Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 7 (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Evaluation Of Serum Magnesium, Calcium and Phosphorus in Female Patients Diagnosed with Menstrual Disorders

Khushbu Sharma[1], Bushra Fiza[2*], Shikha Mathur[3]

[1]Tutor, Department of Biochemistry, MGUMST

[2*]Professor, Department of Biochemistry, MGUMST

[3]Professor, Department of Physiology, MGUMST

***Corresponding Author:**

Bushra Fiza

Professor, Department of Biochemistry, MGMCH, Mahatma Gandhi University of Medical Sciences & Technology, Jaipur, Pin 302022,

Email ID: drbushra@mgumst.org

Cite this paper as: Khushbu Sharma, Bushra Fiza, Shikha Mathur, (2025) Evaluation of Serum Magnesium, Calcium and Phosphorus in Female Patients Diagnosed with Menstrual Disorders, *Journal of Neonatal Surgery*, 14 (7), 1132-1137.

ABSTRACT

Introduction: Every healthy woman after attaining puberty undergo hormonal changes, go through menstruation cycle every month which involves the coordination of many events by the hypothalamus, pituitary, ovarian axis and is readily influenced by physiological, pathological and psychological changes occurring during the reproductive lifespan. They suffer from various menstrual disorders and their proper nutritional management is necessary. Levels of Serum Magnesium, Calcium and phosphorus may play important role in symptoms of these disorders.

Aim: To evaluate the levels of serum Magnesium, Calcium and Phosphorus levels among female patients diagnosed with menstrual disorders.

Material and Method: In the present case control study, serum Magnesium, Calcium and Phosphorus levels were determined in 100 Female Patient's diagnosed for menstrual disorders i.e Abnormal uterine bleeding or AUB, PCOS and Dysmenorrhea, visiting the outpatient department (OPD) of gynecology fulfilling the inclusion criteria and exclusion criteria were enrolled for the study. Healthy females with a regular menstrual cycle constituted the control group. Inclusion criteria for the study were Females who were suffering from Abnormal uterine bleeding (AUB), Polycystic ovary syndrome (PCOS) and Dysmenorrhea between 18- 45 years of age and who were interested in taking part in the study. Females with Age below 18 and above 45 years, who are on drugs or hormone therapy, had an IUCD (intrauterine contraceptive device) were known to have cervical or uterine malignancy, fibromyoma etc. and Pregnant women were excluded from the study. Blood samples were collected by venipuncture using standard aseptic technique and following investigation were performed. Serum Calcium, Magnesium, Phosphorus by potentiometry using micro slide assay method on VITROS 5600.

Result: A total of 100 females diagnosed with Polycystic Ovary Syndrome (PCOS), Dysmenorrhea, and Abnormal Uterine Bleeding (AUB) were included in the study. The mean age was comparable between the control and patient groups for AUB and Dysmenorrhea, while the PCOS group had a relatively lower mean age (23.63 ± 4.50 years). The mean serum calcium level was 8.40 ± 1.76 mg/dL in the AUB group ($P = 0.002$), 8.23 ± 1.55 mg/dL in the PCOS group ($P < 0.001$), and 8.75 ± 1.72 mg/dL in the Dysmenorrhea group, with overall statistical significance ($P = 0.063$). The mean serum magnesium level was 2.61 ± 1.02 mg/dL in the AUB group ($P < 0.001$), 2.33 ± 0.82 mg/dL in the PCOS group ($P < 0.001$), and 2.88 ±

1.07 mg/dL in the Dysmenorrhea group ($P < 0.001$). Mean serum phosphorus levels were

5.28 ± 1.39 mg/dL in the AUB group ($P < 0.001$), 5.43 ± 1.64 mg/dL in the PCOS group ($P < 0.001$), and 5.21 ± 1.54 mg/dL in the Dysmenorrhea group ($P < 0.001$)

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Conclusion: Levels of Calcium, phosphorus and Magnesium play a vital role in muscle function and hormonal regulation. They both play important role in healthy menstrual cycle. Imbalance of these minerals could contribute to menstrual abnormalities. Mean Calcium level was found to be decreased in patients with menstrual disorders whereas Mean Phosphorus levels and Magnesium levels increased in patient with menstrual disorders.

Key words: *Mineral Profile, Menorrhagia, Hyperandrogenism, Menstrual Bleeding, Menstrual cycle.*

1. INTRODUCTION

Every healthy woman after attaining puberty undergoes some hormonal changes. Menstruation cycle happen every month in healthy women which involves the coordination of many events. These events are coordinated by the hypothalamus, pituitary, ovarian axis and is readily influenced by physiological, pathological and psychological changes occurring during the reproductive lifespan. The process of losing blood from the uterus each month during reproductive age is referred to as menstruation and onset of menses at puberty is called menarche.(1)Menstrual cycle consists of three phases i.e proliferative or follicular phase, ovulation phase (It happens at the peak offollicular growth in response to luteinizing hormone surge), secretary or luteal phase. In healthy female the normal duration of menstrual cycle is 28 days. (2)

At the age of 45-55 years, the female sexual cycle ceases and female sex hormones diminishes rapidly to almost none at all is called as menopause. The characteristics of Menopause are

hot flushes, night sweats and various other pathological and biochemical changes. (3)

AUB (descriptive terms like menorrhagia, poly-menorrhea, dysfunctional uterine bleeding and heavy menstrual bleeding) is excessive bleeding through out the menstrual cycle. AUB is the common problem among women in the reproductive age. It may be accompanied by pain and discomfort, causes significant social embarrassment, and also have a considerable effect on health-related quality of life.(4)

In developing countries PCOS is the commonest endocrine disorder in women of reproductive age. The Classical symptoms of it consist of hirsutism, persistent acne, androgen dependent alopecia or hyperandrogenism together with symptoms of anovulation that includes infertility, amenorrhea, irregular dysfunctional uterine bleeding. (5)Lifestyle changes play a very important role in improvement of menstrual abnormalities. Lifestyle changes in the form of healthier diet and increased physical activity improves menstrual and metabolic abnormalities and reduces androgen levels. Obesity is also found to be related to the PCOS as PCOS and its clinical features are more common in overweight and obese women. (6) Endocrine disturbances are found to occur in PCOS. These disturbances are characterized by elevated level of Luteinizing hormone (LH), High concentration of androgens i.e testosterone and and rosterone, Disturbance in estrogen production, High prolactin level, Low growth hormone production (GH). (5)

Dysmenorrhea (two types of dysmenorrhea are primary or secondary dysmenorrhea) is a

chronic and cyclic pelvic pain. It is sometimes spasmodic and generally associated with menstruation even in the absence of identifiable pathology typically known as menstrual cramps or period pain. It is sometimes associated with diarrhea, nausea, vomiting, flushing, backache, headaches, concentration difficulties, insomnia, fatigue and in rare of the cases syncope.(7)

In regulation of normal menstrual cycle, cause and the treatment of menstrual disorder, the healthy nutritional intake and metabolism may play a significant role. Variations in total energy intake and the consumption of protein, fat, and carbohydrate have been correlated with cycle phase. (7)

The relation between dietary intake of Calcium and Magnesium among healthy women with normal cycles and numerous physiologic, psychology etc. often reported to occur in relation to menstruation and the menstrual cycle. (8)Micronutrient's dietary intake (which includes calcium, vitamin D etc.) have been previously found to be associated with the development of Premenstrual Syndrome. (9,10) Fluctuations in blood levels of potassium, magnesium, and zinc occurs across menstrual cycle, (11) while low blood levels of zinc and magnesium have been also seen in Premenstrual Syndrome women's comparatively to the level of these in controls according to various studies. (12,13,14) Magnesium (15,16,17) and potassium (18) have been studied as treatments for premenstrual symptoms in a few small studies, which shows inconclusive results.

Role of minerals in menstrual disorders have not been studied much that's why this study was planned to explore levels of calcium, magnesium and phosphorus among female patients of PCOS, Dysmenorrhea and AUB.

2. MATERIAL AND METHOD

100 Female Patient's diagnosed for menstrual disorders i.e Abnormal uterine bleeding or AUB, PCOS and Dysmenorrhea, visiting the outpatient department (OPD) of gynaecology fulfilling the inclusion criteria were enrolled for the study. 50 healthy females with a regular menstrual cycle constituted the control group. The study was conducted after taking approval from the Institutional Ethics Committee and obtaining consent from the willing participants. Inclusion criteria

for the study was Females who were suffering from different menstrual disorders namely AUB, PCOS and Dysmenorrhea between 18-45 years of age and who were interested in taking part in the study. Exclusion criteria of the study includes females with age below 18 and above 45 years, Women who are on drugs or hormone therapy, The patient had an IUCD (intrauterine contraceptive device) were known to have cervical or uterine malignancy, fibromyoma etc., Pregnant women. Complete history taking through physical examination of all enrolled females was performed. Blood samples were collected by venipuncture using standard aseptic technique and following investigation were performed. Serum Calcium, Magnesium, Phosphorus by potentiometry using micro slide assay method on VITROS 5600.

3. RESULTS

The mean age of control group is 32.30 ± 6.24 yrs and that of subjects were 27.58 ±6.55 yrs. The mean age of control group and that of AUB is 31.63 ±3.34 yrs, Dysmenorrhea was

34.68 ± 7.00 and were comparable while PCOS is 23.63 ± 4.50 was lower comparatively and was statistically significant. The mean Calcium level of control group is 9.28 ± 0.63 and that of AUB group is 8.40±1.76 with P= 0.002, the mean Magnesium level of control group is

1.75 ± 0.35 and that of subject group is 2.61±1.02 with P= 0.000and the mean level Phosphorus of control group is 4.03±0.60 and that of subject group is 5.28±1.39 with P value0.000. The results were statistically significant as shown in table 1. The mean calcium of control group is 9.28 ± 0.63 and that of PCOS group is 8.23 ± 1.55 with P value 0.000, the mean magnesium of control group is 1.75± 0.35 and that of PCOS group is2.33±0.82 with the P=0.000 whereas the mean phosphorus of control group is 4.03 ± 0.60 and that of subject group is 5.43 ± 1.64 with the P= 0.000 as shown in table 1. All were statistically significant. Likewise the mean Calcium of control group is 9.28 ± 0.63 and that of subject group is 8.75 ± 1.72. The result was significant (P= 0.063). The mean level of Magnesium in control group was 1.75 ± 0.35 and that of subject group was2.88±1.07 with P= 0.000 while the mean level of Phosphorus in control group is 4.03 ±0.60 and that of subject group is 5.21±1.54 with P= 0.000.All were statistically significant among control and subject groups as shown in table 1.

Table 1: Comparison of Mineral Profile of the AUB, PCOS and Dysmenorrhea group

Group	Control [A] (n=50)	AUB [B] (n=27)	PCOS [C] (n=54)	Dysmenorrhea [D] (n=19)	P-value [A v/s B]	P-value [A v/s C]	P-value [A v/s D]
Calcium (mg%)	9.28 ± 0.63	8.40±1.76	8.23±1.55	8.75±1.72	0.002	0.000	0.063
Magnesium (mg/dl)	1.75±0.35	2.61±1.02	2.33±0.82	2.88±1.07	0.000	0.000	0.000
Phosphorus (mg%)	4.03±0.60	5.28±1.39	5.43±1.64	5.21±1.54	0.000	0.000	0.000

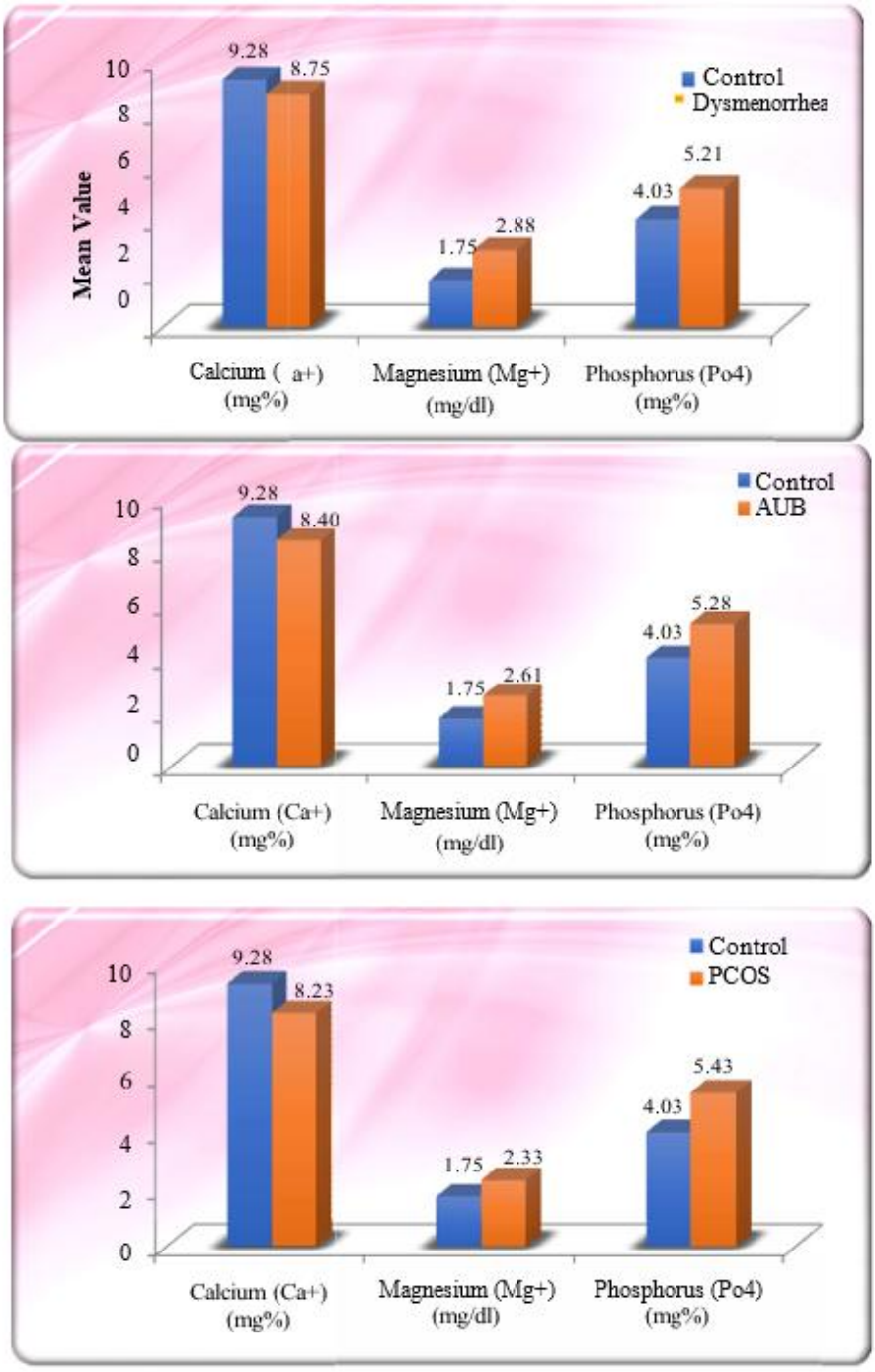

Fig1.1; 1.2; 1.3 Comparison of Serum Calcium, Magnesium and Phosphorus levels in Control vs Dysmenorrhea, AUB and PCOS patients

4. DISCUSSION

In the present study mean age is comparable among control and AUB, Dysmenorrhea group while significant among control and PCOS group of patients. Mean Serum calcium, Serum Magnesium, Serum Phosphorus levels among AUB patients, Dysmenorrhea as well as PCOS patients were statistically significant. Mean Serum Calcium levels were slightly lower among patient group as compared to control group. Mean Serum Magnesium levels statistically significant with higher levels of it among subject group likewise mean serum phosphorus levels among patient group was found to be statistically higher. Pandya AK et al., 1995, investigated serum Calcium, Magnesium and Phosphorus levels serially during various phases of menstrual cycle i.e menstrual, proliferative and secretory phases of menstrual cycle. In his study Serum calcium level was found to be highest during proliferative phase and lowest during secretory phase. Exactly opposite result was observed for serum Magnesium levels which shows highest levels during secretory phase and lowest during proliferative phase. Whereas, for serum Phosphorus, the raised level was seen during menstrual phase and

decreased during the secretory phase.(19) Young et al., 1975, in his study reported that Magnesium irons and oxidative enzymes are needed for carbohydrate utilization which increases significantly during the secretory phase.(20) Grober U et al., 2015, in his study reported that due to deficiency of Magnesium muscles spasms, migraines, depression, constipation, and importantly, premenstrual syndrome and dysmenorrhea occurs.[21] Essential minerals play an important role in various biological activities as epidemiological evidences are accumulating to indicate that certain essential minerals may serve physiological roles inregulating the biological activity in females during menstrual cycle. (22) Calcium may also play a help in reducing menstrual pain.(23) Penland JG et al., 1993 in his study suggested the benefits of Calcium supplements on reducing the severity of menstrual symptoms. (24) Also, there are some possible pathways by which Magnesium might influence Dysmenorrhea. It relaxes the muscles and is involved in the activity of serotonin and other neurotransmitters, as well as in vascular contraction, neuromuscular function and cell membrane stability.(25)All the abnormalities studied in the present research exhibited significant changes in levels of serum Calcium, Phosphorus and Magnesium levels. It is therefore recommended that females with complaint of menstrual disorder should be screened for minerals levels as well specially for calcium, magnesium and phosphorus. Identification of the actual biochemical derangement may be helpful in treatment of the menstrual disorder and over all in improvement of the quality of life.

5. CONCLUSION

The study was undertaken to determine the levels of mineral profile specifically calcium, phosphorus and magnesium in patients of menstrual disorders and its comparison with healthy control. Calcium level was found to be decreased in patients with menstrual disorders whereas phosphorus and magnesium levels increased in patient with menstrual disorders. It is therefore recommended that females with complaint of menstrual disorder should be evaluated for minerals level also specially calcium, magnesium and phosphorus along with identification of the actual biochemical derangement may be helpful in treatment of the menstrual disorder.

Abbreviations:

PCOS-Polycystic ovarian syndrome

AUB-Abnormal uterine bleeding

OPD- Outpatient Department

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