Supplementary Table 2: Detailed characteristics of included studies

Study Number	Study	Design	Country	Level of Evidence	Age in Years (range) and country	Eligibility Criteria	Number of cases and controls	Risk Factors values in cases and controls (Presented as number of participants (%) or mean values (SD) unless otherwise noted)	Results
1	Kruckeberg et al 2020 (Incidence of and Risk Factors for Glenohumeral Osteoarthritis After Anterior Shoulder Instability)	Case-control study	USA	III	Mean age at instability event: 20.9 (range 19.9 - 22.0 years) Mean follow-up time: 15.2 (range 5.1 - 29.8 years)	Patients <40 years old at the time of diagnosis for anterior shoulder instability (ASI) were identified using ICD-9 and ICD-10 codes for from Rochester Epidemiology Project (REP) of southeastern Minnesota and southwestern Wisconsin. Patients were confirmed for ASI if they had clinical diagnosis and imaging or surgical findings. Patients were enrolled based on 1 or more ASI events with confirmed diagnosis, <40 years old, min 5 years between initial instability event and final clinic visit and radiographic evaluation >5 years since the time of instability. Patients were excluded for having posterior or multidirectional shoulder instability	Total cases N = 154 Operative N = 84 Nonoperative N = 70 Osteoarthritis N = 35 No Osteoarthritis N = 119	Current or Former Smoker Hyperlaxity Laborer Occupation Body Mass Index Age at initial instability Seizure Disorders Sports Participation	**OR 4.3 (1.1-16.5) P = 0.030** **OR 10.1 (1.4-72.4) P = 0.020** **OR 6.1 (1.02-36.1) P = 0.043** **OR 1.2 (1.03-1.3) P = 0.012** **OR 1.1 (1.02-1.2) P = 0.013** Operative vs Nonoperative: sex (P ≥ 0.999) age at first instability episode (P = 0.767), length of follow-up (P = 0.876), smoking status (P = 0.473), diabetes (P = 0.594), hyperlaxity (P = 0.380), seizure disorders (P = 0.305), laborer occupation (P = 0.226), sports participation (P = 0.188) OA vs No OA at final follow-up: **age at initial instability event (P = 0.002)**, **smoker status (P = .004)**, **seizure disorder (P = 0.033)**, **laborer occupation (P = 0.044)**, **BMI (P = 0.007)**, diabetes (P = 0.668), hyperlaxity (P = 0.878), **sports participation (P = 0.032)**

2	Zhang et al 2016 (Prevalence of and risk factors for the occurrence of symptomatic osteoarthritis in rural regions of Shanxi Province, China)	Cross-sectional study	China	IV	43.9 years (range 16 – 90 years) China	Permanent residents older than 16 years were examined under Community Oriented Program for the Control of Rheumatic Diseases (COPCORD) Patients with secondary OA, diabetes, rheumatoid arthritis, gout, and ankylosing spondylitis were excluded	Cases N = 7126 Male Cases N = 3,609 Female Cases N = 3,517 Shoulder Cases N = 211 Male Shoulder Cases N = 88 Female Shoulder Cases N = 123	Gender, advanced age, sweet tooth, waist circumference, poor home ventilation, poor home heating, separation, divorce, death of a partner, occupation, education level, BMI, and concomitant cardiovascular disease.	**Values based on overall OA and not separated by shoulder:** **Male vs Female OA prevalence (P = 0.007)** (once stratified, only females aged 76-80 showed a higher prevalence than males the same age) **BMI (P < 0.001)** **Waist circumference (P < 0.001)** **Eating habit (P < 0.001)** **Number of cigarettes/day (P = 0.001)** **Rating of home ventilation (P < 0.001)** **Type of home heating (P < 0.001)** **Marital status (P < 0.001)** **Occupation (P < 0.001)** **Underground work history (P < 0.001)** **Educational level (P < 0.001)** **CVD status (P < 0.001)**
3	Wall et al 2019 (Obesity is associated with an increased prevalence of glenohumeral osteoarthritis and arthroplasty: A cohort study)	Retrospective review	USA		BMI <19 BMI = 20-24 BMI = 25-29 BMI = 30-34 BMI = 35-39 BMI >39	Patient information was collected from Humana database using PearlDiver technologies user interface to access the data for BMI using ICD-9 diagnosis codes for BMI <19kg/m^2 to	N = 99,479 each in all 6 cohorts of BMI with age and gender matched individuals – 568,874 total Cases = 27,803	BMI and obesity	**BMI <19 OR: 0.83 (0.79-0.87) p < 0.001** BMI 19-24: Reference **BMI 25-29 OR: 1.18 (1.13-1.23) p< 0.001**

						>39kg/m^2. The ICD-10 codes were used from the fourth quarter of 2015 to third quarter of 2016. A BMI between 19-24kg/m^2 was used as a reference or control	Controls = 541,071		**BMI 30-34 OR: 1.38 (1.32-1.44) p< 0.001** **BMI 35-39 OR: 1.54 (1.48-1.61) p< 0.001** **BMI >39 OR: 1.59 (1.53-1.66) p< 0.001**
4	Plachel et al 2021 (Patient-specific risk profile associated with early-onset primary osteoarthritis of the shoulder: is it really primary?)	Case-Control study	Germany	III	Cases 52 ± 7 years Controls 53 ± 7 years	Patients with primary glenohumeral osteoarthritis under 60 years of age underwent primary shoulder arthroplasty from 2010 to 2016. Patients with secondary GH OA were excluded. All patients had symptomatic GH OA in the form of severe pain and a limited range of motion.	Cases = 32 Controls = 32	BMI 28±5; 25±3 Current Smokers (%) 69; 26 Smoking package-years 12±15; 4±10 Hypertension (%) 31; 3 Polyarthritis (%) 44; 3 Shoulder Activity Level 1.9±1.2; 0.6±0.7 Combat Sport (%) 25; 3 Weightlifting (%) 20; 6 Diabetes (%) 6;0 Weight (kg) 84±19; 76±15 Previous shoulder surgery (%) 28;0	**P = 0.017** **P<0.001** **P= 0.009** **P = 0.007** **P<0.001** **P<0.001** **P = 0.020** **P = 0.011** P = 0.157 P = 0.058 **P < 0.001**
5	Cho et al 2015 (Prevalence and Risk Factors of Spine, Shoulder, Hand, Hip, and Knee Osteoarthritis in Community-dwelling Koreans Older than Age 65 Years)	Cross-sectional study	South Korea	IV	Mean age of total study 72±5 years (range 65-91) South Korea	Patient's data were extracted from a base-line database of Korean Longitudinal Study on Health and Aging (KLoSHA). Presence of glenohumeral osteoarthritis was confirmed based on AP radiograph and OA severity was determined based on Kellgren-Lawrence score	Total cases N = 696 Controls = 660 Total cases male = 298 Total cases female = 398 Total shoulder cases N = 36 Male shoulder cases N = 8	Female gender Age Obesity	**OR 2.7 (1.2-6.1) P = 0.010** Adjusted OR values: Female gender OR 1.9 (0.8-4.4) P = 0.132 Age (per 5 years) OR 1.1 (0.7 - 1.6) P = 0.637 Obesity OR 1.7 (0.8 - 3.8) P = 0.162

							Female shoulder cases N = 28		
6	Siviero et al 2009 (Functional limitations of upper limbs in older diabetic individuals. The Italian Longitudinal Study on Aging)	Prospective cohort study	Italy	IV	76.9 ± 5.4 (range, 68-89 years)	Patients recruited were diagnosed for shoulder OA based on clinical assessment by a physician, disease history, documentation, and direct evaluation of symptoms. Patients recruited through data collected in the Italian Longitudinal Study on Aging from the demographic registers of eight Italian municipalities in 1992 with two follow-ups in 1996 and 2000.	Cases = 851 (possible = 676, definite = 175) Controls = 1016	Female gender Increasing age Increased BMI Years of schooling Diabetes	**P<0.001** **P<0.001** **P = 0.007** **P<0.001** **P = 0.0107**