

Pre-operative Assessment of Unexpected Micronutrients Status among Elderly Patients with Elective General Surgery and no Apparent Clinical Indication; Zinc, Magnesium, Calcium, Inorganic Phosphorous

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ABSTRACT

Background: Electrolytes and micronutrients abnormality level can influence the outcome of surgery. Measurement of Zinc (Zn), Magnesium (Mg), inorganic Phosphorous (P) and Calcium (Ca) routinely was not evaluated Pre-operatively. Determinations of serum level of micronutrients are exclusively attended on the emergency conditions or special procedures and rarely applied as pre-operative screening tests among elderly. In addition, older age encounters as an important risk factor due to reduced physiologic reserve, malnutrition and underlying disorders. The aim of the study assessed pre-operatively unexpected serum micronutrients among elderly patients for elective general surgery with no apparent clinical indication.

Methods: Our target population is elderly patients from both genders (males and females). Patients that were coming in chest clinic for elective general surgery consultation were enrolled. Zn, Ca, P and Mg levels were measured in serum according to manufacturer's documentation kits.

Results: A total of 171 elderly patients were female 55% male 45%. Mean age was 69.12±6.66 SD years. The frequency of micro-nutrition elements deficiencies observed Zn 15.8%, Mg 11.1%, P 10.5% and Ca 6.4%, respectively.

Conclusion: Considerable of unexpected deficiencies of the micronutrients was demonstrated in the focus population during the study. Global frequencies of deficiencies were hypozincemia, hypomagnesaemia, hypophosphatemia and hypocalcaemia, respectively. Sex distribution of electrolyte deficiencies noticed in Zn, Mg, P and Ca, individually. Moreover, the obvious some electrolyte disturbances in elderly should be considered as a health problem. Pre-operatively determination of unexpected electrolytes routinely may provide safety of surgery in our country.

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► Implication for health policy/practice/research/medical education:

Pre-operative Assessment of Unexpected Micronutrients Status among Elderly Patients with Elective General Surgery

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1. Introduction:

Advanced age is encompassed as a strong risk factor or important classification group of health problems in general population (1). Rate of Iranian aged population was 13% over 60 years since 2006 years, and it will be increased in future years (2). However, reduced physiologic reserve and present of age-related underlying diseases are strong evidence of selection or elimination of pre-operative testing among elderly people.

Assessment of overall elected surgery was 15.5% in elderly patients (3). 14% of all routine preoperative tests were abnormal in elective general surgery and of those 9.2% was expected (4). Mortality rate was 4.5% in hospital, and of those 25% had an adverse postoperative outcome (5).

The micronutrients and electrolytes are contributed in further metabolism and homeostatic functions (6). In addition, they are occasionally encountered as the reversible risk factors. Backbones of preoperative selective test usually are focused upon the emergency conditions or special procedures. They have been rarely considered as routine screening tests in geriatric general surgery (7). Prevalence of malnutrition was 12% among Iranian elderly (8). It predisposed old aged-patients to be micro-nutritional element's disturbances (9).

General electrolytes are routinely measured such as sodium and potassium. Its abnormalities were 1.6% in

preoperatively (10). Whereas evaluation of selective micro-nutrition like Zinc (Zn), Magnesium (Mg), Calcium (Ca) and Phosphorous (P) are depended to preexisting diseases.

The aim of the study assessed pre-operatively unexpected serum micronutrients among elderly patients for elective general surgery with no apparent clinical indication.

2. Materials and Methods:

The study was cross-sectional. It finalized in Shahid Beheshti University of medical sciences (SBUMS), Logman Hakeem general teaching hospital since 2008-2009 years. The Logman Hakeem is a tertiary center in south of Tehran and had over 170,000 admission with up to 0000 operations annually.

The selection criteria include elderly patients over 60 years, underwent general elective surgery. Exclusion criteria consisted of ambulatory surgery, local anesthesia, using supplements, neoplastic diseases, kidney diseases, metabolic diseases and gastrointestinal enteropathy, chronic diarrhea.

Participations evaluated as a routine screening pre-operation coming to additional assessment. Blood sample at morning state obtained at fasting state. Whole blood referred to unique laboratory. The Zn in serum was measured with zinc Ls kit (Ziestchem Diagnostics Tehran, Iran). Sample was collected in the special trace element tube. Colorimetric method was used with BT instrument. Cut of point level of Zn was male; 73.0-127µg/ dl and female 70.0-114µg/dl. It selected at 69µg/dl.

The Mg level was detected with colorimetric, magnesium kit (Pars azemon Co Ltd). Normal standard rage defined male 1.8.0-2.6mg/dl and female 1.9-

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2.5mg/dl. Value 1.7mg/dl was the end point.

The Ca level analyzed with colorimetric, CPC kit (Pars azemon Co Ltd). Standard range was 8.6-10.3mg/dl. Ca threshold level was 8.5mg/dl.

The P concentration was assessed with colorimetric, phosphorus kit (Pars azemon Co Ltd). Standard set point was 2.6-4.5mg/dl. The electrolytes were detected during the study analyzed with auto-analyzer Liasys (Made in Italy). Normal selected point of p serum was 2.5mg/dl.

Analyzed of data was performed with SPSS program version 18. Frequency presented with percent value. Compare of means carried out with nonparametric tests as; Crosstab and K independent samples test. Association performed with Chi-square. Significant value was set in through study at $P < 0.05$ (Tow tailed).

3. Results:

171 subjects had the study criteria. Mean age was 69.12 ± 6.66 SD years. It ranged between 60-80, Median 68 years. Gender was distributed in male 45% and female 55%. Fig. 1 shows age classes' distribution respect to sex. There were significant differences between sex with age classes ($\chi^2 < 0.03$).

Table 1 presents characteristic of measured micronutrients in the preoperative elderly. Fig. 2 shows deficiency status of micronutrients among sexes. Hypozincemia was detected in the 16% of study population and 56% of males.

Hypomagnesaemia found in the 11% of target population and 74% female sex. Association detected between age classes and sexes with magnesium level in serum; (Eta; $P = 0.03$) and (Eta; $P = 0.02$), respectively.

Hypophosphatemia was observed in the 11% of focus population and 61% of males.

Hypocalcaemia was disclosed in the 6.4% of sample study and 91% of females. There was an association between age classes with Ca level ($P = 0.04$).

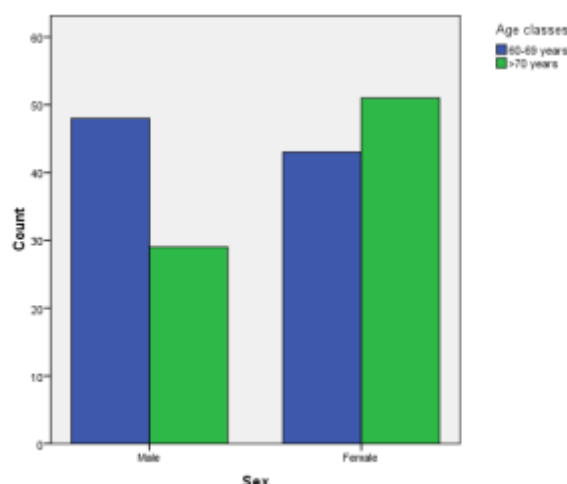


Fig. 1. It presents age classes' distribution in respect to sexes of elderly patients.

K independent sample's test carried out between sexes with global micro-nutrition element values of the sample study. There was relevant difference between sexes with Ca level in serum ($P = 0.002$).

4. Discussion:

Zinc is a trace element. Zn has potential the role in tissue repairing due to injury or stress (11) and response to infection (12). Its supplement is effective in lowering incidence of infection among the elderly (13). Zn deficiency was observed post-surgery trauma (14). It occurred through urine excretion. The first report of Zn deficiency was published from Iran in 1958 years (13). Phytate count was higher in Iranian bread (15). It is one of the main energy sources in Iranian general nutrition. It may be the causes of Zn deficiency.

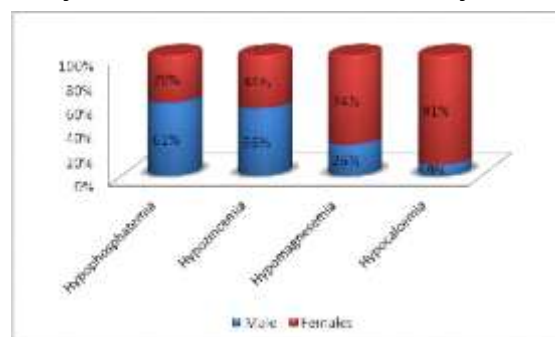


Fig. 2. It reveals unexpected micronutrient deficiency's distribution between sexes.

Table 1: It reveals characteristics of pre-operative micronutrients abnormalities in the elderly patients for elective general surgery.

Total electrolyte values	Mean $\pm$ SD	Electrolyte deficiency %	Electrolyte deficiency /N	Cut of point	P value<0.05
Zinc μ g/dl	98.19 $\pm$ 26.42	15.8	27	76	0.001
Magnesium mg/dl	2.00 $\pm$ 0.28	11.1	19	1.6	0.001
Phosphorous mg/dl	3.61 $\pm$ 0.66	10.5	18	2.5	0.001
calcium mg/dl	9.42 $\pm$ 0.64	6.4	11	8.5	0.001

Hypomagnesaemia is a silent disease in the elderly patients. It is a common abnormal electrolyte disturbance in the critically ill patients 52% (16) and postoperative intensive care admissions 61% (17). Mg level is effective in a predictor of mortality and morbidity between catastrophic patients. It had mortality rate 55% (18). Hypomagnesaemia was detected within 36% of elderly subjects with long-term setting (19). Hospitalized patients revealed hypomagnesaemia in 12% (20).

Hypomagnesaemia may be occurred in setting; aminoglycoside (21), proton-pump inhibitor (22), diuretic medications (23) and acid-base disorders (23). However, it occurred more frequency with diabetes mellitus, gastrointestinal losses diseases and malnutrition patients (20). The recent concepts are more prevalent and aggregated in the admission of elderly patients in hospital setting. Hypomagnesaemia may be a clue in detection of coexistence electrolyte disturbances as; hypokalemia 42%, hypophosphatemia 29%, hypernatremia 27% and hypocalcaemia 22% (24). Mg level measurement suggested as a routine basis in hospitalized patients (24).

Calcium is a common mineral and has the key role in the body. It parallel regulates fibroblast growth factor level (23). It is effective in down regulation of calcitriol

level, cardiovascular events and mortality (25, 26). Ischemic heart disease and congestive heart failure are prevalently disorder within advanced age population (27). A Ca and Mg level in serum poses markedly effects on the cardiovascular disorders (28). Their abnormalities can be curable and lead to reversed disorders. It was estimated up to 60% of middle age and older woman use calcium supplement in daily regime (29). 80% of Iranian population does not follow the average requirement of calcium (28). Nutritional structure of Iranian people was not associated with enough calcium rich-food (30).

Phosphate has potential role in the acid-base buffer, oxygen release, energy storage and metabolism, cell membranes and bone structure. Its homeostasis related to the balance in three arms; internal redistribution, renal excretion and intestinal absorption. The former mechanism is more affected in the hospitalized patients as; acid-base disorder and medications (31).

Hypophosphatemia incidence was 2.2-3.1% in general hospitalized patients 31, and more frequent in the ICU setting 45% (32). Hypophosphatemia presents in postoperative period (33), trauma (34), gram-negative infection (35), sepsis (36),

myocardial performance (37), effective weaning (38) and respiratory illness (39). In conclusion; considerable of unexpected electrolyte deficiencies were demonstrated in the focus population during of the study. Frequencies of pre-operative electrolyte deficiencies included Hypozincemia, hypomagnesaemia, hypophosphatemia and hypocalcaemia, respectively. Sex distributions of electrolyte deficiencies noticed in Zn, Mg, P and Ca, individually. Female sex apparent deficiencies of Mg and Ca, separately. Male sex more frequency reflected the P and Zn deficiencies.

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