

Related factors of Neck Disability Index (NDI) among elderly people in suburban area: *Shiraniwa cohort study*

📍 Yusuke Hori¹, Masatoshi Hoshino¹, Shinji Takahashi¹,
Shoichiro Ohyama¹, Tadao Tsujio², Akio Kobayashi²,
and Hiroaki Nakamura¹

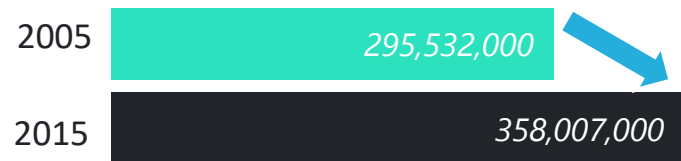
1. Osaka City University Graduate School of Medicine, Osaka, Japan
2. Shiraniwa Hospital, Nara, Japan

Introduction

- **Neck pain** is one of most common symptom that greatly affects the quality of life for elderly people.



Global prevalence numbers of neck pain



- ✓ In 2015, lower back and neck pain was the leading cause of years lived with disability (YLDs) for 24 out of 28 countries and territories of southeast Asia, east Asia, and Oceania.
- ✓ Low back and neck pain prevalence and disability have increased markedly over the past 25 years and will likely increase further with population aging.

Associated factors of neck pain

1 Age, Sex (female), Obesity

Webb R et al. SPINE (2003)
Luime JJ et al. Scand J Work Environ Work (2004)
Fejer R et al. Eur Spine J (2006)

2 Manual labor, Lack of exercise, Psychological factor

El-Sayed AM et al. SPINE (2010)
Rasmussen-Barr E et al. Eur Spine J (2014)
Yang H et al. SPINE (2015)
Oe S et al. Eur Spine J (2018)

3 Sarcopenia, Low appendicular muscle mass

Iizuka et al. BMC Musculoskeletal Disorders (2015)
Oe S et al. Eur Spine J (2018)

4 High C2-7SVA, Low TS-CL

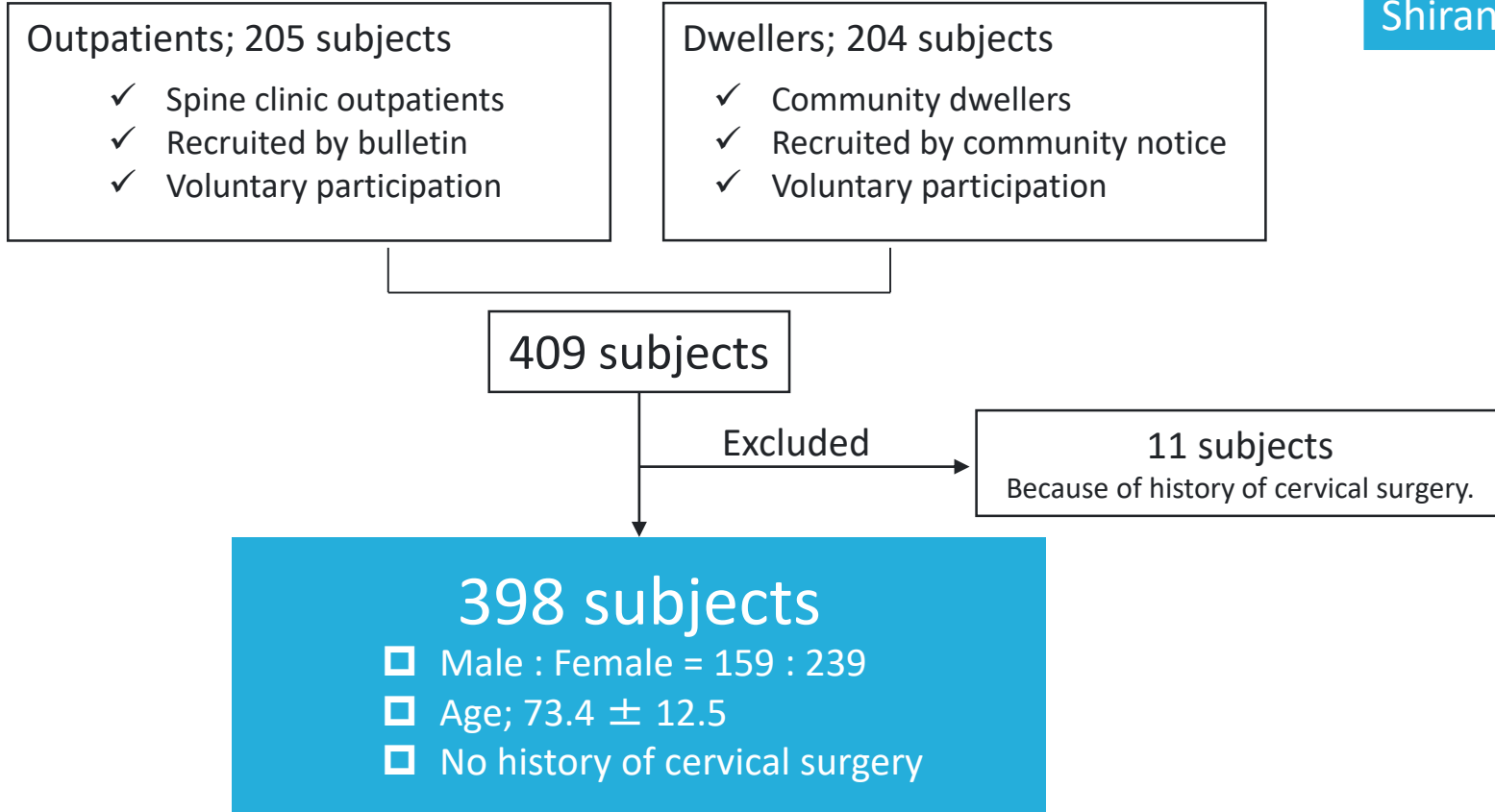
SVA: sagittal vertebral axis, TS; T1 slope, CL; cervical lordosis

Lyer S et al. SPINE (2016)
Oe S et al. Eur Spine J (2018)

- **The purpose of this study** is to investigate the prevalence and related factors of neck pain among elderly population living in suburban area.

Materials

- ✓ We have started a population-based prospective cohort study for elderly residents living in suburban areas (***Shiraniwa study***) since 2016.

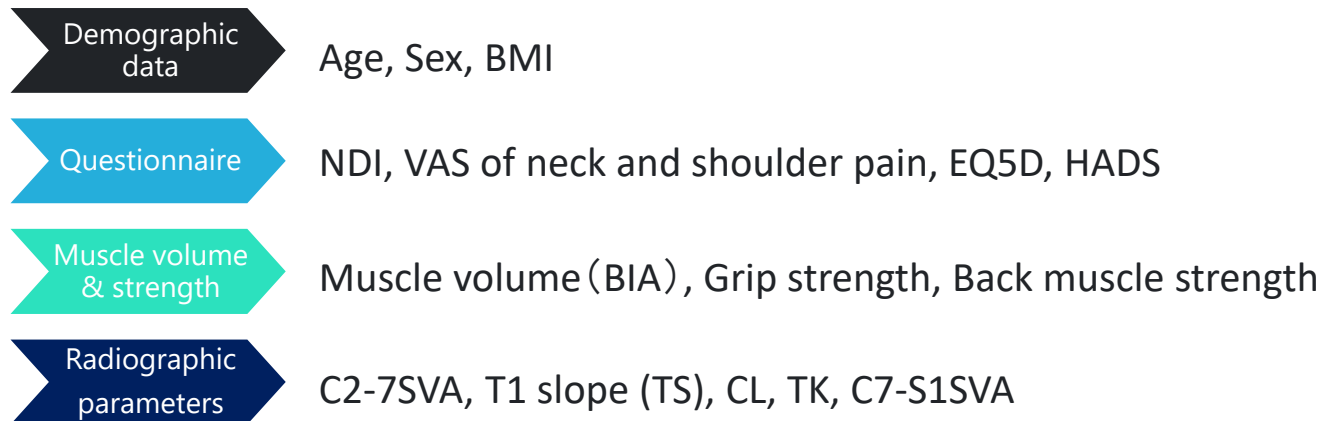


Methods

- ❑ Disability due to neck pain was assessed with **Neck Disability Index (NDI)**.
- ❑ As the cut-off value of the NDI was reported to be 15 among Japanese population*, participants were divided into two groups; **Normal group (NDI < 15)** or **Disability group (NDI ≥ 15)**

*Kato S et al. J Orthop Sci (2012)

- ❑ The following survey items were compared between the two groups.



BMI; body mass index, VAS; visual analog scale, EQ5D; Euro QOL 5 dimension, HADS; the hospital anxiety and depression scale, BIA; bioelectrical impedance analysis, SVA; sagittal vertical axis, CL; cervical lordosis. TK; thoracic kyphosis

- ❑ Univariate and multivariate logistic regression models were used to explore the association between NDI and the candidates. Statistical tests were considered significant at $P < 0.05$.

Results



19% of participants (76/398)

reported disability due to neck pain with NDI ≥ 15 .

- Demographic data

	Normal (N=322)	Disability (N=76)	p
Age, yrs	72.7 (5.2)	76.3 (5.5)	<0.001
Sex (male)	41.6%	32.9%	0.193
BMI, kg/m ²	22.76 (3.09)	23.68 (3.97)	0.028

Figure

Slim (BMI < 18.5)	23 (7.2)	5 (6.6)	0.06
Normal (18.5 \leq BMI < 25.0)	230 (71.7)	45 (59.2)	
Obesity (BMI \geq 25.0)	68 (21.2)	26 (34.2)	

Results

- Psychological factor



	Normal	Disability	p
HADS depression score	3.48 (2.63)	5.74 (2.96)	<0.001
Depression	6.5%	22.4%	<0.001
HADS anxiety score	3.75 (2.74)	5.63 (3.49)	<0.001
Anxiety	9.0%	21.1%	0.008

- Clinical appearance

	Normal	Disability	p
Frailty	9.3%	32.9%	<0.001
Sarcopenia	4.4%	5.3%	0.759
EQ-5D	0.85 (0.15)	0.68 (0.13)	<0.001
VAS of neck pain	5.90 (11.62)	27.86 (23.63)	<0.001
VAS of shoulder pain	10.21 (16.05)	30.72 (25.56)	<0.001



Results

- Muscle volume & strength

	Male 			Female 		
	Normal	Disability	p	Normal	Disability	p
Trunk muscle mass	26.26 (2.43)	24.51 (2.38)	0.001	19.43 (1.59)	18.77 (1.99)	0.014
SMI	7.98 (0.95)	8.29 (0.96)	0.143	6.30 (0.67)	6.51 (0.89)	0.066
Low SMI (male < 7.0 kg/m ² , female < 5.7 kg/m ²)	14.3%	4.0%	0.203	18.2%	15.7%	0.836
Grip power	35.57 (7.45)	30.87 (6.54)	0.004	21.62 (4.99)	18.95 (4.66)	0.001
Back muscle strength	86.98 (26.69)	60.82 (20.46)	<0.001	46.88 (16.87)	33.92 (17.04)	<0.001



Results

- Radiographic parameters

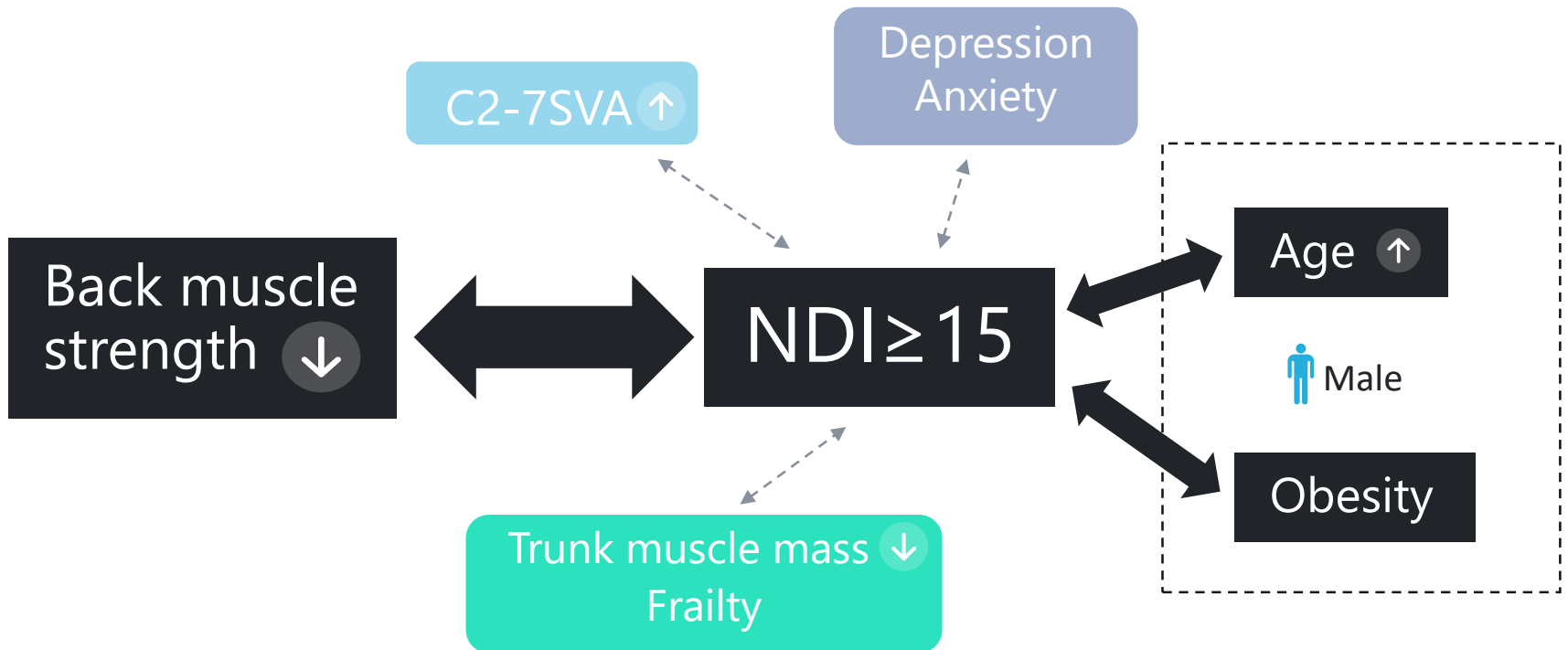
	Male 			Female 		
	Normal	Disability	p	Normal	Disability	p
C2-7SVA, mm	29.2 (14.5)	37.9 (20.6)	0.01	20.4 (10.9)	26.0 (15.0)	0.003
TS, °	31.2 (10.8)	33.2 (14.4)	0.424	27.9 (9.9)	33.8 (13.0)	0.001
CL, °	-23.3 (13.4)	-18.3 (13.7)	0.088	-19.3 (13.8)	-20.4 (14.1)	0.612
TK, °	27.1 (11.0)	25.2 (14.0)	0.457	27.6 (12.9)	29.6 (15.3)	0.336
C7-S1SVA, mm	28.5 (41.4)	42.6 (46.1)	0.125	31.7 (45.1)	57.6 (56.4)	0.001

Results

- ✓ Multivariate logistic analysis for NDI ≥ 15 using age, BMI, trunk muscle mass, back muscle strength, depression (HADS ≥ 8), anxiety (HADS ≥ 8), cSVA as an explanatory variable was performed.

	Male 		Female 	
	OR	95%CI	OR	95%CI
Age (+1 yrs)	1.14	1.01 - 1.29	1.04	0.97 - 1.11
Obesity	4.95	1.58 - 15.50	1.72	0.78 - 3.81
Slim	N/A	N/A	1.01	0.32 - 3.18
Back muscle strength (-10kg)	1.30	1.03 - 1.64	1.41	1.11 - 1.79
Depression	3.37	0.81 - 14.00	1.91	0.67 - 5.46
Anxiety	1.70	0.39 - 7.44	1.69	0.64 - 4.46
C2-7SVA (+1mm)	0.99	0.97 - 1.03	1.02	0.99 - 1.05

Discussion



Limitations

- ❑ No assessment with degenerative change of cervical spine.
- ❑ No information about neck muscle volume and strength.
- ❑ Causal relationship is unknown.

Conclusion

- ✓ Cervical spine alignment and whole spinal alignment were not clearly related to NDI.
- ✓ On the other hand, **back muscle strength was the independent related factor for NDI.**
- ✓ The possibility that maintaining the muscular strength leads to the prevention of neck pain or of disability due to neck pain was suggested in a cohort of residents living in suburban areas.

Disclosure

I and co-author have nothing to disclose