

Prevalence and Risk Factor of Neck Pain in Elderly Korean Community Residents

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Neck pain is a common musculoskeletal condition, which causes substantial medical cost. In Korea, prevalence of neck pain in community based population, especially in elderly subjects, has scarcely been reported. We evaluated the prevalence, the severity and the risk factors of neck pain in elderly Korean community residents. Data for neck pain were collected for 1,655 subjects from a rural farming community. The point, 6-months and cumulative lifetime prevalence of neck pain was obtained in addition to the measurement of the severity of neck pain. The mean age of the study subjects was 61 yr and 57% were females. The lifetime prevalence of neck pain was 20.8% with women having a higher prevalence. The prevalence did not increase with age, and the majority of individuals had low-intensity/low-disability pain. Subjects with neck pain had a significantly worse SF-12 score in all domains except for mental health. The prevalence of neck pain was significantly associated with female gender, obesity and smoking. This is the first large-scale Korean study estimating the prevalence of neck pain in elderly population. Although the majority of individuals had low-intensity/low-disability pain, subjects with neck pain had a significantly worse SF-12 score indicating that neck pain has significant health impact.

Key Words: Neck Pain; Prevalence; Risk Factors

INTRODUCTION

Neck pain is a common musculoskeletal condition, which causes work absenteeism, disability, and substantial medical cost. In a cohort study in Ontario, the estimated percentage of lost time for claimants with neck pain was 11.3% and male workers between the ages of 20 and 39 yr were the most likely to experience an episode of work absenteeism caused by neck pain (1). Neck pain is usually mild and does not result in major disability in most cases, but significant correlations between neck pain intensity and disability are present (2). The cost incurred by neck pain in the Netherlands was estimated to be about 1% of the total health care expenditure or 0.1% of the Dutch gross domestic product (3). The overall prevalence of neck pain in general population ranges between 0.4% and 86.8% (mean 23.1%), the point prevalence ranges from 0.4% to 41.5% (mean 14.45%) and 1-yr prevalence from 4.8% and 79.5% (mean 25.8%)(4). The wide variation of prevalence likely results from the differences in definition of neck pain or population studied with different genetic and environmental factors. Most studies show higher incidence of neck pain among women and in the age between 35-49 yr-old (4, 5). Although prevalence of neck pain may differ

according to additional factors, such as lifestyle and ethnicity, it has been scarcely reported in Asia compared to Western countries (4).

In Korea, prevalence of neck pain in community based population, especially in older subjects, has scarcely been reported. In this study, we evaluated the prevalence, the severity and the risk factors of neck pain in middle-to-old age Korean community residents.

MATERIALS AND METHODS

Study population

All subjects in the present study were recruited from the Anseong community cohort. Anseong is a rural area located 75 km south of Seoul and more than half of the population live agriculture. The Anseong cohort was established for a large scale community based epidemiological study of chronic disease in Korea. The age distribution of subjects is 38.6% in their 60s. The methods of the present study have been described previously (6). Briefly, the eligibility criteria included age of 40-79 yr, residence within the borders of the survey area for at least 6 months before the survey, and mental and physical ability to participate.

Cluster sampling using a bracket survey method was conducted among 132,906 residents in Anseong. Subjects were selected using a random sampling method and the local telephone directory from 2007 to 2008. After excluding 846 subjects who were ineligible or who refused to participate in the neck pain study, data for neck pain were available for 1,655 subjects.

Data collection

Demographic information was collected at baseline and included educational attainment, occupation, exercise, and comorbidities using a standard questionnaire during a face-to-face interview. Educational attainment was dichotomized into ≥ 12 yr (finished high school, finished vocational school, some college, finished college, some graduate school and higher) or < 12 yr for the analysis. Occupation was classified into 14 standard categories according to the Korean National Statistical Office. Occupations including factory worker, laborer, and farmer were defined as manual work. The exercise category was self-reported and classified as none, once per week, 2-3 times per week, and daily. The data on self reported hand or knee arthritis were collected from the responses to the following question: Have you ever been diagnosed with hand (or knee) arthritis by a physician? Height (cm) and body weight (kg) were measured to the nearest 0.1 cm and 0.1 kg, respectively, with the subject wearing light clothing and barefooted for calculation of the body mass index (BMI). A BMI ≥ 30 kg/m² was defined as obese. The presence of diabetes mellitus (DM) was defined as either a fasting glucose level ≥ 126 mg/dL or a 2-h glucose level of ≥ 200 mg/dL after 75 mg of oral glucose loading. The presence of hypertension was defined as either a systolic pressure ≥ 140 mmHg or a diastolic pressure ≥ 90 mmHg after measuring the blood pressure with a sphygmomanometer, with the second and third of three measurements averaged to estimate the systolic and diastolic pressure.

The point, 6-month, and cumulative lifetime prevalence of neck pain were obtained using a direct questionnaire. A mannequin diagram was used to define the anatomical location of cervical pain. For the point prevalence, the question read, "Do you have neck pain at the present time, that is, right now?" The 6-month and lifetime prevalence questions read, "During the last 6 months, have you had neck pain lasting more than a day?" and "In your lifetime, have you ever had neck pain lasting more than a day?" Neck pain on the mannequin diagram was verified as that in the area from the occiput to third thoracic vertebra and included the trapezius but not the shoulder joint. Additionally, the Chronic Pain Questionnaire, a measure of graded severity of neck pain, was used (7, 8). The Chronic Pain Questionnaire has been demonstrated to have good psychometric properties in the general population as well as in patients with low back pain, headache, and temporomandibular joint disorders (9). The questionnaire is a seven-item Guttman scale that

was developed to classify pain in population-based and primary health care surveys with three items assessing pain intensity and four items assessing disability over the previous 6 months. Pain intensity is rated from 0 to 10, according to the following variables: 1) today's pain, 2) the worst pain in the last 6 months, and 3) the average pain experienced in the last 6 months. Three disability questions measure the interference over the past 6 months caused by neck pain and are rated from 0 to 10 with respect to the following: work; recreational, social, and family activities; and daily activities. One disability question measures the number of days in the past 6 months that the respondent had been kept from usual activities due to neck pain (work, school, or housework). Five grades of pain severity are derived from the aggregate score of pain intensity (ranging from 0 to 100) and the number of disability points (ranging from 0 to 6), which are derived from the three disability scores and the number of disability days (Table 1, 2) (10). Subjects also filled out the SF-12 questionnaire, which measures self reported health status and quality of life (QoL).

Statistical analyses

For a comparison between the normal subjects and those with neck pain, continuous variables were tested using Student's *t*-test, and categorical variables were tested using Pearson's chi-square test. Odds ratios (ORs) and 95% confidence intervals (CIs) for neck pain risk factors were calculated using multivariate logistic regression analysis with adjustments made for the factors significantly associated with neck pain in the univariate analysis.

For comparison of QoL measures assessed by SF-12, adjustments for confounding factors were made using ANOVA with multiple classification analysis. Neck pain was used as the dependent variable with adjustments made for age, body mass index, education, manual occupation, exercise, smoking, alcohol, marital status, and the presence of diabetes mellitus. Statistical analyses were performed using the SPSS software (ver. 12.0; SPSS Inc., Chicago, IL, USA). A *P* value < 0.05 (2 tailed) was considered to indicate statistical significance.

Ethics statement

The ethics committees of the Korean Health and Genome Study and the institutional review board of Ajou University School of Medicine approved the study protocol (approval number AJIRB-CRO-07-012). Written informed consent was obtained from each participant.

RESULTS

Table 3 shows the baseline characteristics of the study participants. The mean age of the study subjects was 61.4 ± 8.7 yr and 57.4% were females. Table 4 shows the lifetime, point, and 6-

Table 1. Questionnaires for grading chronic pain severity

Questions										
Pain intensity items										
1. How would you rate your neck pain on a 0-10 scale at the present time, that is right now, where 0 is 'no pain' and 10 is 'pain as bad as could be'?										
(No pain)										(Pain as bad could be)
0	1	2	3	4	5	6	7	8	9	10
2. In the past 6 months, how intense was your worst pain rated on a 0-10 scale where 0 is 'no pain' and 10 is 'pain as bad as could be'?										
(No pain)										(Pain as bad could be)
0	1	2	3	4	5	6	7	8	9	10
3. In the past 6 months, on the average, how intense was your pain rated on a 0-10 scale where 0 is 'no pain' and 10 is 'pain as bad as could be'? (That is, your usual pain at times you were experiencing pain.)										
(No pain)										(Pain as bad could be)
0	1	2	3	4	5	6	7	8	9	10
Disability items										
4. About how many days in the last 6 months have you been kept from your usual activities (work, school or housework) because of neck pain?										
()	disability days								
5. In the past 6 months, how much has neck pain interfered with your daily activities rated on a 0-10 scale where 0 is 'no interference' and 10 is 'unable to carry on any activities'?										
(No interference)										(Unable to carry on any activities)
0	1	2	3	4	5	6	7	8	9	10
6. In the past 6 months, how much has neck pain changed your ability to take part in recreational, social and family activities where 0 is 'no change' and 10 is 'extreme change'?										
(No change)										(Extreme change)
0	1	2	3	4	5	6	7	8	9	10
7. In the past 6 months, how much has neck pain changed your ability to work (including housework) where 0 is 'no change' and 10 is 'extreme change'?										
(No change)										(Extreme change)
0	1	2	3	4	5	6	7	8	9	10

Table 2. Methods of grading chronic pain severity

Disability point			
Disability days (0-180)		Disability score (0-100)	
0-6 days	0 point	0-29	0 point
7-14 days	1 point	30-49	1 point
15-30 days	2 point	50-69	2 point
31+ days	3 point	70+	3 point
Grade		Definition	
Grade 0 (pain free)		No pain problem (prior 6 months)	
Grade I (Low disability-low intensity)		Characteristic pain intensity less than 50, and less than 3 disability points	
Grade II (Low disability-high intensity)		Characteristic pain intensity of 50 or greater, and less than 3 disability points	
Grade III (High disability-moderately limiting)		3-4 Disability points, regardless of characteristic pain intensity	
Grade IV (High disability-severely limiting)		5-6 Disability points, regardless of characteristic pain intensity	

Scoring methods: Characteristic pain intensity is a 0-100 score derived from question 1-3 on Table 1 during last 6 months; mean (pain right row, worst pain, average pain) × 10. Disability score is a 0-100 score derived from question 5-7 on Table 1 during last 6 months; mean (daily activity, social activities, work activities) × 10. Disability points add the indicated points for disability days (question 4 on Table 1) and for disability score.

month prevalence of neck pain. The lifetime prevalence of neck pain was 20.8% in this cohort, with women having a higher prevalence than men except for those among 40-50 yr-old group. The point and 6-month prevalence was also higher among women. The lifetime and point prevalence did not increase with age in both genders (Fig. 1). The distribution of neck pain severity grade, measured using the Chronic Pain Questionnaire, was 77.1%, 17.4%, and 5.5% for grade 1, grade 2, and grade 3-4, respectively, showing that the majority of individuals had low-intensity/low-disability pain. The prevalence of neck pain ≥ grade 3 was highest in 40-50 yr-old male group (Fig. 2). Subjects with neck pain had significantly worse SF-12 scores in all domains

except for vitality and mental health after adjustment of confounders (Table 5). It is of note that neck pain significantly affected QoL only among women. Next, we evaluated risk factors associated with the presence of neck pain. The 6-month prevalence of neck pain, after adjustment of multiple confounders, was significantly associated with female gender and the presence of obesity (Table 6). Lifetime prevalence of neck pain was significantly associated with female gender (adjusted OR, 2 [1.36-2.95], *P* value = 0.000), the presence of obesity (adjusted OR, 1.87 [1.15-3.04], *P* value = 0.011) and smoking (adjusted OR, 1.5 [1.01-2.23], *P* value = 0.045), and the point prevalence of neck pain was significantly associated with female gender (ad-

justed OR, 2.92 [1.69-5.06], *P* value = 0.000) and smoking (adjusted OR, 1.96 [1.13-3.4], *P* value = 0.017).

DISCUSSION

In this study, we found that the prevalence of lifetime, point and 6 month prevalence of neck pain was 20.8%, 10.1%, and 15.8% in a Korean farming community. The presence of neck pain led to significant deterioration of QOL as measured with SF-12. Female gender, obesity and smoking were significantly

associated with neck pain after adjustment of confounders. To our knowledge, this is the first Korean study estimating the prevalence of neck pain in elderly community population.

The prevalence of neck pain in our subjects is lower than that previously reported among Western population (3, 4). It is reported that the prevalence of neck pain increases until around late 40s, after which it begins to decline (3-5). Thus, the lower risk in our study population may reflect the fact that our study included older subjects. In a study among subjects with similar age to ours, 20.5% prevalence for neck pain is reported (11).

In our study, prevalence of neck pain among women was higher than among men, except for the prevalence in 40-50 yr-old group. In other studies, higher prevalence of neck pain among women is also reported (5). This can be explained by the general tendency of higher prevalence of musculoskeletal complaints among women, and more specifically, biological factor such as lower strength of shoulder girdle muscle among women (12-16). Higher prevalence of musculoskeletal pain among women is explained by 3 factors : 1) women are more willing to report musculoskeletal pain; 2) women are more exposed to risk factors for musculoskeletal pain (exposure model); and 3) women are more vulnerable to develop musculoskeletal pain meaning that women react in different way to risk factors for musculoskeletal pain (vulnerability model) (17). The gender difference in vulnerability may be due to sex-linked biologic factors (hormones or physiology), difference in pain sensitivity, or difference in social or psychological factors.

Table 3. Baseline characteristics of the subjects

Variables	Subjects (n = 1,655)	Men (n = 704)	Women (n = 951)
Age (yr, mean ± SD)	61.4 ± 8.75	61.1 ± 8.83	61.7 ± 8.69
Body mass index (kg/m ² , mean ± SD)	24.5 ± 3.26	23.7 ± 3.05	25.0 ± 3.29
Education ≥ 12 yr	337 (20.4)	241 (34.2)	96 (10.1)
Manual occupation	472 (28.5)	107 (15.2)	365 (38.4)
Regular exercise	570 (34.4)	249 (35.4)	321 (33.8)
Previous or current smoker	319 (19.3)	300 (42.6)	19 (2.0)
Alcohol	668 (40.4)	482 (68.5)	186 (19.6)
Married	1,381 (83.4)	663 (94.2)	718 (75.5)
Diabetes Mellitus	356 (21.5)	137 (19.5)	219 (23.0)
Hypertension	303 (18.3)	96 (13.6)	207 (21.8)
Self-reported hand or knee arthritis	780 (47.1)	255 (36.2)	525 (55.2)

Except where indicated otherwise, values are number (%). The body-mass index is the weight in kilograms divided by the square of the height in meters. Manual occupation was defined as work demanding physical exertion (factory worker, laborer and farmer). Regular exercise was defined as self-reported exercise more than 3 times per week.

Table 4. Prevalence of neck pain

	Life time prevalence		Point prevalence		6-Month prevalence	
	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)
Men (n = 704)	119	16.9 (16.1-17.7)	70	7.3 (6.9-7.7)	84	11.9 (11.3-12.5)
Women (n = 951)	226	23.8 (22.6-25.0)	152	12.4 (11.8-13.0)	178	18.7 (17.8-19.6)
All (n = 1,655)	345	20.8 (19.8-21.8)	222	10.1 (9.6-10.6)	262	15.8 (15.0-16.6)

95% confidence interval (CI) was calculated with the use of the modified Wald method.

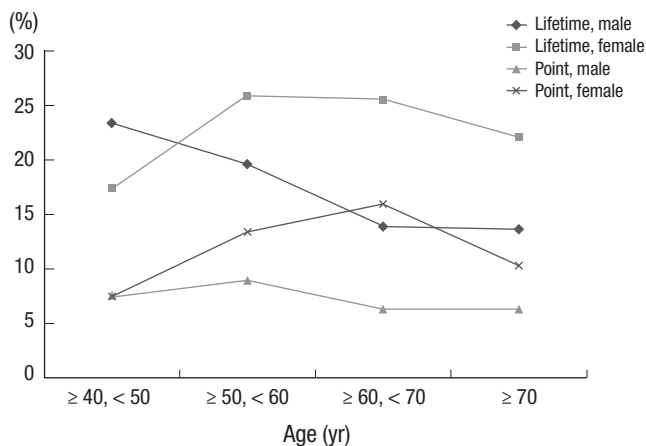


Fig. 1. Life time and point prevalence of neck pain according to age and gender.

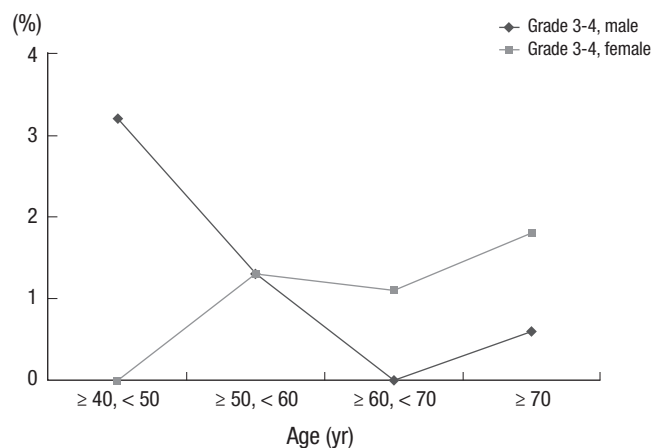


Fig. 2. The distribution of severe neck pain severity grade over previous 6 months according to age and gender.

Table 5. Quality of life measured with SF-12 among subjects with and without neck pain during last 6 months

	ALL			Women			Men		
	No pain	Pain	P value	No pain	Pain	P value	No pain	Pain	P value
Physical functioning	68.19 ± 0.99	57.31 ± 2.32	0.000	60.34 ± 1.40	47.29 ± 2.92	0.000	78.67 ± 1.38	72.45 ± 3.86	0.131
Role physical	75.57 ± 0.79	68.26 ± 1.85	0.000	69.76 ± 1.12	60.28 ± 2.35	0.000	83.37 ± 1.08	80.33 ± 3.00	0.341
Bodily pain	80.21 ± 0.67	70.63 ± 1.56	0.000	75.15 ± 0.96	63.46 ± 2.01	0.000	86.96 ± 0.88	81.76 ± 2.44	0.045
General health	45.72 ± 0.62	36.42 ± 1.46	0.000	42.71 ± 0.85	31.52 ± 1.79	0.000	49.72 ± 0.90	44.62 ± 2.51	0.057
Vitality	48.63 ± 0.86	44.73 ± 2.02	0.077	44.39 ± 1.17	39.03 ± 2.45	0.049	54.26 ± 1.28	53.65 ± 3.56	0.871
Social functioning	87.77 ± 0.64	83.89 ± 1.50	0.018	84.79 ± 0.90	80.26 ± 1.89	0.030	91.73 ± 0.90	89.50 ± 2.50	0.401
Role emotional	85.46 ± 0.67	78.93 ± 1.58	0.000	82.49 ± 0.98	74.31 ± 2.05	0.000	89.44 ± 0.88	86.33 ± 2.44	0.233
Mental health	44.05 ± 0.46	45.80 ± 1.08	0.138	45.42 ± 0.63	46.70 ± 1.32	0.384	42.21 ± 0.68	45.15 ± 1.88	0.143
Mental component score	67.74 ± 0.66	58.64 ± 1.54	0.000	62.26 ± 0.92	51.37 ± 1.93	0.000	75.06 ± 0.92	69.79 ± 2.57	0.055
Physical component score	66.75 ± 0.45	63.63 ± 1.05	0.006	64.55 ± 0.62	60.51 ± 1.30	0.005	69.67 ± 0.64	68.65 ± 1.80	0.595

Data were adjusted for age, body mass index, education, manual occupation, exercise, smoking, alcohol, marital status and the presence of diabetes mellitus.

Table 6. Risk Factors of neck pain during last 6 months

	6-Month odds ratio (95% CI)			
	P value	Unadjusted OR	P value	Adjusted OR*
Age	0.442		0.264	
≥ 50, < 60 (vs ≥ 40, < 50)	0.280	1.28 (0.82-2.02)	0.255	1.33 (0.82-2.16)
≥ 60, < 70 (vs ≥ 40, < 50)	0.345	1.24 (0.79-1.93)	0.745	1.09 (0.65-1.84)
≥ 70 (vs ≥ 40, < 50)	0.994	1.00 (0.62-1.61)	0.630	0.87 (0.48-1.55)
Female	0.000	1.70 (1.28-2.25)	0.000	2.27 (1.46-3.52)
Hypertension	0.037	1.41 (1.02-1.94)	0.103	1.35 (0.94-1.92)
Obesity	0.003	2.09 (1.28-3.41)	0.015	1.89 (1.13-3.17)
Alcohol	0.064	0.77 (0.59-1.02)	0.767	0.95 (0.67-1.34)
Smoking	0.565	0.90 (0.64-1.27)	0.095	1.48 (0.93-2.33)
Exercise	0.317	0.87 (0.65-1.15)	0.265	0.84 (0.62-1.14)
Diabetes mellitus	0.327	1.17 (0.85-1.60)	0.707	1.07 (0.76-1.50)
Osteoporosis	0.253	1.17 (0.89-1.54)	0.248	0.81 (0.57-1.15)
Manual work	0.734	0.95 (0.71-1.27)	0.844	1.03 (0.75-1.42)
Self-reported hand, knee arthritis	0.289	1.16 (0.88-1.51)	0.695	1.07 (0.77-1.48)

*Adjustments made for the factors significantly associated with neck pain in the univariate analysis.

Unlike in older age groups, the prevalence of neck pain and neck pain ≥ grade 3 in 40-50 yr-old group was higher in men than in women in our study. In this age group, men may be exposed to more mechanical stress aggravating the neck pain such as working with arms raised to or above shoulder level (18), although we could not make the analyses on the specific type of work activities in our study.

It is of note that only female subjects with neck pain had a significantly worse SF-12 score. In other studies examining the association between neck pain and health related quality of life (HRQoL), worse physical and mental HRQoL among subjects with neck pain has also been reported, implying significant health impact (19, 20). On the other hand, another recent study showed that most of the observed association between neck pain and HRQoL is attributable to comorbidities (21). While the differential influence of neck pain on QoL according to gender has not been reported previously, QoL as measured with SF-36 was reported to be significantly worse in females in other musculoskeletal problems such as low back pain and symptomatic peripheral osteoarthritis (22). SF-12 scores tended to be lower

in females compared to males even in subjects without neck pain, and it is postulated that instrument for measuring QoL, such as SF-12 captures deterioration in QoL more sensitively among females. Among risk factors identified, female gender was significantly associated with all aspects of neck pain (point, lifetime, and 6-month). Obesity was associated with 6-month and lifetime prevalence of neck pain, while smoking was associated with lifetime and point prevalence. It is notable that in contrast to lower back pain, age was not significantly associated with neck pain (23). This result is in line with previous data showing that the prevalence of neck pain peaks in the middle age and declines in later life (5). It can be speculated that compared to lower back pain, neck pain may be less affected by the progression of age-related degenerative change in the spine. The association of obesity with neck pain was also reported in previous studies (24, 25). Compared to other weight-bearing joints, such as the knee and lumbar spine, neck may be less vulnerable to adverse biomechanical effect stemming from obesity. On the other hand, metabolic factors might be responsible for neck pain as in generalized osteoarthritis (26). A study examining

the association between the metabolic syndrome and persistent chronic pain syndromes showed that hypothalamus-pituitary-adrenal stress axis dysfunction plays a role (27). The association between smoking and neck pain was also reported in other studies (24, 28). Palmer et al. (29) suggested that this association could arise from a pharmacological effect of tobacco smoke (for example, on neurological processing of sensory information or nutrition of peripheral tissues); another possibility is that people with a lower threshold for reporting pain and disability are more likely to take up and continue smoking.

Our study has strengths and limitation. This is the first large scale epidemiological study exploring the prevalence and risk factors of neck pain in Korea. We included elderly, rural community based subjects, an underrepresented population in the neck pain research. On the other hand, due to restraint in the budget, we could not take radiographs of cervical spine for our study subjects, so the influence of degenerative change in the cervical spine on neck pain could not be examined. Because of the cross-sectional design, the risk factors verified in our study merely indicates an association and not the definite cause and effect relationship.

In conclusion, this is the first large-scale Korean study estimating the prevalence of neck pain in elderly population. Lifetime prevalence of neck pain was 20.8% in our subjects with women having a higher prevalence. Although the majority of individuals had low-intensity/low-disability pain, subjects with neck pain had a significantly worse SF-12 score indicating that neck pain has significant health impact.

DISCLOSURE

The authors have no conflicts of interest to disclose.

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