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RESEARCH ARTICLE

Study the Effect of Oxides Emitted from the Smoke of Bakeries on the Density of Bone

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Abstract

Objectives: Osteoporosis is bone disorders that excess a person's dangers of fracture due to low bone mineral density, impaired bone microarchitecture/mineralization, & diminution bone strength. This asymptomatic condition often remains undiagnosed until it manifests as a low-trauma fracture of the hip, spine, proximal humerus, pelvis, & wrist, which frequently leads to hospitalization. Methods: The present study of 41 bakeries worker's various places in Baghdad. Serum levels of vitamin D_3, PTH hormone, Calcium, magnesium and phosphorus were measured and analyzed of the bakeries smoke resulting from the combustion of kerosene substance by a device (aeroqual).Results: a significant increase in serum level of parathyroid hormone in bakery workers' group when the compared to a healthy control group (P=0.003). a slightly decrease of vitamin D_3 in bakery worker groups as compared with a healthy control group, but it was not significant differences (p=0.068). Calcium, magnesium & phosphorus were determined in sera of healthy control group & bakery workers' group as It is clear that, there is no significant variation in the calcium & magnesium concentrations between control group and bakery workers' group (p=0.612), (p=0.748), respectively, while a significant decrease in the phosphorus concentrations, in bakery workers' group as compared to a healthy control group. This result showed that there was an appositive correlation between magnesium and years of work. Conclusion: It is possible to predict the risk of osteoporosis in bakeries bone by measuring levels of vitamin D_3, PTH and bone minerals (Ca, Mg, and phosphorus) in their sera, and measuring the toxic oxides concentrations (NO_2 and CO) emitted from the smoke of bakeries resulting from combustion of kerosene used as fuel.

Keywords: *Osteoporosis; Vitamin 25 (OH) D_3, PTH hormone, Magnesium.*

Introduction

Osteoporosis is one of the most common diseases in the world. It is characterized by a decrease in bone mineral density & the precise engineering disturbance of bone tissue resulting in an increased risk of fractures, which are major complications of the disease [1]. Of the fractures caused by osteoporosis are common fractures in older people such as fractures in the vertebrae, resulting from diseases or after minimal trauma [2].Osteoporosis is very common among Asians because people live longer [1, 3].

One of the causes of osteoporosis is malnutrition, which results in the inability to create a bone matrix & vitamin-C deficiency is essential for secretion of substances within the cell [4]. Here are three types of fractures resulting from fragility: hip fractures, forearms, vertebrae [5].Vitamin- D_3 is generally advanced because of deficient exporter of endogenous & exogenous vitamin-D_3 (inappropriate intake or too much consuming) & may lastly outcome in bone mass lowering [6]. Aging is linked with lower an exposure of the sun, oral intake & lashing stimulation of vitamin- D_3, & vitamin reabsorption. All of these factor share in to vitamin- D_3 failure, which is wanted for Ca intake & bone mineralization. Minimize sera vitamin -D_3 is linked excretion with raise parathyroid hormone excretion who in transformation leads to bone absorption & raise nephritic calcium secretion [7].

Vitamin-D_3 is fundamental for metabolism of calcium & for fracture preventing.

The powerful linked between vitamins- D_3 lack and fracture expansion believes propose & notion underlie the significant raise in death-rate & morbidity average of fracture persons [8]. Vitamin D state is resolved by measurement sera vitamin -D_3 level [9].

Vitamin-D_3 is a indicative of clinical state & is the key deliberation vitamin- D_3 metabolite [10]. Pipe et al; discovered that in elderly person which lately experienced hip fracture, vitamin- D_3 failure was a generally reveal phenomena & not a occasional finding [11]. Calcium is the main metal component of the structural order is as well a fundamental alimentary for nerve, muscle contraction, hormone & enzyme, excretion, & blood clot.

Enough Ca intake is fundamental in the growth & development of the skeleton & teeth & for enough bone mineralization [12]. The largest percentage of calcium was found in bone (99%) & extracellular fluid [13]. The full thematic of the Ca balance is to preserve the biologically active ionizing compose in a passable tight domain (1.1-1.4 mmol/L) in arrangement to perform a critical function such as indication conversion [13].

Phosphate is the basic component of the skeletal structure because it is the main component of hydroxyapatite and is obtained from lunch through meat and pulses and has recently been added to the food as a supplement to be a major dietary [7]. Parathyroid hormone is a substance endocrine regulator of calcium & phosphorus concentrations in extracellular fluid. Physiologic levels of circulating PTH are fundamental for maintaining sera & urinary calcium levels within their normal domain [14]. Chronic excessive PTH production is reason of skeletal disease.

Secondary hyperparathyroidism has been involved in the pathogenesis of senile osteoporosis, while primary hyperparathyroidism (PHPT) is related with accelerated bone loss, osteopenia, & increased bone turnover, a separate risk factor for fractures. Studies have established that Mg is highly active in decrease the average of heart attacks & strokes. A favorable relationship has been found among dietary Mg intake & bone mineral intensity [14]. The purpose of this study is to define the serum level of PTH hormone, vitamin D_3 and Ca, Mg ion and phosphorus to show their impact on bone loss.

Material & Methods

A total of 41 samples of bakery workers and 41 healthy volunteers matched in ages were included in the present study. Blood samples were collected from various areas of the province of Baghdad and the range age for bakery workers was 16-45 year. Some information about the duration of work was recorded as a baker and the number of working hours during the day and duration of exposure to smoke, family history, if the baker is a smoker or not, drink alcohol or not, or disease such as previous bowel infection, hypertension, diabetes mellitus, take calcium tablets or vitamin D_3.

In addition to some information about height, weight and exercise, protein intake or not. Parathyroid hormone and vitamin D_3, were measured by using an ELISA kit (Mono bind Inc, U.S.A), and (Euroimmun, Germany) & Calcium & magnesium were measured in sera specimen by utilize spectrophotometer method based by using kits (Linear, Barcelona) and phosphorus measure by using a kit (Spin react, Spain). Bakery smoke was analyzed using a device aeroqual-series 500 product by (Aeroqual Company U.S.A).

Statistical Analysis

Data was statistically analyzed by SPSS software version 22. The variables were reported as means ± standard deviation t-test was utilized to comparison the average worth of the biochemical parameters in variation groups. The interconnections between the serums of Mg with years of work were detected utilizing the Pearson ś correlation analysis. &p-value less than 0.05 were considered statistically significant.

Results and Discussion

The participants of the present study included total 82 individuals. The bakery workers' group consists of 41 and control group consists of 41 healthy. The mean age ± SD for bakery workers and the control group was (30.46 ± 7.931), (27.78 ± 7.757) years, respectively, and the mean BMI± SD for bakery workers and the control group was (2.621 ± 0.408), (2.712±0.592) kg/m^2, respectively and the mean duration of the work of a baker (14. 85± 7.970) years as summarized in the Table 1. Bakery smoke was analyzed results from the combustion of kerosene substance, where it was found to contain the following oxides:

- Carbon mono oxide concentration (6.0 ppm).
- Nitrogen dioxide concentration (0.195 ppm).

Table 1: Mean & standard deviation of age, (BMI), and duration of the work of bakery workers/years

Parameters	Bakery workers (N=41)	Control (N=41)
Age/ year	30.46 ± 7.931	27.78 ± 7.757
body mass index(BMI), kg/m²	2.621 ± 0.408	2.712±0.592
Duration of the work of a baker/year	14.85± 7.970	

Vitamin D_3 and parathyroid hormone levels were measured in sera for all studied groups. Result in Figure 1 shows there is a significant differences increase in serum level of parathyroid hormone in bakery workers' group as the compared with a healthy control group (P=0.003). Revealed that in spite of the presence of slightly decrease of vitamin D_3 in bakery worker group as compared with a healthy control group, but it was not significant (p=0.068).

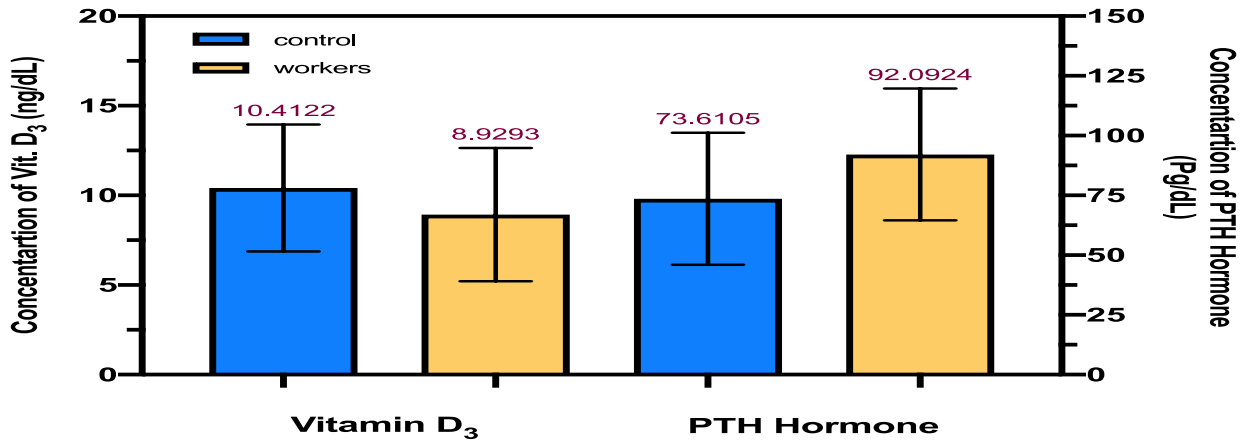

Figure 1: Comparison the mean and standard deviation of parathyroid hormone (PTH) and vitamin D_3 levels between the healthy control group & bakery workers group

Calcium, magnesium & phosphorus were specified in sera of healthy control group and bakery workers' group as the results are described in Table 3, it can be noticed at Figure 1, there are no significant differences in the calcium and magnesium concentrations in bakery workers' group as compared to the control group (p=0.612), (p=0.748), respectively. While a highly significant decrease was observed in the phosphorus concentrations, in bakery workers' group as compared to a healthy control group.

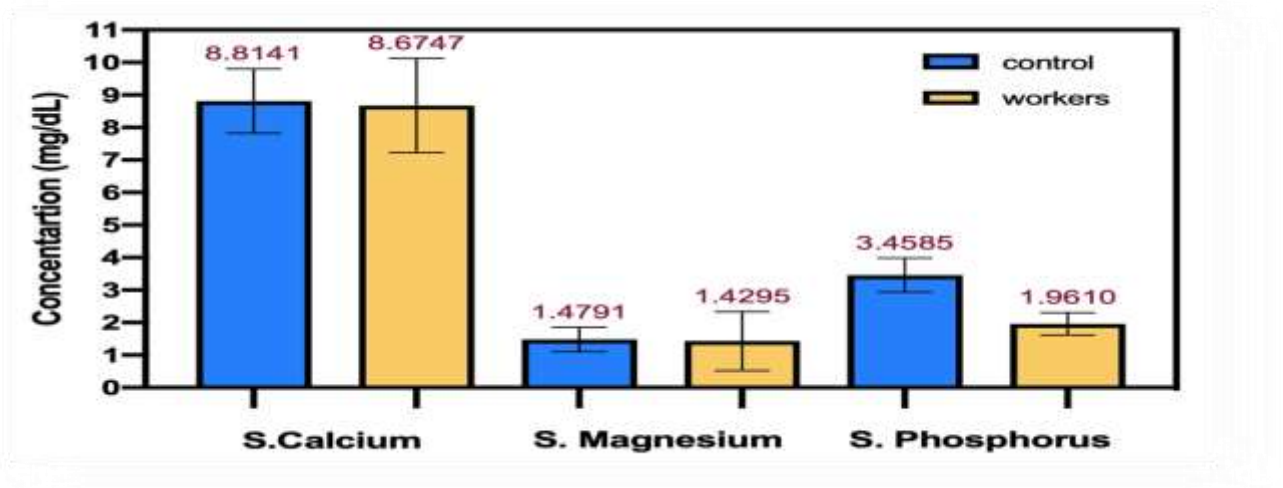

Figure 2: Comparison the mean and standard deviation of calcium, magnesium, and phosphorus levels the healthy control group & bakery worker groups

Our result showed that there was an appositive correlation between magnesium and duration of the work of a baker/year (p=0.005). As shown in the Figure 2, while no correlation between duration of the work of a baker /year with other parameters.

Table 2: Correlation between level magnesium in serum bakery workers and Duration of the work of a baker/year

Parameter	Duration of the work of a baker/year	
	r	p
S. Magnesium (mg/dl)	0.407	0.005
*P value is significant at the 0.05 level (2-tailed)		

Various studies have attempted to distinguish the etiology of osteoporosis or at least recognize its danger laborer [12, 13, 14]. The present study that conducted in Baghdad showed significant effect of increasing exposure to pollution caused by the bakeries smoke result from the combustion of kerosene. And effect on bone mineral density (BMD). This study corresponds to recent studies which have been deducted imparted to light how loss, bone intensity & bone fractures can be rias by air contamination & establish that people in region of elevated ambient focus of polluted particle matter had lower bone mineral intensity with raise average of hospital admission for bone broken, which lead to the illation that air contamination is a dangers laborer for osteoporosis & bone broken [15]. Prada et al. establish that air polluted together with particulate matter, like black C, is hurtful to bone validity, therefore, they didn't have arrival to information on other air contamination like NO2 [16].

Nevertheless, another modern study by (Chang et al).It has been confirmed that high air contamination by great focus of NO2, along together with CO, in (Taiwan city) did raised the danger of osteoporosis &bone broken [17]. The present study supports that a high parathyroid hormone level and low vitamin $–D_3$ in the blood has a significant effect on bakery workers where they are more prone to osteoporosis.

In the condition of vitamin D_3 shortage and parathyroid hormone raise, to crowd Ca from the skeleton, perform into local foci of bone deterioration, lower BMD, and osteoporosis. However, the parathyroid hormone raises. Several results in various levels of bone loss [18]. Fisher et al [19], show a that the situation of vitamin- D_3-parathyroid hormone axis are significantly linked to hip fracture kind.

The further novel finding was that vitamin-D_3 non-shortage persons, who nevertheless exhibited increase parathyroid hormone levels, were also more liable to trochanteric fractures. The PTH-linked findings of studies signal that the existence of parathyroid hormone surplus, whether subaltern to vitamin- D_3 shortage or not, may outcome in trochanteric fractures, most perhaps due to the parathyroid hormone-induced osteopenia & osteoporosis[19]. The data of this study showed no significant variation in Ca level in osteoporotic and in the control group there was not linked between BMD & iCa. Our results agree together with Rana [20]. Who establish no significant variation in calcium in osteoporotic women (2.19 ± 0.11 mmol/L) & in control group (2.24 ± 0.14 mmol/L) the normal domain in mmol/L (2.1-2.6).

Calcium comes from bone to blood to form calcium in the blood. Ca deposition in the blood, in bone to form bone Ca, calcium levels in bones and blood change continuously and dynamically, forming physiological balance together. This function regulates several hormones & enzymes in the body. Through them, vitamin D_3, calcitonin hormone, parathyroid hormone & their activating metabolites are the great humoral regulatory agents. Bones, intestines & kidneys are the three main major members. Vitamin -D_3 & its active metabolites uplift the absorption of intestinal Ca. Calcitonin has the impact of inhibiting the degeneration of bone salt & decrease the blood Ca [21]. PTH has the impact of uplift osteolysis & raise the blood Ca [22].

By knowing the proportion of calcium in the blood aid can determine the causes of osteoporosis, but not as a reason for diagnosing osteoporosis [22].The finding the low concentration of phosphorus in line with previous studies. Such as study done by Selvapandian et al [5]. Phosphorus is found in the body as univalent or bivalent phosphate collection. 85% of bone phosphorus is combined with calcium in the form of hydroxyapatite (Ca) 10 (PO4) 6 (OH) 2] in the skeleton which represents the largest reservoir of phosphorus in the body lower phosphate may be because by too much nephritic phosphate analogies or weakness intake or absorption, through the course of sharp alteration in energy metabolism (like intake of carbohydrate loads or insulin), carry phosphate from extracellular into the

intracellular, Leading to sharp lower phosphate.

Hypophosphatemia reason symptomatic muscle impairment, including cardiac dysfunction, Chronic hypophosphatemia also causes bone pain & strain fractures due to osteoporosis (weaken bone mineralization. Three related hormones regulate plasma phosphate focus: Vitamin –D_3, parathyroid hormone, and fibroblast growth factor23. These hormones amend intestinal phosphate absorption vitamin-D_3 and renal tubular phosphate reabsorption (parathyroid hormone and fibroblast growth factor23).

However, parathyroid hormone and Vitamin-D_3 job primarily to regulate calcium equilibrium, while fibroblast growth factor23 is further is fundamental for phosphate equilibrium [23]. Contrary to the previous result, we found significant impact of magnesium on bakery workers. Because the level of Mg found it minimal than natural values in serum of workers. Studies have established that Mg is very operative in decrease the average heart aggression & stroke [24].

A positive relationship has been established between dietary magnesium assimilation and bone mineral intensity. Although most osteoporosis handling & preventing research centered around raise calcium & vitamin D_3 intake, a study 82 shown that persons which used the elevated quantities of magnesium had higher bone intensity and lower dangers of osteoporosis [24]. Several population-based studies have found positive associations between magnesium intake and bone mineral density in men. Also Magnesium impact the focus of both parathyroid hormone & the active form of vitamin- D_3, which are major regulators of bone homeostasis [25].

Magnesium is implicated in bone formatting & impacts the activities of osteoblasts & osteoclasts. These & other findings single that magnesium shortage might be a danger factor for osteoporosis [26].We have discovered through our study there is significant effect of nitrogen oxides and Carbone monoxide caused by the smoke of bakeries on the bone minerals, especially magnesium, where note that there is a relationship between the years of work and continuous exposure of toxic oxides with the reduction of bone magnesium. This is consistent with the results, findings by Chang et al. That establishing air contaminated with large focus NO_2, along together with CO, in Taiwan did raise the danger of osteoporosis & bone broken [17].

Conclusion

It is possible to predict the risk of osteoporosis in bakeries bone by measuring levels of vitamin D_3, PTH and bone minerals (Ca, Mg, and phosphorus) in their sera, and measuring the toxic oxides concentrations (NO_2, CO) emitted from the smoke of bakeries resulting from combustion of kerosene used as fuel.

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