

# Zinc supplementation on Prediabetes

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2023-05-01 16:04:14.276418

## Preparation

### Load package

```
library(tidyverse)
library(meta)
library(google sheets4)
```

### Import Data

#### Import data & save locally

```
data <- read_csv("data.csv")
#attach(data)
```

#### Import data from local storage

## Analysis

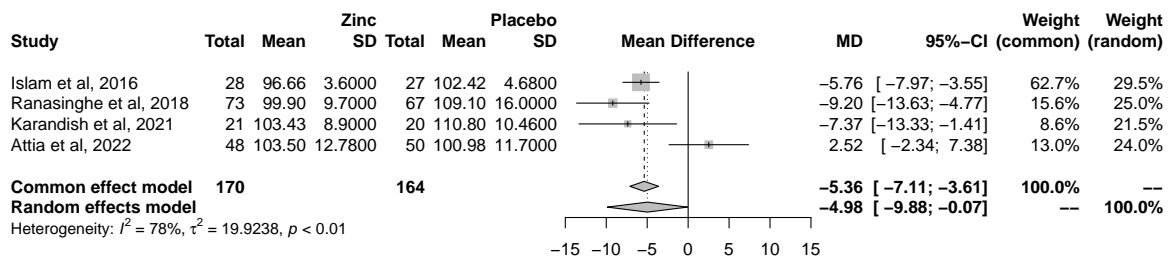
```
fpg <- metacont(n.e = total_zinc,
               mean.e = mean_fpg_zinc,
               sd.e = sd_fpg_zinc,
               n.c = total_placebo,
               mean.c = mean_fpg_placebo,
               sd.c = sd_fpg_placebo,
               data = data,
               studlab = paste0(author, ", ", year))
print(summary(fpg), digits = 2)
```

### Metanalysis Fasting Plasma Glucose

```
##              MD              95%-CI %W(common) %W(random)
## Islam et al, 2016      -5.76 [-7.97; -3.55]      62.7      29.5
## Ranasinghe et al, 2018 -9.20 [-13.63; -4.77]     15.6      25.0
## Karandish et al, 2021  -7.37 [-13.33; -1.41]      8.6      21.5
## Attia et al, 2022      2.52 [-2.34; 7.38]      13.0      24.0
##
## Number of studies combined: k = 4
## Number of observations: o = 334
##
##              MD              95%-CI      z  p-value
## Common effect model -5.36 [-7.11; -3.61] -6.00 < 0.0001
```

```
## Random effects model -4.98 [-9.88; -0.07] -1.99 0.0466
##
## Quantifying heterogeneity:
## tau^2 = 19.9238 [2.6198; >199.2383]; tau = 4.4636 [1.6186; >14.1152]
## I^2 = 77.9% [40.2%; 91.8%]; H = 2.13 [1.29; 3.50]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 13.56   3 0.0036
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau

meta::forest(fpg,
  digits = 2,
  #sortvar = year,
  label.e = "Zinc",
  label.c = "Placebo",
  xlim = c(-15,15))
```



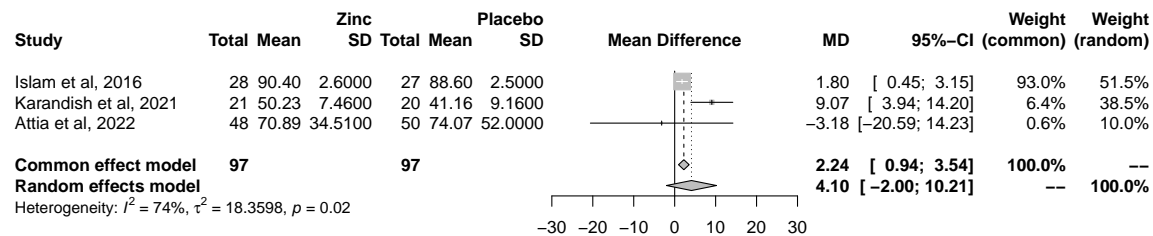
```
insens <- metacont(n.e = total_zinc,
  mean.e = mean_InSens_zinc,
  sd.e = sd_InSens_zinc,
  n.c = total_placebo,
  mean.c = mean_InSens_placebo,
  sd.c = sd_InSens_placebo,
  data = data[-2,],
  studlab = paste0(author, ", ", year))
print(summary(insens), digits = 2)
```

## Metanalysis Insulin Sensitivity Index

	MD	95%-CI	%W(common)	%W(random)
## Islam et al, 2016	1.80	[ 0.45; 3.15]	93.0	51.5
## Karandish et al, 2021	9.07	[ 3.94; 14.20]	6.4	38.5
## Attia et al, 2022	-3.18	[-20.59; 14.23]	0.6	10.0
##				

```
## Number of studies combined: k = 3
## Number of observations: o = 194
##
##           MD           95%-CI      z p-value
## Common effect model  2.24 [ 0.94;  3.54] 3.38 0.0007
## Random effects model 4.10 [-2.00; 10.21] 1.32 0.1879
##
## Quantifying heterogeneity:
## tau^2 = 18.3598 [0.1213; >183.5982]; tau = 4.2848 [0.3482; >13.5498]
## I^2 = 73.7% [11.9%; 92.1%]; H = 1.95 [1.07; 3.56]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 7.60    2 0.0224
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau
```

```
meta::forest(insens,
  digits = 2,
  #sortvar = year,
  label.e = "Zinc",
  label.c = "Placebo",
  xlim = c(-30,30)
)
```

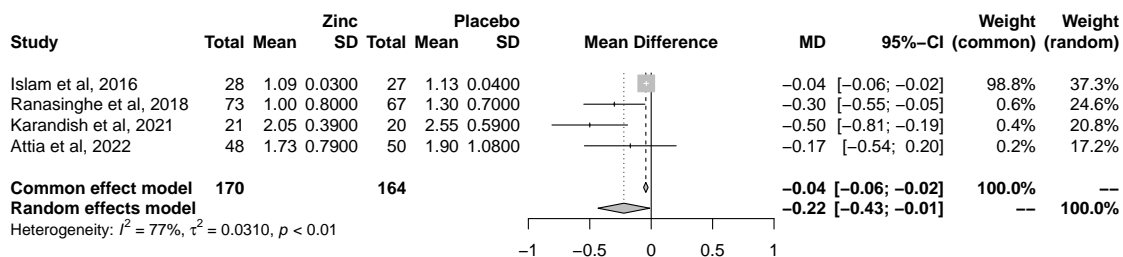


```
inres <- metacont(n.e = total_zinc,
  mean.e = mean_InRes_zinc,
  sd.e = sd_InRes_zinc,
  n.c = total_placebo,
  mean.c = mean_InRes_placebo,
  sd.c = sd_InRes_placebo,
  data = data,
  studlab = paste0(author, ", ", year))
print(summary(inres), digits = 2)
```

Metanalysis Insulin Resistance Index

```
##                               MD          95%-CI %W(common) %W(random)
## Islam et al, 2016            -0.04 [-0.06; -0.02]      98.8      37.3
## Ranasinghe et al, 2018      -0.30 [-0.55; -0.05]        0.6      24.6
## Karandish et al, 2021       -0.50 [-0.81; -0.19]        0.4      20.8
## Attia et al, 2022           -0.17 [-0.54; 0.20]         0.2      17.2
##
## Number of studies combined: k = 4
## Number of observations: o = 334
##
##                               MD          95%-CI      z  p-value
## Common effect model          -0.04 [-0.06; -0.02] -4.57 < 0.0001
## Random effects model         -0.22 [-0.43; -0.01] -2.07  0.0389
##
## Quantifying heterogeneity:
## tau^2 = 0.0310 [0.0027; 0.5198]; tau = 0.1759 [0.0518; 0.7210]
## I^2 = 77.1% [37.7%; 91.6%]; H = 2.09 [1.27; 3.45]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 13.12   3  0.0044
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau
```

```
meta::forest(inres,
  digits = 2,
  #sortvar = year,
  label.e = "Zinc",
  label.c = "Placebo",
  xlim = c(-1,1)
)
```



```
beta <- metacont(n.e = total_zinc,
  mean.e = mean_BetaFunc_zinc,
  sd.e = sd_BetaFunc_zinc,
  n.c = total_placebo,
```

```

mean.c = mean_BetaFunc_placebo,
sd.c = sd_BetaFunc_placebo,
data = data,
studlab = paste0(author," ",year))
print(summary(beta), digits = 2)

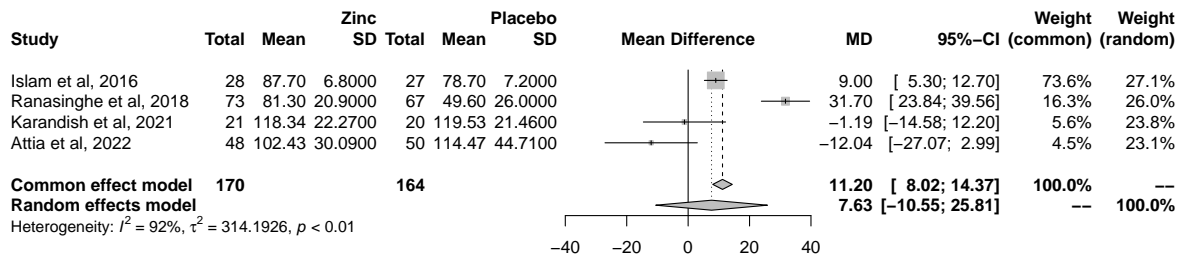
```

### Metanalysis Beta Cell Function

```

##              MD          95%-CI %W(common) %W(random)
## Islam et al, 2016      9.00 [ 5.30; 12.70]      73.6      27.1
## Ranasinghe et al, 2018 31.70 [ 23.84; 39.56]      16.3      26.0
## Karandish et al, 2021  -1.19 [-14.58; 12.20]       5.6      23.8
## Attia et al, 2022    -12.04 [-27.07;  2.99]       4.5      23.1
##
## Number of studies combined: k = 4
## Number of observations: o = 334
##
##              MD          95%-CI    z  p-value
## Common effect model  11.20 [ 8.02; 14.37] 6.91 < 0.0001
## Random effects model  7.63 [-10.55; 25.81] 0.82  0.4106
##
## Quantifying heterogeneity:
## tau^2 = 314.1926 [80.2698; >3141.9263]; tau = 17.7255 [8.9593; >56.0529]
## I^2 = 92.5% [84.0%; 96.5%]; H = 3.65 [2.50; 5.33]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 39.97    3 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau
meta::forest(beta,
  digits = 2,
  #sortvar = year,
  label.e = "Zinc",
  label.c = "Placebo",
  xlim = c(-40,40)
)

```



```
tg <- metacont(n.e = total_zinc,
               mean.e = mean_TG_zinc,
               sd.e = sd_TG_zinc,
               n.c = total_placebo,
               mean.c = mean_TG_placebo,
               sd.c = sd_TG_placebo,
               data = data[-3,],
               studlab = paste0(author, ", ", year))
print(summary(tg), digits = 2)
```

## Metanalysis Triglyceride

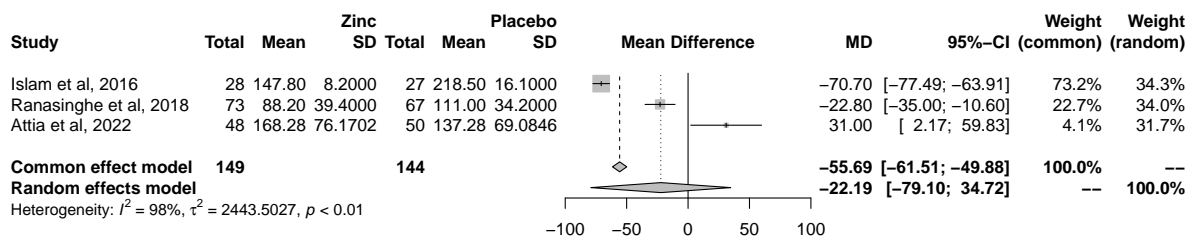
```
##                               MD          95%-CI %W(common) %W(random)
## Islam et al, 2016            -70.70 [-77.49; -63.91]      73.2      34.3
## Ranasinghe et al, 2018      -22.80 [-35.00; -10.60]      22.7      34.0
## Attia et al, 2022           31.00 [  2.17;  59.83]       4.1      31.7
##
## Number of studies combined: k = 3
## Number of observations: o = 293
##
##                               MD          95%-CI      z p-value
## Common effect model      -55.69 [-61.51; -49.88] -18.79 < 0.0001
## Random effects model     -22.19 [-79.10;  34.72]  -0.76  0.4447
##
## Quantifying heterogeneity:
## tau^2 = 2443.5027 [588.7140; >24435.0269]; tau = 49.4318 [24.2634; >156.3171]
## I^2 = 97.5% [95.3%; 98.7%]; H = 6.38 [4.59; 8.87]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 81.45    2 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau

meta::forest(tg,
              digits = 2,
              #sortvar = year,
```

```

label.e = "Zinc",
label.c = "Placebo",
xlim = c(-100,100)
)

```



```

hdl <- metacont(n.e = total_zinc,
               mean.e = mean_HDL_zinc,
               sd.e = sd_HDL_zinc,
               n.c = total_placebo,
               mean.c = mean_HDL_placebo,
               sd.c = sd_HDL_placebo,
               data = data[-3,],
               studlab = paste0(author, ", ", year))
print(summary(hdl), digits = 2)

```

## Metanalysis HDL

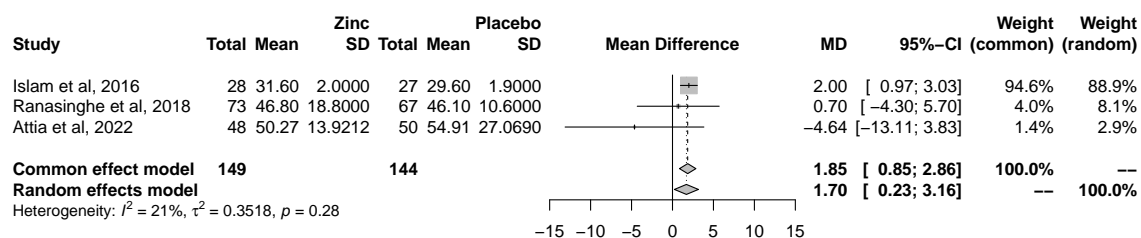
```

##              MD          95%-CI %W(common) %W(random)
## Islam et al, 2016      2.00 [ 0.97; 3.03]      94.6      88.9
## Ranasinghe et al, 2018 0.70 [ -4.30; 5.70]       4.0       8.1
## Attia et al, 2022     -4.64 [-13.11; 3.83]       1.4       2.9
##
## Number of studies combined: k = 3
## Number of observations: o = 293
##
##              MD          95%-CI      z p-value
## Common effect model  1.85 [0.85; 2.86] 3.63 0.0003
## Random effects model 1.70 [0.23; 3.16] 2.27 0.0230
##
## Quantifying heterogeneity:
## tau^2 = 0.3518 [0.0000; >100.0000]; tau = 0.5932 [0.0000; >10.0000]
## I^2 = 21.2% [0.0%; 91.8%]; H = 1.13 [1.00; 3.49]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 2.54   2 0.2811
##
## Details on meta-analytical method:

```

```
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau
```

```
meta::forest(hdl,
  digits = 2,
  #sortvar = year,
  label.e = "Zinc",
  label.c = "Placebo",
  xlim = c(-15,15)
)
```



```
ldl <- metacont(n.e = total_zinc,
  mean.e = mean_LDL_zinc,
  sd.e = sd_LDL_zinc,
  n.c = total_placebo,
  mean.c = mean_LDL_placebo,
  sd.c = sd_LDL_placebo,
  data = data[-3,],
  studlab = paste0(author, ", ", year))
print(summary(ldl), digits = 2)
```

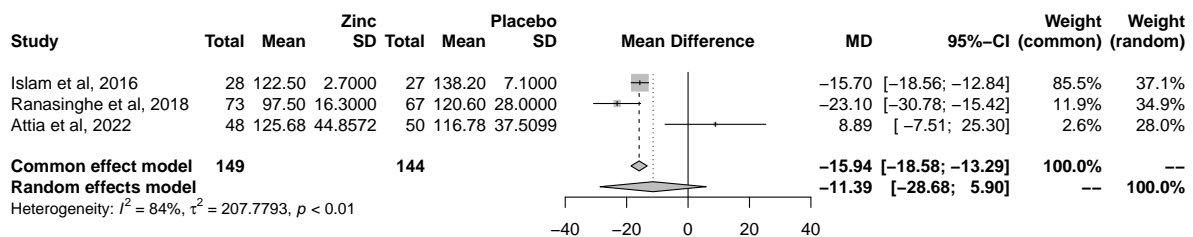
## Metanalysis LDL

```
## MD 95%-CI %W(common) %W(random)
## Islam et al, 2016 -15.70 [-18.56; -12.84] 85.5 37.1
## Ranasinghe et al, 2018 -23.10 [-30.78; -15.42] 11.9 34.9
## Attia et al, 2022 8.89 [ -7.51; 25.30] 2.6 28.0
##
## Number of studies combined: k = 3
## Number of observations: o = 293
##
## MD 95%-CI z p-value
## Common effect model -15.94 [-18.58; -13.29] -11.82 < 0.0001
## Random effects model -11.39 [-28.68; 5.90] -1.29 0.1967
##
## Quantifying heterogeneity:
## tau^2 = 207.7793 [27.5696; >2077.7935]; tau = 14.4146 [5.2507; >45.5828]
## I^2 = 83.6% [50.4%; 94.6%]; H = 2.47 [1.42; 4.29]
```



```
##
## Test of heterogeneity:
##      Q d.f. p-value
## 12.17    2  0.0023
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-Profile method for confidence interval of tau^2 and tau
```

```
meta::forest(ldl,
  digits = 2,
  #sortvar = year,
  label.e = "Zinc",
  label.c = "Placebo",
  xlim = c(-40,40)
)
```



cp zinc\_prediabetes.html index.html