Short notes

Impact of oral contraceptives on serum electrolytes concentration of calcium, phosphoric acid, magnesium and iron levels in Sudanese women in Shendi Town, Sudan

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Abstract

A descriptive cross-sectional study was conducted in Shendi Town, Sudan, from March to July 2018 to assess the effect of oral contraceptives on the level of Ca^{2+}, PO_4^{3-}, Mg^{2+}, Fe^{2+} sera in 100 women (50 using oral contraceptive pills and 50 not, as a control group) with ages of 15-50 years. Mean levels of Ca^{2+}, PO_4^{3-}, Mg^{2+}, Fe^{2+} sera among women on oral contraceptive pills was 7.7, 3.31, 1.8 and 32.0 mg/dL respectively, while for the control group was 8.8, 3.35, 2.1 and 20.8 mg/dL respectively. A significantly lower mean Ca^{2+}, PO_4^{3-} and Mg^{2+} and higher Fe^{2+} level was found in women using oral contraceptive pills compared to the control group.

Keywords: Contraceptive pills, women, Ca^{2+}, PO_4^{3-}, Mg^{2+}, Fe^{2+}.

Introduction

Oral contraceptive pills are medication that prevents pregnancy. There are two types of them: combined pills, which contain progestins and estrogens and progestin-only pills. These medications primarily work by preventing ovulation, thinning the endometrium, and causing cervical mucus thickening that prevents sperms entry into the uterus.

Electrolytes are elements that, when dissolved in water or another solvent, dissociate into ions able to conduct an electric current. Electrolytes differ in their concentrations in blood plasma, interstitial fluid, and cell fluid and affect the movement of substances between those compartments. An optimum level of principal electrolytes is critical to metabolic function. The main electrolytes include Ca^{+2}, PO_4^{3-}, Na^{+}, K^{+}, Mg^{+2}, HCO_3^{-1}, and Cl^{-}. Calcium and phosphate are essential minerals found in the bone, blood and soft tissue. Electrolytes can be affected by different factors. It is necessary to be maintained within normal range Ca^{2+}:2.2-2.6mmol/L and (PO_4^{3-}:0.8-1.4mmol/L. Mg^{2+}, is one of the major intracellular cations. It is important for normal neuromuscular activity and it is an important cofactor for various enzymes, transporters, and nucleic acids that are essential for normal cellular function, replication, and energy. Fe^{2+}, is an essential posthetic cation of heme in hemoglobin and the active site of peroxidases that protect

cells from oxidative injury by reducing peroxides to water. Heme is also the active site of electron transport in cytochromes. When Fe^{2+} levels are insufficient, a proliferation of bacteria or nucleated cells stops. This can be caused by some conditions and medications. Oral contraceptives had long been incriminated in the reduction of serum levels of Ca^{2+}, PO_4^{3-} and Mg^{2+} [1]. Other serious considerable side effects of oral contraceptive pills are a disturbance of normal lipid profile [2-4] and increasing coagulation tendency [5].

This study was conducted to assess the effect of oral contraceptives on the level of Ca^{2+}, PO_4^{3-}, Mg^{2+} and Fe^{2+} sera in women of Shendi Town, Sudan.

Materials and methods

The study was conducted in Shendi Town, Sudan from March to July 2018. Included 100 participant women (50 using oral contraceptive pills and 50 not, as a control group) with the age of 15-50 years. Participants with renal or thyroid disease or any other clinical condition that might affect electrolytes level were excluded from the study. Data were collected using a preformed questionnaire. 5ml of the venous blood sample was taken from each participant in a lithium-heparinized container. Levels of Ca^{2+}, PO_4^{3-}, Mg^{2+} and Fe^{2+} sera were measured in mg/dL using a Biosystem spectrophotometer autoanalyzer (Barcelona, Spain).

Ethical approval was obtained from the Faculty of Graduates Studies and Scientific Research, Shendi University. Verbal informed consent for participation was obtained from each participant before recruitment into the study.

Data were analyzed using an online *t*-test calculator with a *P*-value less than or equal to 0.05 was considered significant.

Results and discussion

There was a significantly lower level of calcium, magnesium and contraceptive pills between the group who use the contraceptive pills and the control (Table 1). This is in line with a previous result that taking contraceptives resulted in lowering the level of Ca^{2+}, PO_4^{3-} and Mg^{2+}sera [6].

Table 1. Mean level of Ca^{2+}, PO_4^{3-}, Mg^{2+} and Fe^{2+} sera among the test and control group

Cation/Anion	Group	No.	Mean (mg/dL)	SD	*P*-value
Ca^{2+}	Test	50	7.706	0.7493	0.000
	Control	50	8.808	0.8750	
PO_4^{3-}	Test	50	3.312	1.2165	0.850
	Control	50	3.352	0.8671	
Mg^{2+}	Test	50	1.8320	0.41066	0.000
	Control	50	2.1240	0.31270	
Fe^{2+}	Test	50	32.022	6.6965	0.000
	Control	50	20.888	6.5536	

Medication had a positive effect on an iron (Fe^{2+}) level as previously highlighted [7] that the frequency of iron depletion has reached 28.1% in women using intrauterine devices, but only 13.6% in those using oral contraceptives. It has also found that the serum-(Fe^{2+}) and serum-total iron-binding capacity (T.I.B.C.) were strikingly elevated in the group using oral contraceptives and this effect may be partly due to a response to circulating estrogens and/or progesterone [8]. Moreover, the positive effect probably attributed to shorter bleeding times associated with the use of oral contraceptives [9].

Reduction in the mean level of Ca^{2+}, PO_4^{3-} and Mg^{2+}sera was proportional to the duration of oral contraceptive use (Table 2) as previously documented [10]. The age had no obvious effect on the level of Ca^{2+}, PO_4^{3-}, Mg^{2+} and Fe^{2+} sera (Table 3). Likewise, the educational level and the number of children of the participants had no effect on the level the sera investigated (Tables 4 and 5). However, there was a significant difference between the educational level and a number of children of the participants (Table 6). This is likely due to the positive impact of education on birth control.

Finally, it is recommended that hormonal contraceptives should be prescribed after a medical consultation. Likewise, nutritional counseling and nutrients supplements, especially calcium should be considered for women on long term use of hormonal contraceptives.

Table 2. Mean level of Ca^{2+}, PO_4^{3-}, Mg^{2+} and Fe^{2+} sera according to the duration of intake contraceptive pills

Duration of intake in years		Ca^{2+} (mg/dL)	PO_4^{3-} (mg/dL)	Mg^{2+} (mg/dL)	Fe^{2+} (mg/dL)
< 1	Mean	8.509	4.036	2.0482	31.018
	Total No. (%)	11(22.0)	11(22.0)	11(22.0)	11(22.0)
1- 3	Mean	7.577	3.240	1.8149	31.369
	Total No. (%)	35(70.0)	35(70.0)	35(70.0)	35(70.0)
> 3	Mean	6.625	1.950	1.3875	40.500
	Total No. (%)	4(8.0)	4(8.0)	4(8.0)	4(8.0)
P-value		0.000	0.008	0.017	0.027

Table 3. Mean level of Ca^{2+}, PO_4^{3-}, Mg^{2+} and Fe^{2+} sera according to the age of the participants

Age in years		Ca^{2+} (mg/dL)	PO_4^{3-} (mg/dL)	Mg^{2+} (mg/dL)	Fe^{2+} (mg/dL)
21 - 26	Mean	7.743	3.743	1.8236	31.921
	Total No. (%)	14(28.0)	14(28.0)	14(28.0)	14(28.0)
27 - 32	Mean	7.778	3.100	1.8528	30.289
	Total No. (%)	18(36.0)	18(36.0)	18(36.0)	18(36.0)
> 32	Mean	7.606	3.189	1.8178	33.833
	Total No. (%)	18(36.0)	18(36.0)	18(36.0)	18(36.0)
P-value		0.777	0.294	0.965	0.288

Table 4. Mean level of Ca^{2+}, PO_4^{3-}, Mg^{2+} and Fe^{2+} sera according to the educational level

Educational level		Ca^{2+} (mg/dL)	PO_4^{3-} (mg/dL)	Mg^{2+} (mg/dL)	Fe^{2+}(mg/dL)
Primary	Mean	7.800	2.150	1.5500	34.250
	Total No. (%)	2(4.0)	2(4.0)	2(4.0)	2(4.0)
Secondary	Mean	7.330	3.090	1.7900	33.635
	Total No. (%)	20(40.0)	20(40.0)	20(40.0)	20(40.0)
University	Mean	7.968	3.554	1.8821	30.711
	Total No. (%)	28(56.0)	28(56.0)	28(56.0)	28(56.0)
P-value		0.071	0.167	0.465	0.299

Table 5. Mean level of Ca^{2+}, PO_4^{3-}, Mg^{2+} and Fe^{2+} sera according to the number of children of the participants

No. of children		Ca^{2+} (mg/dL)	PO_4^{3-} (mg/dL)	Mg^{2+} (mg/dL)	Fe^{2+} (mg/dL)
1 - 3	Mean	7.728	3.306	1.8766	31.244
	Total No. (%)	32(64.0)	32(64.0)	32(64.0)	32(64.0)
4 - 6	Mean	7.665	3.406	1.7265	33.582
	Total No. (%)	17(34.0)	17(34.0)	17(34.0)	17(34.0)
> 6	Mean	7.700	1.900	2.2000	30.400
	Total No. (%)	1(2.0)	1(2.0)	1(2.0)	1(2.0)
P-value		0.963	0.494	0.323	0.503

Table 6. Educational level according to the number of the participant children

Educational level	No. of children			Total
	1-3	4-6	> 6	
Primary	0	2	0	2
Secondary	9	10	1	20
University	23	5	0	28
Total	32	17	1	50

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