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Original/*Obesidad*

Association between serum Fe levels and obesity: a meta-analysis

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Abstract

The purpose of this study is to clarify the association between serum Fe levels and Obesity using a meta-analysis approach. We searched eligible papers on the relevance published between 2006 and 2014 from the PubMed and the Chinese National Knowledge Infrastructure. Review Manage software was used to collect and analysis the date cited in the papers.6 eligible articles with 934 subjects from 40 case-control studies were identified. Overall,polled analysis indicated that subjects with obesity had lower Fe levels than healthy controls [standardized mean difference (SMD) = -0.738,95%confidence interval (CI) = (-1.228,-0.247)]. Thus, dietary supplement of Fe is recommended to prevent obesity.

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Key words: *Fe*. *Serum*. *Obesity. Meta-analysis*.

LA ASOCIACIÓN ENTRE LOS NIVELES SÉRICOS DE HIERRO Y LA OBESIDAD: UN METAANÁLISIS

Resumen

El objetivo de este estudio es determinar la asociación entre los niveles séricos de hierro y la obesidad mediante un metaanálisis. Hemos buscado los documentos sobre la pertinencia, publicados entre 2006 y 2014 por PubMed y China National Knowledge Infrastructure. El examen se utiliza para recoger y gestionar el software de análisis de la fecha citada en los documentos. Se eligieron seis artículos en los que se identificaron 934 sujetos de entre 40 estudios de casos y controles. En general, los encuestados indicaron que los sujetos con obesidad tenían menores niveles de hierro que los controles sanos [diferencia de promedios estandarizados (DPE) = - 0.738,95% intervalo de confianza (IC) = (-1.228,-0.247)]. Por lo tanto, se recomienda un suplemento dietético de hierro para prevenir la obesidad.

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Palabras clave: *Hierro*. *Suero*. *Obesidad*. *Metaanálisis*.

Introduction

Obesity is a state that excess lipids accumulated in various body fat issues owing to a chronic imbalance between energy absorption and energy consumption, which is associated with diseases including hypertension, cardiovascular diseases, endocrine diseases and so on[1].

Serum Fe ,as one of trace elements in the tissue, with the bio-availability has been estimated to be in the range of 14-18% for mixed diets[2], has a vital effect on the function of the immune response[3], which influenced the biochemical metabolism of adipose cell indirectly[4]. Some studies proved that obesity-associated inflammation is connected with Iron deficiency[5]. Some studies have reported that the obese patients were short of serum Fe on account of chronic depleting[6], some studies suggested that lower Fe levels Iron deficiency due to obesity[7, 8].

Meta-analysis is a vital tool for revealing the trends that may not be obvious.Therefore,we show a meta-analysis of the studies to present a more clear and evidence-based conclusion on the association between serum Fe levels and Obesity.

Materials and Methods

We researched the medical literature published in the PubMed and the Chinese National Knowledge Infrastructure.papers were conducted using the search terms"obesity","serum Fe"and "China"in the Chinese language for the Chinese database and in English for the PubMed database with free text words. Eligible texts were retrieved from the above data.

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**Lijuan Yang,Yi Chen and Mi Lu are equal contributor to the work.*

Selection Criteria

Eligible studies should meet the following criteria: (1) human study, (2) case-control study or cohort study or randomized clinic trial, (3) subjects without drugs intake which influence the levels of Fe, (4) studies providing data of Fe levels for both subjects with Obesity and non-obesity controls.

Exclusion criteria included: (1) animal study, (2) review, (3) studies not providing Fe levels for either subjects with obesity or non-obesity controls.

Data extraction

We extracted data using a standard form.The following information was extracted from each included study:first author's family name,year of publication,number of patients,data on levels of Fe.

Statistical analysis

The extracted data were used to performed meta-analysis to obtain the standardized mean difference (SMD) and 95% confidence intervals (CI). The SMDs were calculated using either fixed-effects models or,in the presence of heterogeneity,random-effects models,-therefor,we selected the later .Heterogeneity in studies was tested through the I-square tests,if the I*2 value was greater than 50% and the p value was less than 0.05,the meta-analysis was considered as homogeneous.

Publication bias was measured using visualization of funnel plots.All statistical analyses were conducted with Review Manage.

Results

Basic information and assessment of quality

A total of 163 articles were from the online PubMed (147) and Chinese National Knowledge Infrastructure (16). In total, 93 papers were excluded after preliminary screening. Of these, 27 were review articles. A further 43 papers were investigations of the relationship between obesity and Fe levels. Another 37 papers lacked the necessary data or incomplete data, so were excluded. Assessment of quality was made by meta-analysis of observational studies. Finally, 6 papers were included[9-14] (Fig. 1).

Meta-analysis of association between Fe levels and obesity

In the figure 2, heterogeneity testing was carried out for the association between Fe levels and obesity,with a result of I*2=89.8%(p<0.00001),-suggesting that the research results for the papers were heterogeneous.A random-effects model was introduced to merge the data for meta-analysis.As shown by the forest plots ,subjects with obesity had lower Fe levels than non-obesity controls in total. (SMD=-0.738,95% confidence interval [CI]=[-1.228,-0.247]).

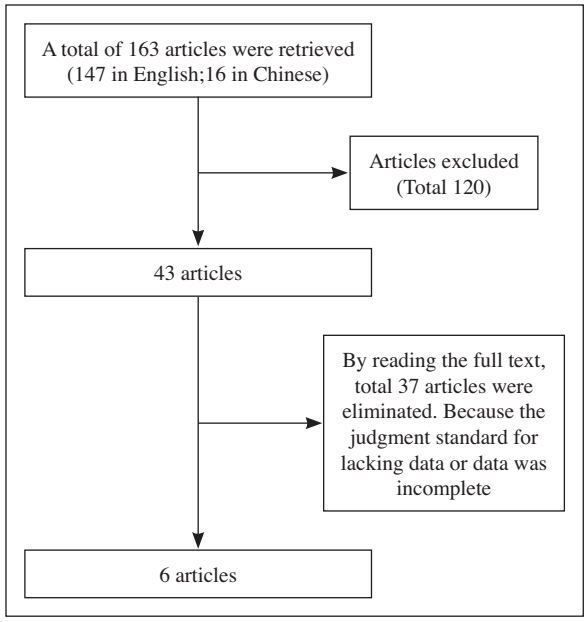

Fig. 1.—Flow chart for literature screening.

Publication bias

Publication bias refers to the tendency of a study to produce statistically significant results leading editors to accept them.This is a potential threat in meta-analysis,we could use it to test the possible bias in our literature selection (Figs. 3-4).

Discussion

In the present meta-analysis, the relationship between Fe levels and obesity was examined. it clearly demonstrated that the obese patients had lower levels of Fe than non-obese controls. It supported that there was some difference in levels of Fe between the obese patients and controls. Fe was a significant component of metabolic substances such as hemoglobin and myoglobin (16). Fe is postulated to influence glucose tolerance via its role as a cofactor for serum ferrites[15], which contributes to increase the concentrations of ferrites which is good to decline the consumption of fatty body[16].

However, our results showed strong heterogeneity among the studies. Heterogeneity indicates differences

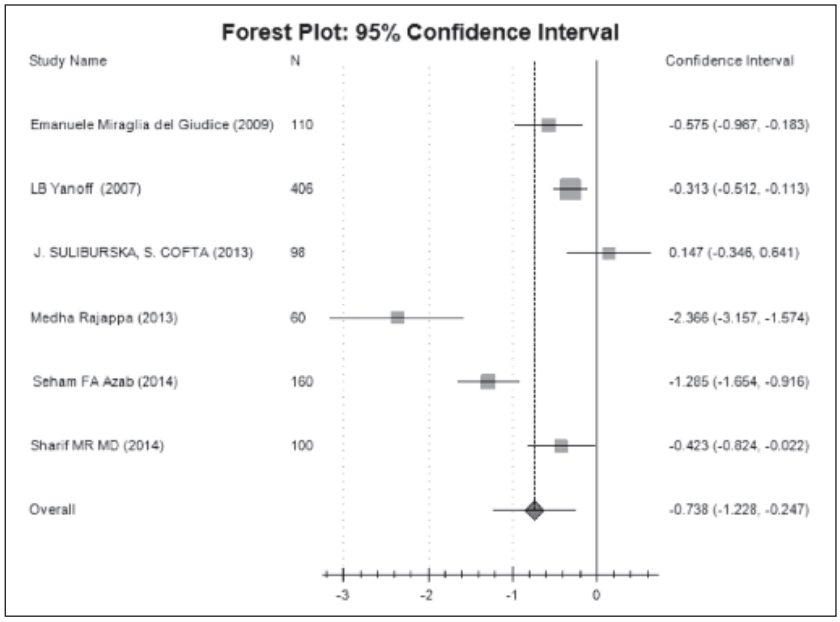

Fig. 2.—Forest plot for the relationship between serum Fe levels and obesity and confidence intervals for obesity in each study and overall in the meta-analysis.

in results across the studies. There are two sources of heterogeneity: one is within-study variability which means a difference within a study of estimating the same effect size and its always exits in meta-analysis is between-study variability which means differences among Studies in estimating effect size among different population. In the present study, the between-study variability was the main source of heterogeneity.

To the best of our knowledge, this is a meta-analysis to estimate the association between Fe levels and obesity. We ensure that minimize the bias by methods of study steps. We search PubMed and Chinese National Knowledge Infrastructure, besides; we inspected all reference lists from relevant studies. The limitations of our study should be considered, owing to only 6 articles, we failed to perform the subgroup by geographical location which was the possible causes of heterogeneity.

Limitation

The following limitation cannot be ignored: for example, we selected the articles based on free, relevant samples are small size. Therefore, more and further studies are needed to explore.

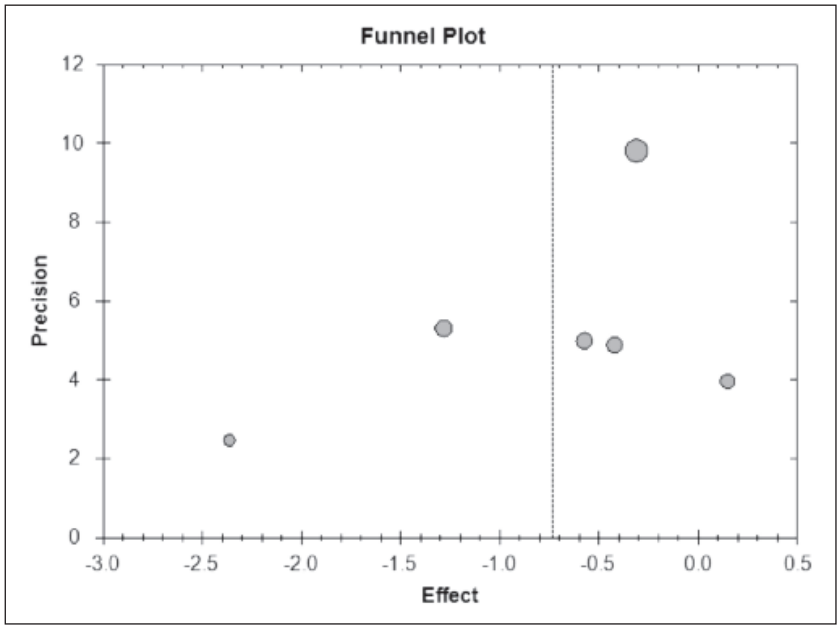

Fig. 3.—Funnel plot for overall in the meta-analysis.

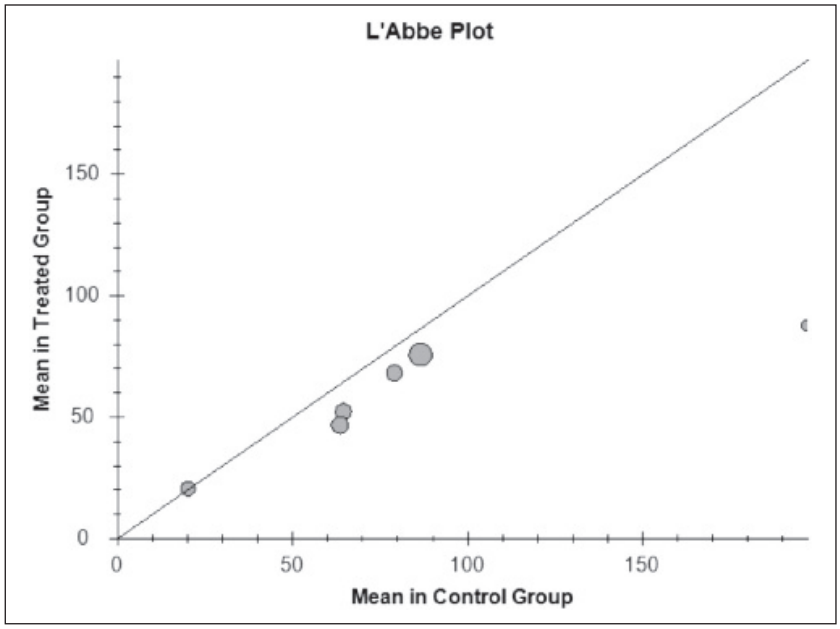

Fig. 4.—L'Abbe Plot for overall in the meta-analysis.

Conclusion

Our results suggested that the lower serum Fe levels maybe risk factor of obesity.

Acknowledgement

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Conflict of interest

None.

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