Associations between neck and shoulder pain and neuropathic pain in a middle-aged community-living population

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Data Availability

The cohort data used to support the findings of this study are restricted by the Institutional Review Board of Nagoya University Graduate School of Medicine in order to protect the privacy of subjects in Yakumo study.

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Ethical Approval

All participants provided written informed consent, and the study protocol was approved by the Institutional Review Board of Nagoya University Graduate School of Medicine. Moreover, the study protocol was approved by the Committee on Ethics in Human Research of our university, and the study procedures were carried out in accordance with the principles of the Declaration of Helsinki.

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Conflicts of interest

The authors report no conflict of interest except for the national grant.

ABSTRACT

Study Design: A cross-sectional study.

Objective: The present study aimed to investigate the prevalence of neuropathic pain (NeP) in subjects suffering from neck and shoulder pain (NSP) to reveal the impact of NeP on the health-related quality of life (HRQOL) in middle-aged and elderly people with NSP in a health checkup.

Summary of Background Data: No previous studies have established the relationship between NSP and NeP as potential risk factors contributing to a decreased quality of life (QOL) in the general population.

Methods: The present study involved 203 participants (men: 84, women: 119; mean age: 63.3 years). For each subject, anthropometric measurements, physical function examinations, and blood testing were performed. A cut-off score of ≥0 on the short-form Spine painDETECT questionnaire (SF-SPDQ) defined the presence of NeP. Subsequently, the NSP (+) subjects were divided into two sub-groups: the NeP (+) and NeP (−) groups. For the assessment of QOL, the Medical Outcomes Study 36-item short-form health survey (SF-36) and the EuroQol 5 dimension 5 level version (EQ-5D-5L) tool were used.

Results: The study included 100 NSP (+) and 103 NSP (−) subjects. Among the NSP (+) subjects, 46 and 54 subjects were found to be NeP (+) and NeP (−), respectively. For SF-36, the multivariate regression analysis revealed that the prevalence of NeP was associated with a lower physical QOL (odds ratio [OR] 3.56) and lower mental QOL (OR 4.04). Similarly, the NeP prevalence was found to be the predictor for low QOL scores in EQ-5D-5L (EQ-5D-5L index value <0.875; OR, 3.61).

Conclusions: The prevalence of NeP was reported to be 46.0% in healthy middle-aged and elderly population suffering from NSP, where it was associated with poor HRQOL. Therefore, strategies aimed at alleviating NeP may contribute significantly to the improvement of QOL in middle-aged and

elderly people with NSP.

KEY POINTS

- Neuropathic pain (NeP) was present in 46 subjects (46.0%) in 100 middle-aged and elderly people with neck and shoulder pain (NSP) who attended an annual health checkup.
- The NeP (+) group had higher visual analog scale (VAS) of NSP than in the NeP (−) group.
- Using the SF-36, both PCS and MCS in the NeP (+) group was lower than those in the NeP (−) group.
- The NeP (+) group had significantly lower EQ-5D-5L index compared to the NeP (−) group.
- In multivariate logistic regression analysis, NSP (+) was identified as risk factors for low physical QOL (odds ratio (OR): 3.56), and NSP (+) was the only significant risk factor for low mental QOL (OR: 4.04).

MINI ABSTRACT

The prevalence of neuropathic pain (NeP) was 46.0% (46 of 100) in middle-aged and elderly subjects with neck and shoulder pain (NSP). In the multivariate regression analysis, the prevalence of NeP was associated with lower physical QOL (odds ratio (OR), 3.56) and lower mental QOL (OR, 4.04).

INTRODUCTION

Neck and shoulder pain (NSP) is a disabling musculoskeletal condition that severely affects an individual's physical, social, and psychological well-being. With a global prevalence of 16%–75%, this disabling condition is known to act as a socioeconomic burden on both the society and the affected individual.[1,2] Previous studies have shown that NSP is a very common symptom among the general population, where it is either described as neck pain, non-specific neck pain, or chronic NSP.[3-11]

Neuropathic pain (NeP) is defined as "pain caused by a lesion or disease of the somatosensory nervous system". It is characterized by a "burning," "shooting," or "electric shock-like" pain.[12-14] Patients with neuropathic pain experience sleep disturbances and increased levels of anxiety and depression.[15] Consequently, NeP has been reported to negatively affect patients' health-related quality of life (HRQOL).[16]

Disease-related information provided by HRQOL indicators holds great significance for researchers, clinicians, and health planners.[17,18] HRQOL instruments are widely utilized for an extensive evaluation of a community's health status.[19] However, the relationship between NSP and NeP as potential risk factors for decreased quality of life (QOL) in the healthy population remains to be established. Thus, the present study investigated the role of pain, including both NSP and NeP, as possible risk factors for poor physical and mental QOL in the middle-aged and elderly population in a health checkup. This study aimed to evaluate the prevalence of NeP in the subjects suffering from NSP so as to reveal the impact of NeP on the HRQOL in the middle-aged and elderly people with NSP.

MATERIALS AND METHODS

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Participants

The volunteers undergoing routine medical assessments, funded by Yakumo's local administration in 2019, were recruited as subjects. The total population size of Yakumo, Japan is approximately 17,000. Among these, 28% of the inhabitants were of age >65 years, and the majority of the population practiced agriculture and fishing-related activities. For evaluation, an HRQOL survey was conducted as per the previously established standards.[20-24]

Subjects with a documented history of limb and spine surgery, serious injury to knee(s), severe osteoarthritis, hip or spine fracture, disorders of the nervous system, severe mental disease, diabetes, renal or cardiac disease, severe movement or standing disabilities, or disorders of the central or peripheral nervous system were excluded. Participants that had not fasted prior to their check-ups were also ineligible for inclusion. Among 537 potential participants, 203 individuals suffering from NSP (men: 84, women: 119; mean age: 63.3 years), without any issues of low back pain (LBP) and knee joint pain, were found to be eligible for inclusion in this study.[25] The study protocol was approved by Human Research Ethics Committee at Nagoya University Graduate School of Medicine and Institutional Review Board (Approval no.: 2014-0207). Written informed consent was obtained from all individuals before study participation. The study protocol adhered to the principles outlined in the Declaration of Helsinki.

Definition of NSP

NSP was defined as the presence of muscle tension, stiffness, pressure, or dull pain in the regions extending from the neck to the scapular arch.[9] The NSP localization pattern followed in the present study is shown in Figure 1.[11] None of the participants reported any history of neck and shoulder surgery. Participants suffering from neck ailments, like cervical spondylotic radiculopathy and cervical disk herniation, were considered to be ineligible for inclusion. At the

beginning of the interview, participants were enquired about the occurrence of NSP during the 1-month-period preceding the interview date.[11] The participants were asked to describe the intensity of pain using a visual analog scale (VAS), where "no pain" was scored 0 and "pain as bad as it could be or worst imaginable pain" was given a score of 100 on a 100-mm scale.[26]

Definition of NeP

The painDETECT questionnaire (PDQ) was used as a screening questionnaire. The application of PDQ was first reported in a study conducted in the German population by Freynhagen et al.[27] Later, the PDQ was translated into Japanese, and the validity and reliability of the translated version (PDQ-J) were subsequently established.[28] For neuropathic pain caused by spinal disorders, Nikaido et al. developed a specific screening tool, the Spine painDETECT questionnaire (SPDQ). The same study also reported the development of a brief and simplified version of the tool, short-form SPDQ (SF-SPDQ).[29] The PDQ-J generally consists of 9 items originally defined in the PDQ.[28] In particular, 2 questions, "Do you have sudden pain attacks in the area of your pain, like electric shocks?" and/or "Do you suffer from a sensation of numbness in the areas that you marked?", were exclusively included in the SF-SPDQ. To calculate the SF-SPDQ total score, an item score for each SF-SPDQ item was first calculated using a PDQ score multiplied by the weighting coefficient for the item, which was further added up for the two items. Following this, a constant value of 7 was subtracted from this value to obtain the total score. A cut-off score of ≥ 0 defined the possibility of spinal neuropathic pain in the SPDQ and SF-SPDQ (Supplemental Table 1). Therefore, NeP was defined with a score of ≥ 0 points in the present cohort study.[29]

Anthropometric measurements

Bioelectrical impedance analysis (BIA) was used to collect the information regarding

anthropometric parameters, including body weight, body mass index (BMI), percent body fat (PBF), appendicular skeletal muscle index (aSMI) representing muscle mass, and neck circumference (NC). The evaluations were performed using the InBody 770 body composition and body water analyzer (InBody, Seoul, Republic of Korea), a BIA unit known to distinguish tissues (such as fat, muscle, and bone) on the basis of their electrical impedance.[25] Several previous studies have established the accuracy of BIA measurements.[30] To calculate aSMI for the documentation of arm and leg skeletal muscle, a subject's muscle mass in kilograms was divided by the square of his or her height in meters (m^2).[31] NC was calculated using the InBody 770 BIA device as per the previously established protocol.[25] For NC measurements, the participant was instructed to stand with his or her head positioned in the Frankfort horizontal plane with relaxed shoulders, and a non-stretchable plastic tape was used to measure NC from a level below the laryngeal prominence, perpendicular to the long axis of the neck. All the results were presented in centimeters, by rounding off for all measurements.[25]

Physical performance

Grip strength was measured using the Toei Light Handgrip Dynamometer (Toei Light Co., Saitama, Japan).[32] The subjects were instructed to stand in an upright position and grip strength was tested simultaneously for both hands. The average value of the two was deemed as the participant's grip strength. For the measurement of back muscle strength, which represents the trunk muscles' maximal isometric strength, a digital back muscle strength meter (T.K.K.5402; Takei Scientific Instruments Co., Niigata, Japan) was used, and all the evaluations were conducted in a standing position with 30° of lumbar flexion.[23,25] To evaluate mobility, participants were instructed to perform two tasks. First, the participants were directed to walk in a straight line for 10 m at their fastest pace and the time taken to complete the task was recorded

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as the participant's 10-m gait time.[32] Next, the participants were instructed to rise from a sitting position from a standard chair with a height of 46 cm, walk for 3 m, turn around, walk back to the same chair, and sit down. The process was performed in duplicates, and the average time was documented as the result for 3-m timed up-and-go test (3-m TUG).[23,25]

Blood tests

An autoanalyzer (JCA-RX20; Nihon Denshi, Tokyo, Japan) was used for biochemical analyses of blood samples.[25]

The HRQOL

The Medical Outcomes Study 36-item short-form health survey (SF-36) and the Japanese version of the EuroQol 5-dimension, 5 level version (EQ-5D-5L) were used for HRQOL assessment.[32-34]

The SF-36 (Japanese ver. 2.0) was used to evaluate the QOL of the subjects included in the study.[33] Most of the participants completed the questionnaires on their own unless assistance was required. These questions assessed eight domains of SF-36 that aggregated into two summary measures, the physical component summary (PCS) and the mental component summary (MCS). For evaluation, values of PCS < 50 and MCS < 50 represented poor physical and mental QOL, respectively.[32]

The EQ-5D-5L is a self-administered tool that includes five dimensions, namely mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. For each dimension, the severity is rated as either no problem, a slight problem, moderate problems, severe problems, or extreme problems.[35] The Japanese version of the EQ-5D-5L value was used to obtain the EQ-5D-5L index, which has been previously assessed using the EuroQol Group's crosswalk methodology.[36] An EQ-5D-5L index value of <0.875 defined poor QOL.[34]

Review of the Literature

A MEDLINE search was conducted for the key words “Neck and shoulder pain”, “Neuropathic pain” and “quality of life” between 2001 and 2021. The search resulted in 258 citations in total. Furthermore, articles reporting middle-aged and elderly people, healthy volunteers, and health-related quality of life were selected. Case reports and series containing results for low back pain were excluded. Exclusion criteria included (1) studies reporting evaluation before 2000, and (2) studies reporting fewer than 10 subjects.

Statistical analyses

SPSS statistical software (version 25.0; SPSS Statistics, IBM Corp., Armonk, NY, USA) was used for statistical analyses. Continuous variables were presented as means and standard deviations (SDs), while the categorical variables were represented as proportions. The chi-square and the Mann–Whitney *U* tests were used to evaluate the differences between the groups. To identify the predictors of poor HRQOL, factors having a *p*-value of < 0.05 were entered into a multivariate logistic regression model, with age and gender as confounders. Subsequently, prevalence odds ratios (ORs) and the corresponding 95% confidence intervals were defined. For all analyses, a *p*-value of < 0.05 was considered to be statistically significant.

RESULTS

The NSP (+) subjects were found to be younger than the NSP (−) group. The NSP (+) group included a higher proportion of female participants as compared to the NSP (−) group. Among the 203 participants, the NeP prevalence was recorded to be 25.6% (52 out of 203). Moreover, the prevalence of NeP was higher in the NSP (+) group (46 of 100) than in the NSP

(−) group (6 of 103) (46.0% vs 5.8%, $p < 0.0001$) (Table 1).

The NSP (+) group included 46 NeP (+) subjects and 54 NeP (−) subjects. No significant differences were recorded in the age, gender, and the results for most of the parameters, including anthropometric measurements, physical performance assessment, and blood test analysis, for the two groups. A VAS value of 45.0 mm was recorded in the NeP (+) group, which was significantly higher as compared to the VAS value of 33.1 mm reported for the NeP (−) group ($p < 0.01$) (Table 2).

The results of the assessment showed that the NeP (+) group was characterized by significantly lower values of SF-36 for all domains. The PCS value was recorded to be 43.7 in the NeP (+) group, which was lower as compared to the PCS value of 48.2 reported for the NeP (−) group ($p < 0.01$). Similar results were observed for the MCS component, where MCS values of 47.4 and 51.6 were recorded in the NeP (+) and NeP (−) groups, respectively. The differences observed between the two groups were found to be statistically significant ($p < 0.05$) (Table 3).

For EQ-5D-5L, a significantly lower index value of 0.79 was recorded in the NeP (+) group as compared to the index value of 0.89 in the NeP (−) group ($p < 0.001$). For each EQ-5D-5L dimension, the NSP (+) group displayed higher scores for all items (Table 4).

The results for the multivariate logistic regression analysis, with age and sex as confounders, showed that the prevalence of NeP was associated with poor HRQOL. In the case of SF-36, the NeP prevalence was found to be a predictor of both a low physical QOL score (PCS < 50; OR, 3.563; $p < 0.01$) and a low mental QOL score (MCS < 50; OR, 4.044; $p < 0.05$). Similar observations were reported for EQ-5D-5L, where the NeP prevalence acted as the predictor of a low QOL (EQ-5D-5L index value <0.875; OR, 3.611; $p < 0.01$) (Table 5).

DISCUSSION

With the aging of society, there has been a significant increase in the number of people suffering from chronic pain. NSP and NeP are two commonly reported symptoms in the general population. NeP is particularly defined as ‘‘pain arising as a direct consequence of a lesion or disease affecting the somatosensory system.’’[1,13] Chronic pain might be associated with higher maintenance costs and poor HRQOL, especially in the elderly population.[32] Therefore, the present study aimed to investigate whether the presence of NeP in subjects with NSP affects the pain intensity and HRQOL in the middle-aged and elderly population. A total of 203 subjects were evaluated. Among these, 100 subjects were found to be NSP (+), which were further divided into two groups, NeP (+) and NeP (−). In particular, a variety of factors influencing the pain intensity and HRQOL were screened, and the differences between the NeP (+) and NeP (−) groups were recorded. The results of the study showed that NeP was an independent risk factor associated with low physical and mental QOL.

The present study reported a higher prevalence of NeP in the NSP (+) group (46.0%) as compared to the NSP (−) group (5.8%). Furthermore, a higher VAS value for NSP was reported in the NeP (+) group in comparison to the NeP (−) group. The NeP (+) group was characterized by significantly lower SF-36 values for all the eight domains assessed, namely physical functioning, role-physical, bodily pain, general health perception, vitality, social functioning, role-emotional, and mental health. For the SF-36 assessment, both PCS and MCS values were found to be lower in the NeP (+) group as compared to the NeP (−) group. The study also utilized the EQ-5D-5L tool that involved five dimensions, namely mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. The NeP (+) group showed higher scores for all these dimensions. Moreover, the NeP (+) group was characterized by a low EQ-5D-5L index. Thus, all

these results suggested that the use of strategies aimed at prevention or alleviation of NeP might improve the QOL in the middle-aged and elderly population.

The EQ-5D-5L is a simple, efficient, standardized, and validated tool that evaluates five general health parameters and their influence on the EQ-5D-5L index.[34] In the present, results for the EQ-5D-5L index suggested that the presence of NSP increases the likelihood of poor HRQOL. The assessment for EQ-5D-5L dimensions further showed that NeP had a higher influence on both the physical and mental QOL. Thus, pharmacological or rehabilitation therapies focused on alleviating NeP symptoms might improve the QOL of middle-aged and older adults.

This study also reviewed the previous literature about the relationship between NSP and NeP as potential risk factors for decreased QOL. NeP has been reported to negatively affect patients' HRQOL.[16] Schaefer C et al reported that subjects across NeP conditions exhibited high pain levels, which were significantly associated with poor function, compromised health status by EQ-5D.[15] Imagama S et al reported that the NeP (+) rate was 10% in healthy middle-aged and elderly subjects who attended an annual health checkup, and a NeP (+) status was related to significantly severer pain, and lower physical and mental QOL by SF-36.[26] NeP was found to be an independent risk factor for low physical and mental QOL.[32] Takasawa E et al described that the prevalence of NSP was 48.3 % in the general population, and NSP was more common in females than males.[9,11] The prevalence was higher in the generation from 20 to 50 years of age and decreased with age. NSP was associated with pain in the upper extremities and lower EuroQol scores, but not with pain in the lower extremities or medical complications.[11] The previous study reported that NSP (+) status was directly related poor HRQOL, and NSP is a predictor of suboptimal physical and mental QOL.[37] However, there has been no analysis of the

relationship between NSP and NeP as potential risk factors for decreased QOL in the healthy general population.[38] As per the literature, this is the first report on the impact of NeP on the HRQOL in middle-aged and older persons with NSP, screened during a routine medical examination.

The subjects with NeP are generally unaware of their ailment, and thus accurate diagnosis and intervention are essential for disease management. Significant differences were reported in aSMI and muscle strength for the NSP (+) and NSP (−) groups in the present study. In comparison to this, the NeP (+) and NeP (−) groups differed only in terms of the pain intensity that was evaluated using VAS. Thus, it is clinical significance in this study to make an early diagnosis of NeP by screening methods involving SPDQ, particularly in subjects with relatively strong neck pain.

The present study was associated with certain limitations. The study included a relatively small number of participants. Future large-scale studies will be planned with additional volunteers. Further, the present study reported results for the participants from a single center that included healthy middle-aged and older adults of a single race. These participants lived in a relatively rural setting and practiced agriculture or fishing-related occupations. Thus, the current study group might not be an ideal representative of the general population.[25,30] Thus, future studies must include longitudinal approaches involving urban areas. Lastly, the cross-sectional design employed in the present study limits the causal inferences between NeP and HRQOL in middle-aged and older persons with NSP. Because the SF-SPDQ doesn't have a specific-regional inquiry, it is possible that a small number of subjects without low back pain had sciatica.

Despite these limitations, the present study provided an insight into the occurrence of NeP in the enrolled healthy adults. Furthermore, the relationship established between NeP and

HRQOL could aid in better and timely management of NeP symptoms. Thus, new findings in this study suggested that the identification of NeP in healthy middle-aged and elderly persons with NSP by healthcare workers, during routine checkups, should be followed by immediate application of effective strategies to improve their QOL.

CONCLUSIONS

The prevalence of NeP was reported to be 46.0% in healthy middle-aged and elderly population suffering from NSP, where it was associated with poor HRQOL. Therefore, strategies aimed at alleviating NeP may contribute significantly to the improvement of QOL in middle-aged and elderly people with NSP.

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Table 1.
Demographic, anthropometric, blood test data, and prevalence of neuropathic pain in the study participants

Variables	Total	NSP+	NSP−	*p*
Number of subjects	203	100	103	
Age (years)	63.3 ± 10.1	61.7 ± 10.9	64.7 ± 9.0	**.0168**
Gender (Male/Female)	84/119	31/69	53/50	**.0031**
Body height (cm)	158.9 ± 8.29	157.6 ± 8.07	160.2 ± 8.33	**.0254**
Body weight (kg)	60.0 ± 11.6	59.7 ± 12.2	60.2 ± 11.1	.7836
BMI (kg/m^2)	23.6 ± 3.58	24.0 ± 3.92	23.3 ± 3.21	.2188
PBF (%)	29.0 ± 6.99	30.6 ± 7.14	27.6 ± 6.56	**.0027**
aSMI (kg/m^2)	6.84 ± 1.06	6.71 ± 0.98	6.98 ± 1.12	**.0374**
NC by manual (cm)	35.2 ± 3.23	35.0 ± 3.28	35.4 ± 3.18	.1792
NC by BIA (cm)	34.2 ± 3.29	34.0 ± 3.24	34.3 ± 3.35	.2718
Grip strength (kg)	28.9 ± 8.99	27.3 ± 8.20	30.4 ± 9.42	**.0145**
Back muscle strength (kg)	83.8 ± 34.3	76.1 ± 30.9	91.2 ± 35.8	**.0038**
10 m gait time (s)	4.95 ± 0.88	4.93 ± 0.71	4.97 ± 1.01	.7645
TUG (s)	5.86 ± 0.93	5.87 ± 0.83	5.86 ± 1.02	.9730
Albumin (g/dL)	4.36 ± 0.23	4.36 ± 0.23	4.37 ± 0.23	.8608
Total cholesterol (mg/dL)	208.3 ± 35.4	211.3 ± 34.4	205.5 ± 36.2	.2566
Triglycerides (mg/dL)	91.0 ± 58.0	90.5 ± 67.0	91.5 ± 48.8	.4535
CRP (mg/dL)	0.14 ± 0.43	0.20 ± 0.61	0.08 ± 0.13	.0726
Prevalence of NeP (%)	52, 25.6%	46, 46.0%	6, 5.8%	**<.0001**

The values are given as the mean and the standard deviation (mean ± SD). Bold values indicate significant difference.

NSP, neck and shoulder pain; BMI, body mass index; PBF, percent body fat; aSMI, appendicular skeletal muscle index; NC, neck circumference; BIA, bioelectrical impedance analysis; TUG, timed up-and-go; CRP, C-reactive protein; NeP, neuropathic pain.

Table 2.
Comparison between with and without neuropathic pain

Variables	NeP+	NeP−	*p*
Number of subjects	46	54	
Age (years)	62.8 ± 11.3	60.8 ± 10.5	.3520
Gender (male/female)	16/30	15/39	.5906
Body height (cm)	157.4 ± 8.61	157.7 ± 7.66	.8718
Body weight (kg)	59.9 ± 11.0	59.6 ± 13.2	.8899
BMI (kg/m^2)	24.1 ± 3.91	23.8 ± 3.96	.6784
PBF (%)	30.1 ± 7.1	31.1 ± 7.20	.4927
aSMI (kg/m^2)	6.81 ± 0.88	6.62 ± 1.05	.3770
NC by manual (cm)	35.2 ± 3.08	34.8 ± 3.46	.4953
NC by BIA (cm)	34.3 ± 2.77	33.9 ± 3.61	.5639
Grip strength (kg)	28.1 ± 8.51	27.0 ± 8.17	.3953
Back muscle strength (kg)	73.7 ± 29.0	78.2 ± 32.6	.5056
10 m gait time (s)	4.90 ± 0.76	4.96 ± 0.68	.7100
TUG (s)	5.87 ± 0.88	5.87 ± 0.78	.9876
Albumin (g/dL)	4.35 ± 0.23	4.37 ± 0.24	.6814
Total cholesterol (mg/dL)	202.2 ± 31.6	219.3 ± 35.1	.0516
Triglycerides (mg/dL)	98.8 ± 86.9	83.1 ± 42.3	.2869
CRP (mg/dL)	0.25 ± 0.79	0.15 ± 0.39	.4678
VAS of NSP (mm)	45.0 ± 21.4	33.1 ± 19.4	**.0056**

The values are given as the mean and the standard deviation (mean ± SD). Bold values indicate significant difference.

NeP, neuropathic pain; BMI, body mass index; PBF, percent body fat; aSMI, appendicular skeletal muscle index; NC, neck circumference; BIA, bioelectrical impedance analysis; TUG, timed up-and-go; CRP, C-reactive protein; VAS, visual analog scale; NSP, neck and shoulder pain.

Table 3.
Impact of neuropathic pain status on SF-36

Variables	NeP+	NeP−	*p*
Physical functioning	82.9 ± 20.4	89.5 ± 16.1	**.0104**
Role-physical	80.9 ± 24.6	90.6 ± 16.2	**.0203**
Bodily pain	56.9 ± 20.8	68.9 ± 19.8	**.0038**
General health perception	57.4 ± 19.5	67.1 ± 17.8	**.0089**
Vitality	52.5 ± 21.8	63.9 ± 14.3	**.0043**
Social functioning	82.7 ± 21.3	93.1 ± 11.0	**.0061**
Role-emotional	82.6 ± 24.4	91.0 ± 17.5	**.0409**
Mental health	69.9 ± 19.1	76.4 ± 13.5	**.0422**
Physical Component Summary	43.7 ± 10.6	48.2 ± 10.5	**.0034**
Mental Component Summary	47.4 ± 9.53	51.6 ± 8.29	**.0160**

The values are given as the mean and the standard deviation (mean ± SD). Bold values indicate significant difference.
SF-36, The Short Form 36 Health Survey; NeP, neuropathic pain.

Table 4.
Impact of neuropathic pain status on EQ-5D-5L

Variables	NeP+	NeP−	*p*
EQ-5D-5L index	0.79 ± 0.16	0.89 ± 0.08	**.0009**
EQ-5D-5L dimensions			
Mobility	1.49 ± 0.95	1.17 ± 0.42	**.0343**
Self-care	1.20 ± 0.58	1.02 ± 0.14	**.0396**
Usual activities	1.40 ± 0.65	1.09 ± 0.35	**.0033**
Pain/discomfort	2.31 ± 0.87	1.81 ± 0.65	**.0013**
Anxiety/depression	1.60 ± 0.88	1.15 ± 0.36	**.0020**

The values are given as the mean and the standard deviation (mean ± SD). Bold values indicate significant difference.
EQ-5D-5L, EuroQol 5 dimension, 5 level version; NeP, neuropathic pain.

Table 5.
Risk factors for poor HRQOL in multivariate logistic regression analysis adjusted for age and gender

Variables	Odds ratio	95% confidence intervals	*p*
SF-36 PCS<50			
Prevalence of NeP	3.563	1.494-8.498	.004
SF-36 MCS<50			
Prevalence of NeP	4.044	1.189-13.760	.025
EQ-5D-5L index<0.875			
Prevalence of NeP	3.611	1.519-8.585	.004

Only significant factors are shown.
SF-36, The Short Form 36 Health Survey; PCS, Physical Component Summary; NeP, neuropathic pain; MCS; Mental Component Summary; EQ-5D-5L, EuroQol 5 dimension, 5 level version.

FIGURE LEGENDS

Figure 1.

Participants' NSP location.

A schematic of NSP location as documented by Takasawa et al.

Figure 1