**Supplementary Table S1.** Keywords used to screen for eligible articles.

| # | Search strategy steps in Medline database | Search strategy keywords in Medline database |
|---|---|---|
| **1** | Iron deficiency keywords | Iron deficiency anemia OR Iron deficiency anaemia OR Iron deficient OR Iron deficit OR Iron insufficient OR Iron insufficiency OR Total iron binding capacity OR Ferritin OR serum Iron OR Iron therapy OR Iron supplementation |
| **2** | HbA1c keywords | HbA1c OR glycated hemoglobin A1c OR glycated haemoglobin A1c OR glycosylated Haemoglobin OR glycosylated hemoglobin OR hemoglobin A1c OR Haemoglobin A1c OR glycohemoglobin OR diabetes OR prediabetes |
| **3** | Merged | 1 AND 2 |
| **#** | **Search strategy steps in Embase database** | **Search strategy keywords in Embase database** |
| **1** | Iron deficiency keywords | Iron deficiency anemia OR Iron deficiency anaemia OR Iron deficient OR Iron deficit OR Iron insufficient OR Iron insufficiency OR Total iron binding capacity OR Ferritin OR serum Iron OR Iron therapy OR Iron supplementation |
| **2** | HbA1c keywords | HbA1c OR glycated hemoglobin A1c OR glycated haemoglobin A1c OR glycosylated Haemoglobin OR glycosylated hemoglobin OR hemoglobin A1c OR Haemoglobin A1c OR glycohemoglobin OR diabetes OR prediabetes |
| **3** | Merged | 1 AND 2 |
| **#** | **Search strategy steps in Cochrane database** | **Search strategy keywords in Cochrane database** |
| **1** | Iron deficiency keywords | Iron deficiency anemia OR Iron deficiency anaemia OR Iron deficient OR Iron deficit OR Iron insufficient OR Iron insufficiency OR Total iron binding capacity OR Ferritin OR serum Iron OR Iron therapy OR Iron supplementation |
| **2** | HbA1c keywords | HbA1c OR glycated hemoglobin A1c OR glycated haemoglobin A1c OR glycosylated Haemoglobin OR glycosylated hemoglobin OR hemoglobin A1c OR Haemoglobin A1c OR glycohemoglobin OR diabetes OR prediabetes |
| **3** | Merged | 1 AND 2 |

**Supplementary Table S2.** Joanna Briggs Institute (JBI) critical appraisal checklists for assessing the quality of studies.

| RCT | Question | Low risk of bias | Intermediate risk of bias | High risk of bias |
|---|---|---|---|---|
| Information bias | 4,5,6,10,11 | Answer Yes 4/5 times | Answer Yes 3 times | Answer Yes 0/1/2 times |
| Selection bias | 1,2,3,7,8,9 | Answer Yes 5/6 times | Answer Yes 3/4 times | Answer Yes 0/1/2 times |
| Confounding | - | - | - | - |
| Statistical quality | 12,13 | Answer Yes 2 times | Answer Yes 1 times | Answer Yes 0 times |

| Cohort | Question | Low risk of bias | Intermediate risk of bias | High risk of bias |
|---|---|---|---|---|
| Information bias | 2,3,7,8,9,10 | Answer Yes 5/6 times | Answer Yes 3/4 times | Answer Yes 0/1/2 times |
| Selection bias | 1,6 | Answer Yes 2 times | Answer Yes 1 times | Answer Yes 0 times |
| Confounding | 4,5 | Answer Yes 2 times | Answer Yes 1 times | Answer Yes 0 times |
| Statistical quality | 11 | Answer Yes 1 times | | Answer Yes 0 times |

| Case control | Question | Low risk of bias | Intermediate risk of bias | High risk of bias |
|---|---|---|---|---|
| Information bias | 4,5,8,9 | Answer Yes 4 times | Answer Yes 2/3 times | Answer Yes 0/1 times |
| Selection bias | 1,2,3 | Answer Yes 3 times | Answer Yes 1/2 times | Answer Yes 0 times |
| Confounding | 6,7 | Answer Yes 2 times | Answer Yes 1 times | Answer Yes 0 times |
| Statistical quality | 10 | Answer Yes 1 times | - | Answer Yes 0 times |

| Quasi-experimental | Question | Low risk of bias | Intermediate risk of bias | High risk of bias |
|---|---|---|---|---|
| Information bias | 4,5,6,7 | Answer Yes 4 times | Answer Yes 2/3 times | Answer Yes 0/1 times |
| Selection bias | 1,2,3,8 | Answer Yes 4 times | Answer Yes 2/3 times | Answer Yes 0/1 times |
| Confounding | - | - | - | - |
| Statistical quality | 9 | Answer Yes 1 times | - | Answer Yes 0 times |

**Supplementary Table. S3:** The results of the different JBI questionnaires (questionnaire for randomized controlled trial, cohort studies, case control studies and quasi-experimental studies).

| **RCT** | **Q1** | **Q2** | **Q3** | **Q4** | **Q5** | **Q6** | **Q7** | **Q8** | **Q9** | **Q10** | **Q11** | **Q12** | **Q13** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Naslı-Esfahani | Yes | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes |
| **Cohort** | **Q1** | **Q2** | **Q3** | **Q4** | **Q5** | **Q6** | **Q7** | **Q8** | **Q9** | **Q10** | **Q11** | | |
| Aydın | NA | NA | Yes | Yes | Yes | NA | Yes | Yes | Yes | UC | Yes | | |
| El-Agouza | NA | NA | Yes | Yes | UC | NA | Yes | Yes | Yes | UC | UC | | |
| **Case control** | **Q1** | **Q2** | **Q3** | **Q4** | **Q5** | **Q6** | **Q7** | **Q8** | **Q9** | **Q10** | | | |
| Altuntaş | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | | | |
| Pilla | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | | | |
| Varshney | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | | | |
| Madhu | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | | | |
| Coban | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | | | |
| Gram-Hansen | No | No | Yes | Yes | Yes | No | No | Yes | Yes | Yes | | | |
| **Quasi-experimental** | **Q1** | **Q2** | **Q3** | **Q4** | **Q5** | **Q6** | **Q7** | **Q8** | **Q9** | | | | |
| Mustafa | Yes | Yes | No | No | Yes | UC | Yes | Yes | UC | | | | |

**Supplementary Table S4.** Keywords used to screen for eligible articles.

| # | Search strategy in Medline database | Results |
|---|---|---|
| **1** | Iron deficiency anemia OR Iron deficiency anaemia OR Iron deficient OR Iron deficit OR Iron insufficient OR Iron insufficiency OR Total iron binding capacity OR Ferritin OR serum Iron OR Iron therapy OR Iron supplementation | N = 102,825 |
| **2** | HbA1c OR glycated hemoglobin A1c OR glycated haemoglobin A1c OR glycosylated Haemoglobin OR glycosylated hemoglobin OR hemoglobin A1c OR Haemoglobin A1c OR glycohemoglobin OR diabetes OR prediabetes | N = 1,014,962 |
| **3** | 1 AND 2 | N = 6,383 |
| **#** | **Search strategy in Embase database** | **Results** |
| **1** | Iron deficiency anemia OR Iron deficiency anaemia OR Iron deficient OR Iron deficit OR Iron insufficient OR Iron insufficiency OR Total iron binding capacity OR Ferritin OR serum Iron OR Iron therapy OR Iron supplementation | N = 26,855 |
| **2** | HbA1c OR glycated hemoglobin A1c OR glycated haemoglobin A1c OR glycosylated Haemoglobin OR glycosylated hemoglobin OR hemoglobin A1c OR Haemoglobin A1c OR glycohemoglobin OR diabetes OR prediabetes | N = 1,423,164 |
| **3** | 1 AND 2 | |
| **#** | **Search strategy in Cochrane database** | **Results** |
| **1** | Iron deficiency anemia OR Iron deficiency anaemia OR Iron deficient OR Iron deficit OR Iron insufficient OR Iron insufficiency OR Total iron binding capacity OR Ferritin OR serum Iron OR Iron therapy OR Iron supplementation | N = 274 |
| **2** | HbA1c OR glycated hemoglobin A1c OR glycated haemoglobin A1c OR glycosylated Haemoglobin OR glycosylated hemoglobin OR hemoglobin A1c OR Haemoglobin A1c OR glycohemoglobin OR diabetes OR prediabetes | N = 2625 |
| **3** | 1 AND 2 | N = 264 |

| Author | Information Bias | Selection Bias | Confounding | Statistical Quality |
|---|---|---|---|---|
| Altuntaş, et al. (2021) | + | + | + | + |
| Pilla, et al. (2020) | + | +/- | +/- | + |
| Varshney, et al. (2018) | + | + | + | + |
| Madhu, et al. (2016) | + | +/- | +/- | + |
| Coban, et al. (2004) | + | + | +/- | + |
| Gram-Hansen, et al. (1990) | + | +/- | - | + |
| Aydın, et al. (2022) | +/- | - | + | + |
| El-agouza, et al. (2002) | +/- | - | +/- | - |
| Mustafa, et al. (2021) | +/- | +/- | NA | - |
| Nasli-Esfahani, et al. (2017) | + | + | NA | + |

**Supplementary Table S5:** A detailed evaluation of the risk of bias of all the included studies.

Abbreviations: (+) Low risk of bias, (+/-) intermediate risk of bias, (-) high risk of bias, (NA) not applicable.

**Supplementary Table S6.** Baseline characteristics of the IDA and DM parameters.

| Author | IDA | | | | | | | | | | | | | | | | | | | | | | DM and HbA1c | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hemoglobin | | Ferritin | | Transferrin | | Iron level | | TIBC | | MCV | | MCH | | MCHC | | RBC count | | Hematocrit | | RDW | | DM in cases | DM in control | Messured HbA1c | HbA1c level | | FBG | | Postprandial blood sugar | |
| | Cases | Control | Cases | Control | Cases | Control | Cases | Control | Cases | Control | Cases | Control | Cases | Control | Cases | Control | Cases | Control | Cases | Control | Cases | Control | | | | Cases | Control | Cases | Control | Cases | Control |
| Altuntaş, et al. (2021) | 11.545 ± 1.6* | 13.1 ± 1.3 | 6.6 ± 5.03* | 40 ± 52 | - | - | - | - | - | - | 79 ± 10* | 87 ± 4 | - | - | - | - | - | - | 36.8 ± 4.64* | 39 ± 3.5 | - | - | 0 | 0 | HPLC | 5.4 ± 0.5* | 5.9 ± 0.5 | - | - | - | - |
| Pilla, et al. (2020) | 7.8 ± 0.46* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | 0 | 0 | - | 5.8 ± 0.24* | 5.2 ± 0.2 | - | - | - | - |
| Varshney, et al. (2018) | 9.73 ± 0.83 | 14.00 ± 0.72 | 7.50 ± 2.38 | 131.91 ± 17.88 | 10 ± 2.1 | 40.63 ± 4.34 | 34.24 ± 4.98 | 123.38 ± 20.13 | 552.5 ± 43.12 | 304.12 ± 45.78 | 70.9 ± 9.27 | 94.2 ± 6.61 | 22.2 ± 3.73 | 31.74 ± 3.22 | 30.4 ± 3.38 | 34.28 ± 2.44 | 3.85 ± 0.48 | 4.98 ± 0.37 | - | - | 9.1 ± 1.62 | = 13.4 ± 1.9 | 0 | 0 | HPLC | 5.49 ± 0.8 | 4.68 ± 0.28 | 86.22 ± 10.72 | 84.52 ± 8.74 | 136.28 ± 16.24 | 130.68 ± 10.10 |
| Madhu, et al. (2016) | 7.4 ± 1.2* | 13.4 ± 1.3 | 17.3 ± 3* | 315.9 ± 63.8 | 8.1 ± 2.2* | 28.7 ± 8.2 | 5.4 ± 1.4* | 17.3 ± 4.5 | 73.3 ± 1.7* | 57.9 ± 6.8 | 66.7 ± 7.3* | 89.7 ± 9.7 | 20.1 ± 3.9* | 30.1 ± 2.9 | 29.3 ± 2.1* | 32.6 ± 1.3 | 3.7 ± 0.7* | 4.6 ± 0.6 | 24.9 ± 3.5* | 41.3 ± 4.7 | - | - | 6 diabetic 20 pre diabetic | 0 | HPLC | 5.5 ± 0.7 | 4.9 ± 0.5 | - | - | - | - |
| Coban, et al. (2004) | 10.8 ± 1.2* | 13.6 ± 0.9 | 3.68 ± 1.78* | 22.7 ± 6.3 | - | - | -- | - | - | - | 72.2 ± 4.9* | 84.4 ± 4.8 | 22.8 ± 2.2* | 32.9 ± 1.9 | - | - | - | - | 33.8 ± 3* | 39.9 ± 2.4 | - | - | 0 | 0 | TINIA | 7.4 ± 0.8* | 5.2 ± 0.2 | 91.4 ± 9.8 | 89.7 ± 10.3 | 102.6 ± 5.8 | 101.7 ± 6.1 |
| Gram-Hansen, et al. (1990) | 5.1 ± 0.875* | - | - | - | - | - | - | - | - | - | 66 ± 6.25* | - | - | - | - | - | - | - | - | - | - | - | 0 | 0 | FPLC | 4.9 ± 0.475* | 5 ± 0.325 | - | - | - | - |
| Aydın, et al. (2022) | 10.4 ± 0.4* | | 4 ± 0.75* | | - | | 20 ± 13.3* | | 407.78 ± 52.41* | | 74± 1.55* | | - | | - | | 4.4 ± 0.125* | | 31.95 ± 1.1125* | | - | | 146 | | HPLC | 7.09 ± 0.51* | | 118 ± 6* | | - | |
| El-agouza, et al. (2002) | 10.96 ± 1.12* | | 3.45 ± 1.73* | | - | | - | | - | | 72.38 ± 5.15* | | 23.35 ± 2.23* | | 32.17 ± 0.87* | | 4.71 ± 0.35* | | 34.02 ± 2.98* | | 17.74 ± 2.13* | | 0 | | EMC | 6.15 ± 0.62* | | - | | - | |
| Mustafa, et al. (2021) | - | | - | | - | | - | | - | | - | | - | | - | | - | | - | | - | | 182 | | - | 6.99 ± 0.32 | | - | | - | |
| Nasli-Esfahani, et al. (2017) | 11.52 ± 0.86 | 11.3 ± 0.73 | 32.33 ± 39.23 | 39.37 ± 42.46 | - | - | 45.46 ± 29.77 | 47.35 ± 36.74 | 227.59 ± 116.27 | 238.37 ± 108.01 | 79.94 ± 6.04 | 82.08 ± 6.7 | 26.98 ± 3.27 | 27.65 ± 3.02 | 31.84 ± 1.9 | 31.81 ± 1.73 | 4.7 ± 0.55* | 4.32 ± 0.42 | - | - | - | - | 45 | 45 | HPLC | 7.59 ± 1.16 | 7.4 ± 1.01 | - | - | - | - |

* P value <0.05 (statistically significant). HPLC: High Performance Liquid Chromatography, TINIA: Turbidimetric Inhibition Immunoassay, FPLC: Fast Protein Liquid Chromatography, EMC: Exchange Microcolumn Chromatography

**Supplementary Table S7.** The difference of IDA parameters and HbA1c level after using the iron replacement therapy.

| Author | Number of diabetic patients in cases | Number of diabetic patients in control | Number of cases | Parameters After Iron Replacement Therapy | | | | | | | | | | | | | | | IRT/ HbA1c end correlation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Oral ferrous sulfate mg/day | Duration (by weeks) | HbA1c | Fasting blood glucose | Postprandial blood sugar | Hemoglobin | Ferritin | Transferratin | Iron level | TIBC | MCV | MCH | MCHC | RBC count | Hematocrit | RDW | |
| Altuntaş, et al. (2021) | 0 | 0 | 131 | 100 | 12 | 5.5 ± 0.3 | 90 ± 8.6* | - | 12.2 ± 1.6* | 15.1 ± 5* | - | - | - | 82 ± 7.4* | - | - | - | 38 ± 4.9* | - | Increase |
| Pilla, et al. (2020) | 0 | 0 | 100 | Not mentioned | 12 | 4.85 ± 0.17* | - | - | 12.9 ± 0.205* | - | - | - | - | - | - | - | - | - | - | Decrease |
| Varshney, et al. (2018) | 0 | 0 | 100 | Not mentioned | 8 | 4.88 ± 0.43* | 84.3 ± 8.69 | 134.21 ± 14.71 | 12.98 ± 4.01* | 108 ± 12.24* | 34.24 ± 4.98* | 111.5 ± 12.86* | 336.28 ± 56.42* | 88.86 ± 6.82* | 30.2 ± 4.16* | 33.2 ± 3.76* | 4.56 ± 0.36* | - | 11.4 ± 1.31 | Decrease |
| Madhu, et al. (2016) | 6 diabetic 20 prediabetic | 0 | 62 | 100 | 12 | 5.0 ± 0.6* | - | - | 8.9 ± 1.2* | 36.6 ± 10.6* | 14.6 ± 2.6* | 10.3 ± 2.7* | 64.4 ± 2.9* | 74.3 ± 8.7* | 22.1 ± 3.3* | 29.7 ± 1.9 | 4.1 ± 0.6* | 29.9 ± 3.1* | - | Decrease |
| Coban, et al. (2004) | 0 | 0 | 50 | 100 | 12 | 6.2 ± 0.6* | - | - | 12.7 ± 0.96* | 15.7 ± 1.88* | - | - | - | 82.2 ± 5.1* | 31.6 ± 2.1* | - | - | 39.9 ± 2.4* | - | Decrease |
| Gram-Hansen, et al. (1990) | 0 | 0 | 10 | Not mentioned | 3 | 4.3 ± 0.5* | - | - | 7.2 ± 2.1* | - | - | - | - | 79 ± 5.5* | - | - | - | - | - | Decrease |
| Aydın, et al. (2022) | 146 | | 146 | 270 | 12 | 6.69 ± 0.53* | 116± 4.75 | - | 12.6 ± 0.275* | 15 ± 3.05* | - | 57.5 ± 8.5* | 324.21 ± 67.86* | 82 ± 1.5* | - | - | 4.8 ± 0.5* | 40.25 ± 0.55* | – | Decrease |
| El-agouza, et al. (2002) | 0 | | 51 | 325 | 20 | 5.25 ± 0.45* | - | - | 13.20 ± 0.65* | 28.77 ± 14.13* | - | - | - | 81.30 ± 5.22* | 25.52 ± 1.70* | 31.42 ± 1.48* | 5.19 ± 0.28* | 42.08 ± 2.47* | 19.58 ± 2.98* | Decrease |
| Mustafa, et al. (2021) | 182 | | 182 | 200 | 12 | 6.29 ± 0.32* | - | - | - | - | - | - | - | - | - | - | - | - | - | Decrease |
| Nasli-Esfahani, et al. (2017) | 45 | 45 | 45 | 200 | 12 | 6.8 ± 0.85 | 131.76 ± 41.75 | - | 13.71 ± 1.37* | 64.1 ± 56.82* | - | 73.26 ± 34.27* | - | 84.62 ± 4.37 | 28.66 ± 2.66* | 33.38 ± 1.41 | 4.86 ± 0.41* | - | - | Decrease |

* P value <0.05 (statistically significant). HPLC: High Performance Liquid Chromatography, TINIA: Turbidimetric Inhibition Immunoassay, FPLC: Fast Protein Liquid Chromatography, EMC: Exchange Microcolumn Chromatography