The epidemiological studies published so far on risk factors of UNE are few, the inclusion criteria and methods of recruitment of cases and controls vary widely. The known risk factors include trauma, systemic diseases (diabetes, hypothyroidism and renal failure), smoking, and biomechanical work-related factors of the upper limb [8]. One of the aims of the study was to contribute to the recent findings. A preliminary study on the association between alcohol consumption and BMI show uncertain results [1-11]. By June 2014 we started a prospective multicentre case-control study on risk factors of UNE, the study design was elsewhere reported [12].

Methods
Sample size of 213 cases and 426 controls was sufficient for a case-control study with 1:2 matching, significance level 0.05, power 90%, prevalence 10% and expected odds ratio 2.0. For these preliminary results, we considered an “anatomical” disease based on clinical features. Manifestatory symptoms included numbness, tingling, or burning sensation in the fifth digit of the hand or arm, and weakness in an ulnar distribution, “Hand diagram protocol” proposed by Werner et al. was also used [12-13]. From June 2014 to April 2015 we consecutively identified 98 cases and 178 controls with age > 14 and <= 76 years in 4 UMEs site. For this preliminary report we selected only cases and controls without symptoms and medical conditions affecting peripheral nervous and muscular systems. We considered demographic, anthropometric (BMI, ratio height to weight (WHR), elbow dimensions) and occupational (job titles based on ISCO-2008) findings.

The elbow dimensions were: a) width of the elbow measured between the tips of medial and lateral epicondyle and b) width of the cubital groove (WCG) as the level of the median epicondyle between the two inner edges. The measurements of the elbow were done with the elbow and wrist flexed at 90°, the arm abducted at 90° and the hand palm leaned against a hard surface using a sliding caliper accurate to 0.1 cm (see figure). The length of the cubital groove was measured from the acromion of the shoulder (C5-C6) to the ulnar styloid with a stretch-resistive tape (accurate to 0.5 cm). The ratio between WCG and elbow width and between this ratio divided by the arm length were also calculated. All the examiners underwent a common training to standardize the measurement techniques. The interexaminer agreement of all body, elbow and arm measures of both sides was tested in a single blind measurement session with 16 volunteers of various body sizes (12 women and 8 men, mean age 48.9±10.0 years).

The standardized electrophysiological protocol, inspired to AANEM [14], included: 1) UNE “localizing” (determining) neurographic parameters of the ulnar nerve: a) reduction of MCV in across-elbow segment (“MCV slowing”), b) MCV drop across-elbow vs. forearm (“MCV drop”), c) CMAP amplitude drop across elbow considered an objective sign of ulnar neuropathy at the elbow (drop > 50% from DUC to UNE). 2) Neurographic techniques: a) EMG of ulcer nerve intrinsic hand muscles, b) SNC and SAP amplitude of the ulnar nerve in IV and V digit-nervous segments (4-4 and 4-5) and c) SNC and SAP amplitude of cutaneous ulnar nerve indicates (from the ulnar styloid to the level of the metacarpal interstice between the fourth and fifth fingers). We also performed motor and sensory neurography of the median nerve in all cases controls and of the contralateral ulnar nerve in all cases. Descriptive statistics, differences between case and controls, and between affected and unaffected sides of unilateral UNE cases were calculated with Mann-Whitney and chi-squared tests. Multiivariate logistic regression was carried out to evaluate risk factors associated with UNE.

Results
We included 83 cases (mean age 49.2 years, 45.8% females, 45.8% blue collars) and 160 controls (mean age 47.3 years, 51.3% females, 45% blue collars). Subjects with bilateral UNE were 9/83 (18.8%). At univariate analysis there were differences between cases and controls in WHR, cubital groove and cubital groove/width. We also considered together UNE cases had at least one abnormal value in 85.5%. Between nonlocalizing parameter US SAP amplitudes was abnormal in 59%. At least one abnormal localizing neurographic parameters of contralateral asymptomatic ulnar nerve were recorded in 27.4% of unilateral UNE (see figures).

DISCUSSION
In these preliminary results the “gold standard” of UNE diagnosis is based only on clinical diagnosis, the subjects with comorbidities were excluded, and lifestyle and biomechanical work-related risk factors were not statistically evaluated. At the end of the enrollment we will separate the patients with UNE diagnosis according to clinical and electrophysiological findings from the subjects with ulnar nerve symptoms without abnormal electrophysiological results and we will include the comorbidities in the risk factors.

The most original finding of our preliminary report is that the decreased CGV may be a risk factor of UNE. For convenience we measured the external CGV at the level of medical epicondyle with the elbow flexed at 90°. The space (width, depth and CSA of cubital tunnel) available for the nerve varies with the degree of the elbow flexion. During the progressive flexion the width, depth and cross-sectional area of the cubital tunnel at the level of medial epicondyle decreases the pressure increases and the ulnar nerve stretches. There are differences in amount of this variation according to anatomical (US or MRI) study of the anatomical morphological model in cadavers [15-17]. In our preliminary US study of a sample of the same subjects used to assess the agreement of examiner measurements, we observed that the ratio of width and depth of the groove at the level of the medial epicondyle does not vary significantly during the flexion and the external measurement width will matches with the ultrasonographic measurement (see figures).

Therefore we think that the measurement of the external CGV at the level of medial epicondyle may be a good surrogate (easy to measure) of the available space of the nerve in the retroepicondylar groove.

We also preliminary showed that the increased age was a protective factor and we will check if this association is due to lifestyle and work-related factors. Type A behavior is a risk factor for UNE. But in this preliminary report, considered only the job title, at the end of enrollment we will examine some job tasks regardless of job title (i.e. the exposure to non-neutral postures, repetitive movements of elbow, hand-arm vibrations and forceful work).

Regarding the electrophysiological findings, 27% of patients with unilateral UNE showed contralateral asymptomatic neurographic anomalies, AE MCV was the most sensitive electrophysiological findings and AFI EMG neurography together was more sensitive than neurographic recording from the single muscles. Multiple internally consistent abnormalities more are more convincing than isolated abnormalities, which raise the possibility of artifact or technical mishap.

Finally, if the sample size will be sufficient, we will evaluate whether the increased age, the alcohol consumption and BMI are associated with the diagnosis of ulnar neuropathy. We will also verify if the job exposure matrix: a triple case referent study in the community will be able to predict the prevalence of UNE and its different locations.

Bibliography