

# Quantification of risk factors for cervical ossification of the posterior longitudinal ligament in Korean populations: A nationwide population-based matched cohort study

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## Introduction

Ossification of the posterior longitudinal ligament (OPLL) is a pathological calcification of the posterior longitudinal ligament of the spine. The prevalence of cervical OPLL has been shown to differ between ethnic groups and is known to be higher in Asians than in other ethnic groups. Because of the ethnic differences in prevalence, risk factor studies including genetic factors and habitual status have been performed

## Purpose

OPLL progression can cause spinal cord injury that result in disability. Considering neurologic deficits and disability caused by OPLL, identifying OPLL risk factors for early prediction have important health benefits. The purpose of this study was to quantify risk factors for cervical OPLL using a large nationwide cohort in Korea, a country with a high prevalence of OPLL.

## Materials & Methods

The nationwide population-based matched cohort study was conducted using the Korean National Health Insurance Service cohort data. We selected patients with a primary diagnosis of OPLL involving cervical lesion (ICD-10 code: M48.82, M48.83) between 2002 and 2015. To ensure diagnostic validity, we only included individuals who had visited clinics with a diagnosis of OPLL more than three times. A matched cohort without cervical OPLL was enrolled by randomly matching patients by sex, age, year of diagnosis, and residential area to the OPLL group with a ratio of 1:9. The income deciles of enrolled subjects were categorized into the four groups, and co-morbidities were defined according to their ICD-10 codes. Logistic regression analyses were performed to identify risk associated with OPLL development using Odds Ratios and 95% confidence intervals.  $P < 0.05$  was considered statistically significant. The statistical software SAS System for Windows, version 9.4 (SAS Institute Inc, Cary, NC) was used to perform the statistical analyses.

## Results

**Table 1.** Unadjusted and Adjusted association between Ossification of the Posterior Longitudinal Ligament and Co-morbidities and Demographics

	Unadjusted OR			Adjusted OR		
	OR	95% CI	p-value	OR	95% CI	p-value
<b>Co-morbidities</b>						
Hypertension	1.405	1.182-1.670	0.0001	1.283	1.071-1.538	0.0070
Ischemic stroke	1.482	1.097-2.002	0.0104	1.386	1.017-1.889	0.0387
Hemorrhagic stroke	0.716	0.346-1.479	0.3664	0.562	0.268-1.179	0.1272
Ischemic heart disease	1.130	0.665-1.918	0.6516	0.897	0.524-1.537	0.6923
Diabetes mellitus	1.464	1.215-1.765	<.0001	1.331	1.098-1.615	0.0036
Hyperthyroidism	1.381	0.996-1.913	0.0526	1.117	0.796-1.567	0.5212
Hypothyroidism	1.748	1.316-2.321	0.0001	1.562	1.165-2.094	0.0029
Hyperparathyroidism	1.000	0.127-7.893	1.000	0.738	0.091-5.994	0.7766
Hypoparathyroidism	1.500	0.181-12.459	0.7074	1.142	0.135-9.654	0.9029
Osteoporosis	-	-	-	1.456	1.151-1.842	0.0017
Breast cancer	-	-	-	-	-	-
Endometrial cancer	-	-	-	-	-	-
Ovarian cancer	-	-	-	-	-	-
Colorectal cancer	1.452	0.564-3.733	0.4393	1.651	0.637-4.276	0.3018
Gastric cancer	0.420	0.154-1.149	0.0912	0.407	0.148-1.118	0.0811
<b>Income Level</b>						
Q1 (lowest)	1.000	-	-	1.000	-	-
Q2	1.006	0.789-1.283	0.9615	1.008	0.790-1.287	0.9466
Q3	1.039	0.827-1.304	0.7443	1.023	0.814-1.286	0.8449
Q4 (highest)	1.122	0.895-1.406	0.3192	1.087	0.866-1.365	0.4702

**Table 2.** Adjusted association between Ossification of the Posterior Longitudinal Ligament and Co-morbidities and Demographics according to Sex

	Male			Female		
	OR	95% CI	p-value	OR	95% CI	p-value
<b>Co-morbidities</b>						
Hypertension	1.287	1.003-1.651	0.0469	1.276	0.978-1.666	0.0725
Ischemic stroke	1.610	1.041-2.489	0.0321	1.216	0.778-1.898	0.3909
Hemorrhagic stroke	0.476	0.165-1.375	0.1704	0.628	0.221-1.784	0.3823
Ischemic heart disease	0.665	0.306-1.448	0.3045	1.186	0.548-2.565	0.6655
Diabetes mellitus	1.530	1.176-1.990	0.0015	1.133	0.849-1.512	0.3946
Hyperthyroidism	1.594	0.914-2.778	0.1002	0.919	0.599-1.410	0.6986
Hypothyroidism	1.308	0.679-2.519	0.4230	1.716	1.233-2.388	0.0014
Hyperparathyroidism	<.001	0.000-999	0.9753	1.049	0.125-8.787	0.9650
Hypoparathyroidism	-	-	-	-	-	-
Osteoporosis	2.716	1.702-4.336	<.0001	1.233	0.948-1.605	0.1181
Breast cancer	-	-	-	-	-	-
Endometrial cancer	-	-	-	-	-	-
Ovarian cancer	-	-	-	-	-	-
Colorectal cancer	1.958	0.569-6.743	0.2876	1.436	0.320-6.453	0.6368
Gastric cancer	0.287	0.069-1.194	0.0862	0.577	0.136-2.450	0.4561
<b>Income Level</b>						
<b>Q1 (lowest)</b>	1.000	-	-	1.000	-	-
Q2	0.806	0.561-1.159	0.2440	1.244	0.893-1.733	0.1967
Q3	1.043	0.749-1.454	0.8015	0.978	0.710-1.348	0.8937
Q4 (highest)	1.054	0.759-1.463	0.7554	1.099	0.799-1.512	0.5618

## Conclusions

After adjustment for age, sex, residential area, and household income, co-morbidities such as hypertension, ischemic stroke, diabetes mellitus, hypothyroidism, and osteoporosis were found to be significantly associated with OPLL occurrence. Our findings can provide useful information for OPLL prediction and offer important health benefits. Additional risk factor studies to elucidate the pathophysiological mechanism are recommended.

## Disclosure declaration

The authors declare no conflict of interest