury	Employed	94.7% (36)	94.7% (72)
	Unemployed	5.3% (2)	5.3% (4)
***Employment after injury**	Employed full time	0%	15.8% (12)
	Part time	21.1% (8)	18.4% (14)
	Unemployed	78.9% (30)	65.8% (50)

Statistical significance is marked as follows: *Significant at $p<0.05$; ** Significant at $p<0.001$

Table 1: Demographic characteristics.

Mean age was 44.1 years (range 25-69) for the NDSD group and 45.6 years (range 24-75) for the non-NDSD group.

Foreign-born patients comprised 47.4% of the NDSD group and 43.3% of the non-NDSD group. Notably, 83.3% of foreign-born NDSD litigants versus 51.6% of foreign-born non-NDSD patients were non-European in origin (the finding reached statistical significance, $p<0.05$). The vast majority of non-European subjects originated from Asia (China, Korea, Philippines, India and Pakistan) and the Caribbean for both NDSD and non-NDSD groups.The mean pain duration was 41.5 months in the NDSD group (range 12-108 months), and 36.7 months in the non-NDSD group (range 7-144).

In regards to pain severity for the worst pain site, statistically significant differences in pain ratings were observed a) between NDSD and non-NDSD females with the former reporting higher pain ratings ($p<0.05$); and b) within the NDSD group, where females reported higher mean pain ratings than males (females 7.3/10, range 4-10/10; males 6.1/10, range 3-8/10, $p<0.05$). Pain characteristics are shown in Table 2.

		NDSD group (n=38)	**Non-NDSD group (n=76)**
Pain duration	Mean(range)	41.5(12-108) months	36.7 (7-144) months
*Total words chosen for Severe pain intensity in McGill (0-15)	mean (range)	5.9 (1-15)	4.3 (1-12)
*Total score in McGill (0-45)	mean (range)	25.4 (3-45)	19.8 (2-40)
*Psychiatric illness diagnosis		50% (n=19)	35.3% (n=27)
* Patient hospitalized more than 1 day		n=26	n=38
	Yes	11.6% (3)	47.4% (18)
	No	88.4% (23)	52.6% (20)
Statistical significance is marked as follows: *Significant at $p<0.05$			

Table 2: Pain characteristics.

The NDSD group chose more words on the SFMGPQ severe pain intensity category to describe their pain (mean 5.9, range 1-15) compared to the non NDSD group (mean 4.3, range 1-12, $p<0.05$). Higher total SFMGPQ scores were also obtained by the NDSD group (mean 25.4, range 3-45) compared to the non-NDSD group (mean 19.8, range 2-40, $p<0.05$).

NDSDs were always present at the site of unilateral pain or worst pain site, if more than one body site was involved. Hemi body NDSD was observed in 63.1% of subjects and when present, involved the face in 80% of the cases. In regards to cutaneous and deep sensory modalities in the area of NDSD, hypoalgesia to pinprick was observed in 100% of NDSDs; hypoesthesia to touch in 94.7%; hypoesthesia to cold in 89.4%; and reduction to vibration sense in 81.5%. More than half of the patients with NDSDs (57.9%) had a positive forehead vibration "split" (i.e., reduced vibration on the NDSD side). Deep manual pressure was perceived as reduced in the site of the NDSD in 65.8% of the patients and increased in 26.3% (a paradoxical phenomenon given the reduction in all other sensory modalities).

Pain behaviors' during clinical examination (as defined in the methods section) were observed in 39.5% of NDSD group as compared to only 14.5% of the non-NDSD group ($p<0.05$). SLR differences of more than 30^0 under distraction versus confrontation were observed in 50% of the NDSD subjects versus 22.3% of non-NDSD subjects ($p<0.05$).Numerous social and demographic differences were noted between the NDSD and non-NDSD groups as follows:

NDSD litigants were less likely to have post-secondary education than non-NDSD litigants (28.9% versus 61.8% respectively, ($p<0.001$). However, females with NDSD had greater post-secondary education as compared to males with NDSD (37% vs. 9.1%) ($p<0.001$). While 94.7% of subjects in either group were employed before the MVA, 15.8% of non-NDSD subjects and none of the NDSD litigants, returned to full time employment after the accident ($p<0.05$). Results are shown in Table 1.

Non-NDSD litigants had greater severity of injuries based on duration of hospital stay>1 day, and occurrence of fractures (both based on documentation recorded in files). Specifically, Hospital stay for more than one day was documented in 11.6% of the NDSD litigants compared to 47.4% of the non-NDSD group ($p<0.05$), and fracture in 18.4% in the NDSD group and 35.5% in the non-NDSD group ($p<0.001$). Soft tissue injury was reported by 3/5 patients in both NDSD and non-NDSD groups (68.4% and 60.5%, respectively). Despite greater severity of injury in the non-NDSD litigants, loss of consciousness was more frequently reported to the senior author by the NDSD litigants than the non-NDSD litigants (self-report), though the finding did not reach statistical significance (13.2% of NDSD group and 5.2% of non-NDSD group. Absence of any detectable biomedical pathology in the presence of dominant psychological factors (Group III) was found in 34.2% of NDSD vs. 16% of non-NDSD litigants ($p<0.05$).

NDSD litigants had significantly more mood/anxiety and/or PTSD disorders documented by psychiatrists or psychologists on file after the accident, compared to non-NDSD litigants (44.7% versus 15.7%, respectively) ($p<0.001$) (the collected information on file did not allow us to ascertain whether there was pre-accident psychopathology). Nightmares (as one symptom of Post Traumatic Stress Disorder -PTSD) were reported after the injury by 65.8% of the NDSD litigants compared to 30.3% in the non-NDSD group ($p<0.001$). Both groups reported significant interference with household chores, shopping and socialization. However, 76.3% of the NDSD group reported decreased social interactions compared to 48.7% in the non-NDSD group ($p< 0.001$).

Illustrative Case Report

A 48 year old East Indian female sustained soft tissue injuries and reported a momentary loss of consciousness in a 2010 low impact motor vehicle accident. She participated in extensive courses of facility-based therapy without success, while further

multiple investigations did not reveal any biomedical pathology. She was sent to the senior author by a lawyer in 2012 with severe left-sided body pain and numerous somatic and psychological complaints, such as constipation, dysuria, urinary frequency, painful micturition, buzzing in her ears, facial swelling, anxiety attacks, forgetfulness, driving phobia, nightmares, fragmented sleep, weight gain, loss of libido, and significant depression (diagnosed by her psychologist). The patient's left leg numbness developed within 3-4 months after the accident and persisted. She had been unable to work, resulting in financial distress and a great burden to the family as she was ADL dependent. Pre-accident history was remarkable for a diagnosis of fibromyalgia and an extensive history of anxiety.

On clinical examination, she displayed numerous verbal and non-verbal pain behaviours and significant pain avoidance behaviour. Sensory examination revealed a dense hemi sensory deficit covering the left side of face and trunk, left arm and left leg to all cutaneous sensory modalities including reduced vibration sense with a classic "forehead split".

Discussion

This study confirmed previous findings on NDSD patients while providing insight and important new information regarding the population of litigants in general and NDSD litigants in a Canadian medico legal practice. Female gender and foreign born individuals dominated the population of non-NDSD and NDSD litigants in this study.

Consistent with findings in several previous studies [2,3,4,6] we also noted that NDSDs when present, were found at the site of worst pain, with hemi sensory deficits in more than half of the cases associated with reduced cutaneous modalities (pinprick, touch and cold perception) and deep sensory modalities (vibration sense and deep manual pressure).

The higher pain ratings and higher prevalence of PTSD and mood/anxiety disorder in the NDSD litigants render support to previous observations that psychological and psychosocial factors (possibly associated with a certain type of personality organization) irrespective of the presence or absence of biomedical pathology/tissue injury, contribute to the generation of NDSDs and alteration of brain activation patterns [7]. In addition, the failure of NDSD litigants to return to full time work, as compared to non NDSD litigants, confirms the previous observation [2], that NDSDs are associated with a worse prognosis for return to employment. A number of important demographic findings and several statistically significant differences were found between chronic pain litigants and the general population, as well as between litigants with and without NDSD.

These differences relate to the following variables:

The percentage of foreign-born litigants in this sample (43.3% for non NDSDS and 47.4% for NDSD litigants) is much higher than the proportion of foreign born individuals in the general population in Canada (20.6%), Ontario (28.5%) and Toronto (37.4%) (Stats Canada 2011, Census) [20]. Additionally, women were twice as likely to be involved in litigation than men, irrespective of the presence of NDSD. This ratio is remarkably different from the female/male ratio of 1.2-1.3:1 observed in several large studies of the general pain population in our Comprehensive Pain Program, a tertiary care university based pain clinic [17,21], as well as the 2011 Census data for the provincial and municipal population, the latter reporting female to male ratio (of both working age population and total population) as 1.05/1.

Review of the general literature failed to reveal any previous information regarding associations of gender, country of birth, and litigation, except a previous study of ours [2], which showed a similar preponderance of foreign born and females in Canadian litigation. Given the dearth of data on this topic, the senior author (AMG) surveyed a number of Ontario personal injury legal firms (including personal communication with George and Chris Bonn LLPs, October 25, 2013), as well as a number of medical experts who act as consultants in personal injury cases. She was informed that they too see more women litigants with soft tissue injury and in particular litigants from Asia and the Caribbean. Therefore, empirical data from Ontario legal firms show a higher prevalence of foreign-born and women litigants in this province.

Gender, Ethnicity and Litigation

The explanation for the preponderance of foreign born and female subjects in litigation is complex and likely multi factorial. Biomedical, psychological, and socio cultural variables may indeed be at play.

Research suggests gender plays a role in chronic pain with women generally experiencing more recurrent pain, more severe pain, and longer lasting pain than men. Evidence for sex differences in pain is wide ranging, and comes from basic science, epidemiology, and clinical research. For example, experimental studies show that women have lower pain thresholds and tolerances to a range of pain stimuli when compared to men. Biological mechanisms that may explain the phenomenon include sex hormones, genetics, and anatomical differences [22]. Relevant biological factors to women and car accidents are studies that show that women, having smaller bones and lower bone density, are at greater risk than men of suffering injury or death in crashes. Women are more vulnerable to whiplash due to their less muscular necks. For example, fatality risk is an average of 13.4 ± 2.0 percent higher for

a female driver than for a male driver of the same age exposed to similar physical insults; the corresponding risk increase for right front-seat passengers is 20.5 ± 2.2 percent and for back-seat passengers, 15.7 ± 6.1 percent [23]. In addition to biological differences, other psychosocial influences relevant to women in general include mood (e.g., anxiety, depression), coping strategies, gender roles, health behaviors and use of health care services [22].

Research has also shown that ethnicity, culture and religion appear to play a role in self-reports of illness and pain in adult patients [24,25,26]. Manifestation of emotional distress through somatic complaints has been associated with stressful events, such as immigration, separation from family, changes in traditional sex roles, financial difficulties and depression [27]

In an effort to understand ethnic differences, a study of thermal pain responses in Caucasian British and South (Central) Asian healthy men attempted to detect physiological differences between the groups by measuring different perception thresholds. It showed no differences between the two groups in cold and warm sensory perception thresholds; however, South Asian men displayed lower pain thresholds to heat and greater pain sensitivity. The authors concluded that ethnicity plays an important role, even if they were not exactly sure what determinants of ethnicity (behavioural, genetic, etc.) were involved [28].

In the Women's Health Surveillance Report from Statistics Canada, which surveyed approximately 100,000 households [29], the proportion of South-Central Asians who reported chronic pain was much greater than any other ethnic group in the Canadian population older than 65 years (with 38.2% of the South-Central Asian men and 55.7% of the South-Central Asian women reporting chronic pain). Our own group also reported higher perception and expression of pain in South-Central Asian females attending a tertiary care pain clinic [19].

Our data highlight factors other than the magnitude of physical injury in a) litigation in general and b) in litigants with NDSDs in particular. Factors such as gender, ethnic origin and culture combined with stressors (litigation itself, immigration status, separation from family, changes in traditional sex roles, financial difficulties, depression and others) may increase pain perception by adding alterations to the Central Nervous System as shown in multiple imaging and other studies in NDSDs [2,3,4]. Such CNS changes have been postulated to indicate "Maladaptative Neuro plasticity" [2,3] and become part of the problem by further maintaining and enhancing pain perception. The consistency of signs and symptoms of NDSD patients in general, the contribution of psychological and psychoemotional factors in their generation, coupled with functional and structural imaging changes, highlight the dynamic interplay of complex, multidimensional, biopsychosocial, and interactive aspects of pain perception and expression. It is possible, therefore, that culturally based expression of pain, distress, and associated disability in certain ethnic groups (as in our study population) could ultimately lead to litigation due to intensity of pain and inability to work.

A word of caution: Besides culturally and gender based adverse reactions to a traumatic event, socio environmental factors cannot be underestimated in regards to litigation. Based on extensive personal experience of two of the authors (AM and KS), system-related factors may also be at play, namely networking of legal and paralegal firms within immigrant groups; immigrant community involvement in navigating individuals as to their rights or opportunities for financial compensation, etc. In this context it is possible that some litigants may display "conscious simulation of disease process" (another term for malingering), but our data were designed to capture descriptive characteristics and variables obtained on physical examination, history and review of documents on file, and cannot exclude such contribution to symptoms.

We must stress that there has been little change over the past 15 years in the characteristics and clinical presentation of NDSD and non-NDSD litigants within the medico legal practice of AM despite changes in legal firms and ethnic background of litigants, suggesting that the bio psychosocial variables identified are fairly robust in contributing to chronic pain profiles. Our study has a number of limitations, including the lack of generalizability due to small sample size and possible referral bias of litigants by specific lawyers to the senior author. Additionally, gender and ethnic origin data cannot be generalized to litigation populations in other Canadian provinces, as they may have a different mix of foreign born and also different approach to personal injury (different insurance framework, i.e. tort vs no-fault etc). However, the similarities between the present data on gender, foreign born origin, and NDSD, and our study 15 years earlier, render strength to the persistency of the findings of the present study.

Our findings raise particular issues to be pursued in further research, namely gender and ethnicity, as well as sociodemographic and systemic factors, which may affect and/or drive litigation, pain, and pain related disability as well as NDSDs after motor vehicle accidents.

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