# Correlation of Microelements and Bone Pathologies:

# A meta-analysis

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23 **Abstract**

24 Trace elements are mineral elements that are found in the body in very small quantities to achieve normal physiological processes. Copper, zinc and iron ensure the correct synthesis of macromolecules that form the bone structure. (Brancatella A et al 2020) Without those microelements, the formation of new bone by osteoblasts and the degradation (resorption) of old bone by the osteoclasts, will be modified and the osteoporosis can appear. It have to be a balance

between bone formation and bone resorption for the health of the bone. (Pierre D. Delmas 1993)

25 *Keywords:* osteoporosis, trace elements, diagnosis, bone density, bone metabolism

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28 **Introduction**

Osteoporosis is a pathology involving a number of diseases in the field of endocrinology, but also genetic and nutritional causes. The intake of microelements is essential as they are enzymatic cofactors for the specific enzymes of bone metabolism. (Saltman, PD, & Strause, LG 1993) Zinc, copper, fluorine, manganese, magnesium, iron and boron are part of bone microarchitecture, but if they are deficient in childhood and adolescence, they will cause much more loss of bone tissue at menopause or old age fact that leads to osteoporosis. (Zofková, I., et al 2013) Although the optimal concentration of calcium and vitamin D plays an important role in the prevention of osteoporosis, it is a major public health problem, affecting millions of people because there is a large inadequate supply of important nutrients to the bone, and this increase the risk for bone loss. The process of bone anabolism requires an adequate and constant supply of: protein, magnesium, phosphorus, potassium and fluoride. Recently microelements have been found to play an important role in bone-related metabolic processes, including manganese, copper, boron, iron, zinc. (Palacios, C. 2006)

Gabr S. et al 2016, observed that exercise and active lifestyle are essential for prevention of osteoporosis. The importance of copper in the formation of lysyloxidase and collagen-elastin bonds in the bone matrix has also been observed. Manganese is involved in the formation of chondroitin sulfate. Zinc is a microelement that is part of the structure of bone alkaline phosphatase and is a cofactor for collagenase. It converts procollagen into collagen, and the formation of hydroxyapatite is achieved by releasing phosphorus from the structure of bone alkaline phosphatase. (Gabr, S et al.2016).

Zinc is an essential microelement in bone metabolism that prevents bone resorption and promotes bone reformation, through various mechanisms such as regulating the secretion of calcitonin from the thyroid gland, promoting osteoblastic activity and alkaline phosphatase, having an anabolic role in bone tissue. The data showed that zinc is deficient in the elderly population, thus preventing bone mineralization and the formation of hydroxyapatite and collagen. This leads to osteoporosis with loss of bone structure integrity and increasing the risk of non-traumatic fracture. In osteoporosis, significant concentrations of zinc in the urine are observed, especially in menopausal women. (Colpan L., et al. 2005)

29 **Methods**

30 **Data sources and searches**

31 **Study selection**

# 32 Quality assessment and coding

33 **Data analysis**

34 We used R (Version 4.1.2; R Core Team, 2021) and the R-packages *papaja* (Version

35 0.1.0.9997; Aust & Barth, 2020), and *tinylabels* (Version 0.2.2; Barth, 2021) for all our

36 analyses.

37 **Results**

38 **Literature search results**

39 **Quality assessments results**

40 **Data analysis**

41 **Discussion**

42 **References**

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