**Supplementary file 1**

**Quality assessment**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Author | SELECTION | | | | COMPARABILITY | Outcome | | Total scores |
| Representativeness of the samples | Sample size | Non-responders | Ascertainment of the exposure (risk factor) | A: study controls for age and/or BMI  B: control for any additional factor | Assessment of the outcome  a) Independent blind assessment. \*\*  b) Record linkage. \*\*  c) Self report. \* | Statistical test |
| Chang, 2011 | \* | \* | - | \* | \*\* | \*\* | \* | 8 |
| Lo, 2006 | \* | - | - | \* | \*\* | \*\* | \* | 7 |
| Okoroh, 2015 | \* | \* | \* | \* | \* | \*\* | \* | 8 |
| Sirmans, 2014 | \* | \* | - | \* | - | \*\* | \* | 6 |
| Chang, 2016 | - | - | - | \* | \* | \*\* | \* | 5 |
| Vrbíková, 2003 | - | - | \* | \* | - | \*\* | \* | 5 |
| Gateva, 2012 | - | - | - | \* | - | \*\* | \* | 4 |
| Li, 2013 | \* | \* | \* | \* | - | \*\* | \* | 7 |
| Ramezani Tehrani, 2011 | \* | \* | \* | \* | - | \*\* | \* | 7 |
| Ramezani Tehrani, 2014 | \* | \* | \* | \* | \* | \*\* | \* | 8 |
| Marchesan, 2019 | \* | - | \* | \* | \* | \*\* | \* | 7 |

**Table S1.** Quality assessment of included studies using the Newcastle–Ottawa Quality Assessment Scale for cross-sectional studies.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | SELECTION | | | | COMPARABILITY | Outcome | | | Total scores |
| Author | Representativeness of the exposed cohort | Selection of the non-exposed cohort | Ascertainment of exposure | No outcome of interest at start of study | A: Study controls for age and/or BMI  B: Study controls for other confounders | A: doctor’s diagnosis OR objective measurements  B: parent/self-reported doctor’s diagnosis OR use of medication | follow-up long enough for outcomes ( at least 10 year) | Adequacy of follow up of cohorts |
| Calderon-Margalit, 2014 | \* | \* | \* | \* | \*\* | \* | \* | \* | 9 |
| Ding, 2018 | \* | \* | \* | \* | \*\* | \* | \* | \* | 9 |
| Glintborg, 2015 | \* | \* | \* | \* | - | \* | - | - | 5 |
| Hart, 2014 (98) | \* | \* | \* | \* | - | \* | \* | \* | 7 |
| Merz, 2016 | \* | \* | \* | \* | - | \* | \* | \* | 7 |
| Meun, 2018 | \* | \* | \* | \* | \*\* | \* | \* | \* | 9 |
| Wild, 2000 | \* | \* | \* | \* | - | \* | \* | \* | 7 |
| Dahlgren, 1992 | \* | - | \* | \* | - | \* | \* | \* | 6 |
| Iftikhar, 2012 | \* | - | \* | \* | \*\* | \* | \* | \* | 8 |
| Lunde, 2007 | \* | - | \* | \* | - | \* | \* | \* | 6 |
| Schmidt, 2011 | \* | - | \* | \* | - | \* | \* | \* | 6 |
| Shi, 2014 | \* | \* | \* | \* | - | \* | - | - | 5 |
| Bird, 2012 | \* | \* | \* | \* | - | \* | - | - | 5 |
| Ramezani Tehrani, 2015 | \* | \* | \* | \* | \*\* | \* | \* | \* | 9 |
| Behboudi Gandevani, 2018 | \* | \* | \* | \* | \*\* | \* | \* | \* | 9 |

**Table S2.** Quality assessment of included studies using the Newcastle–Ottawa Quality Assessment Scale for cohort studies.

**Table S3.** Quality assessment of included studies using the Newcastle–Ottawa Quality Assessment Scale for case-control studies.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| First author, year  (reference) | SELECTION | | | | COMPARABILITY | EXPOSURE | | | Total scores |
| adequate case definition | Representativeness of the cases | Community selection of controls | no history of disease among controls | A: study controls for age and/or BMI  B: study control for any additional factors | A: secure record for clinical outcome  B: structured interview where blind to case/control status | Same method of ascertainment for cases and controls | Same Non-response rate for cases and controls |
| Chan, 2013 | \* | \* | - | \* | - | \* | \* | - | 5 |
| Haakova, 2003 | \* | \* | - | \* | - | \* | \* | - | 5 |
| Shroff , 2007 | \* | \* | - | \* | - | \* | \* | \* | 6 |
| Luque-Ramirez, 2007 | \* | \* | - | \* | - | \* | \* | \* | 6 |

**Risk of bias**

**Figure S1.** Risk of bias in cross-sectional and case- control studies.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Study design | First author, date | Bias in assessment of exposure | Bias in development of outcome of interest in case and controls | Bias in selection of cases | Bias in selection of controls | Bias in control of prognostic variable (without case and control matching or adjustment in statistical methods ) |
| cross-sectional | **Chang, 2011** |  |  |  |  |  |
| **Lo, 2006** |  |  |  |  |  |
| **Okoroh, 2015** |  |  |  |  |  |
| **Sirmans, 2014** |  |  |  |  |  |
| **Chang, 2016** |  |  |  |  |  |
| **Vrbíková, 2003** |  |  |  |  |  |
| **Li, 2013** |  |  |  |  |  |
| **Gateva, 2012** |  |  |  |  |  |
| **Ramezani Tehrani, 2011** |  |  |  |  |  |
| **Ramezani Tehrani, 2014** |  |  |  |  |  |
| **Marchesan, 2019** |  |  |  |  |  |
| case-control | **Chan, 2013** |  |  |  |  |  |
| **Haakova, 2003** |  |  |  |  |  |
| **Shroff , 2007** |  |  |  |  |  |
| **Luque-Ramirez, 2007** |  |  |  |  |  |
| Definitely No (low risk of bias) probably no  Definitely yes (high risk of bias) probably Yes | | | | | | |

**A.**

**B.**

**Figure S2.** Risk of bias in cohort studies.

**A.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Author, date | Bias in selection of exposed and non‐exposed cohorts | Bias in assessment of exposure | Bias in present of outcome of interest at start of study | Bias in control of prognostic variables (with matching or adjusting) | Bias in in the assessment of the presence or absence of prognostic factors | Bias in in the assessment of outcome | Bias in adequacy about follow up of cohorts |
| Ding, 2018 |  |  |  |  |  |  |  |
| Calderon-Margalit, 2014 |  |  |  |  |  |  |  |
| Glintborg, 2015 |  |  |  |  |  |  |  |
| Hart, 2014 |  |  |  |  |  |  |  |
| Merz, 2016 |  |  |  |  |  |  |  |
| Meun, 2018 |  |  |  |  |  |  |  |
| Wild, 2000 |  |  |  |  |  |  |  |
| Dahlgren, 1992 |  |  |  |  |  |  |  |
| Iftikhar, 2012 |  |  |  |  |  |  |  |
| Lunde, 2007 |  |  |  |  |  |  |  |
| Schmidt, (2011) |  |  |  |  |  |  |  |
| Shi, 2014 |  |  |  |  |  |  |  |
| Bird, 2012 |  |  |  |  |  |  |  |
| Ramezani Tehrani, 2015 |  |  |  |  |  |  |  |
| Behboudi Gandevani, 2018 |  |  |  |  |  |  |  |
| Definitely No (low risk of bias) probably no  Definitely yes (high risk of bias) probably Yes | | | | | | | |

B.

**Figure S3.** Sensitivity analysis for RR in reproductive age group for all studies.



**Table S4.** sensitivity analysis for RR in reproductive age group for all studies.

**Study omitted | Estimate [95% Conf. Interval]**

Behboudi-Gandevani et al. (2018)| 1.7438776 1.4631997 2.0783963

Bird et al. (2012)| 1.8163466 1.5948005 2.0686698

Calderon-Margalit et al. (2014)| 1.7517917 1.4715889 2.0853477

Chan et al. (2013)| 1.7252944 1.4503318 2.0523858

Chang et al. (2011)| 1.7273015 1.4492077 2.0587597

Chang et al. (2016)| 1.7294208 1.4510241 2.0612314

Dahlgren et al. (1992)| 1.6926078 1.424938 2.0105584

Ding et al. (2018)| 1.7009031 1.4226078 2.0336394

Gateva et al. (2012)| 1.7626334 1.480405 2.0986667

Glintborg et al. (2015)| 1.667802 1.3956908 1.9929655

Haakova et al. (2003)| 1.722587 1.4507524 2.0453565

Hart et al. (2014)| 1.6180612 1.3608732 1.9238546

Iftikhar et al. (2012)| 1.7519197 1.4696397 2.0884185

Li et al. (2013) | 1.7781277 1.4952075 2.1145813

Lo et al. (2006) | 1.6705562 1.3799804 2.0223169

Lunde et al. (2007)| 1.7465718 1.4672309 2.0790954

Luque-Ramirez et al. (2007)| 1.7580776 1.4777819 2.091538

Marchesan et.al (2019)| 1.7026174 1.4301388 2.0270104

Okoroh et al. (2015)| 1.6700399 1.3616711 2.0482428

Ramezani Tehrani et al. (2011)| 1.7311074 1.4567262 2.0571694

Ramezani Tehrani et al. (2014)| 1.7339586 1.4601969 2.059046

Ramezani Tehrani et al. (2015)| 1.7283132 1.4528985 2.0559361

Shi et al. (2014) | 1.7245083 1.4427273 2.0613244

Shroff et al. (2007)| 1.7211879 1.4489206 2.0446172

Sirmans et al. (2014)| 1.6747276 1.399421 2.004195

Vrbíková et al. (2003)| 1.6920248 1.4211771 2.0144906

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Combined | 1.7192039 1.4484419 2.0405803

**Figure S4.** Sensitivity analysis for RR in menopause aging group for all studies.



**Table S5.** Sensitivity analysis for RR in menopause aging group for all studies.

------------------------------------------------------------------------------

Study omitted | Estimate [95% Conf. Interval]

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Behboudi-Gandevani et al. (2018)| 1.3151557 .95511866 1.8109109

Dahlgren et al. (1992)| 1.1271049 .91285157 1.3916451

Merz et al. (2016)| 1.3841956 1.0279515 1.8638988

Meun et. (2018) | 1.3481351 .91374004 1.9890431

Schmidt et al. (2011)| 1.1852014 .87225527 1.6104256

Wild et al. (2000)| 1.3050203 .88736391 1.9192555

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Combined | 1.2624501 .95244965 1.6733485

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**Figure S5.** Sensitivity analysis for Prevalence in patients with PCOS of reproductive ages.



**Table S6.** Sensitivity analysis for Prevalence in patients with PCOS in reproductive ages.

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Study omitted | Estimate [95% Conf. Interval]

-------------------+----------------------------------------------------------

Behboudi-Gandevani et al. (2019)|.13882443.10768192.16996695

Bird et al. (2012)| .13402987 .10511241 .16294733

Calderon-Margalit et al. (2014)|.13738079.10572061.16904098

Chan et al. (2013)| .1405253 .10868426 .17236634

Chang et al. (2011)| .13263194 .10089932 .16436456

Chang et al. (2016)| .13359208 .10187376 .16531041

Dahlgren et al. (1992)|.13662526 .10523987 .16801064

Ding et al. (2018)| .1454097 .11199498 .17882441

Gateva et al. (2012)| .13343471 .10178331 .16508612

Glintborg et al. (2015)|.14260861 .11446112 .17075612

Haakova et al. (2003)|.14502619 .11309789 .17695449

Hart et al. (2014)| .14434238 .11196198 .17672278

Iftikhar et al. (2012)|.13321559 .10140928 .1650219

Li et al. (2013) | .13813789 .10620543 .17007037

Lo et al. (2006) | .14011283 .10756706 .17265861

Lunde et al. (2007)| .1413971 .10952041 .1732738

Luque-Ramirez et al. (2007)|.13435052.10286281 .16583823

Marchesan et.al (2019)|.13882443 .10768192 .16996695

Okoroh et al. (2015)| .14271627 .10586881 .17956375

Ramezani Tehrani et al. (2011)|.14476731.11281621 .17671841

Ramezani Tehrani et al. (2014)|.14531368.1133662 .17726114

Ramezani Tehrani et al. (2015)|.14191486.11006496 .17376475

Shi et al. (2014) | .13594127 .10417929 .16770324

Shroff et al. (2007)| .13919833 .10763681 .17075987

Sirmans et al. (2014)|.13232347 .10068957 .1639574

Vrbíková et al. (2003)|.13633762 .10472579 .16794947

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Combined | .13882443 .10768191 .16996694

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**Figure S6.** Sensitivity analysis for Prevalence in patients with PCOS in menopause aging group.



**Table S7.** Sensitivity analysis for Prevalence in patients with PCOS in menopause aging group.

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Study omitted | Estimate [95% Conf. Interval]

-------------------+----------------------------------------------------------

Behboudi-Gandevani et al. (2019)|.51420444.26584604.76256281

Dahlgren et al. (1992)|.51026291 .22779246 .79273337

Merz et al. (2016)| .52284539 .23031107 .81537974

Meun et. (2018) | .47367305 .21294805 .73439807

Schmidt et al. (2011)|.47078729 .1944975 .74707705

Wild et al. (2000)| .62384993 .53844118 .70925862

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Combined | .51420442 .26584603 .7625628

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**Figure S7.** Sensitivity analysis for Prevalence in healthy controls of reproductive ages.



**Table S8.** Sensitivity analysis for Prevalence in healthy control of reproductive ages.

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Study omitted | Estimate [95% Conf. Interval]

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Behboudi-Gandevani et al. (2019)|.08524524.07134463.09914585

Bird et al. (2012)| .07824372 .06631624 .0901712

Calderon-Margalit et al. (2014)|.08103725.06686623.09520828

Chan et al. (2013)| .08589393 .07173926 .10004859

Chang et al. (2011)| .08233398 .06825068 .09641728

Chang et al. (2016)| .08223884 .0681367 .09634098

Dahlgren et al. (1992)|.0869493 .07281358 .10108502

Ding et al. (2018)| .09043039 .07504443 .10581635

Gateva et al. (2012)| .08085126 .06683648 .09486604

Glintborg et al. (2015)|.09112757 .07550433 .10675082

Haakova et al. (2003)|.08841346 .07419998 .10262694

Hart et al. (2014)| .0911129 .07544126 .10678453

Iftikhar et al. (2012)|.08055217 .06642903 .0946753

Li et al. (2013) | .08148562 .06735143 .09561982

Lo et al. (2006) | .08759554 .07305969 .10213138

Lunde et al. (2007)| .0854909 .07124943 .09973235

Luque-Ramirez et al. (2007)|.08401233.07008898 .09793567

Marchesan et.al (2019)|.08524524 .07134463 .09914585

Okoroh et al. (2015)| .0872822 .0729471 .10161731

Ramezani Tehrani et al. (2011)|.08869115.07441192 .10297038

Ramezani Tehrani et al. (2014)|.08832135.07405568 .10258701

Ramezani Tehrani et al. (2015)|.08702902.07277189 .10128615

Shi et al. (2014) | .08337203 .069165 .09757907

Shroff et al. (2007)| .08526898 .07128266 .09925531

Sirmans et al. (2014)|.08348458 .06935064 .09761851

Vrbíková et al. (2003)|.0854518 .07124299 .09966063

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Combined | .08524524 .07134463 .09914585

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**Figure S8.** Sensitivity analysis for Prevalence in healthy control of menopause aging group.



**Table S9.** Sensitivity analysis for Prevalence in healthy control of menopause aging group.

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Study omitted | Estimate [95% Conf. Interval]

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Behboudi-Gandevani et al. (2019)|.40640807.18044683.63236928

Dahlgren et al. (1992)|.4641901 .18987897 .73850125

Merz et al. (2016)| .34890303 .1314237 .56638235

Meun et al. (2018)| .35157928 .11043011 .5927285

Schmidt et al. (2011)|.40541449 .13798599 .67284304

Wild et al. (2000)| .46239108 .25267416 .67210799

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Combined | .40640807 .18044683 .63236931

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**Figure S9.** The result of sensitivity analysis for all age subgroups.



**Figure S10.** The result of sensitivity analysis for reproductive age subgroup.



**Figure S11.** The result of sensitivity analysis for menopause/aging subgroup.



**Figure S12.** Forest plot of pooled relative risk of HTN for all studies except those with Rotterdam criteria.

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**Figure S13.** Forest plot of pooled relative risk of HTN for all population based studies except those with Rotterdam criteria.

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**Figure S14.** Forest plot of pooled relative risk of HTN for all non-population based studies except those with Rotterdam criteria.

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