



Hypo-magnesium and Hyperlipidemia Responsible for Hypertensive Status of Pregnant Women in Pakistani Population

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Authors' contributions

This work was carried out in collaboration among all authors. Author AP designed the study, guided for practical work, wrote the protocol and wrote the first draft of the manuscript. Author KF performed the experimental work, wrote the protocol and managed the literature searches. Author FA managed the analyses of the study and literature searches. Author MM managed the literature searches and review of manuscript. Author NZ managed the literature searches and review of manuscript. Author ASS managed the literature searches and review of manuscript. Author QA managed the literature searches and performed the critical review of manuscript. Author RA performed the statistical analysis. Author AM performed critical proof reading of manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background/ Aim: Pregnancy induced hypertension (PIH) has been a leading cause of maternal mortality worldwide. It could be responsible for several complications like hemodilution, altered lipid metabolism and deficiencies of different minerals in body. Although the causes of Pregnancy induced hypertension (PIH) remains indistinct. The aim of our present study was to evaluate the changes in magnesium serum levels and lipid profile in hypertensive and normotensive pregnant women.

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Materials and Methods: An analytical case control study comprising 60 individuals was designed. From which 30 normotensive pregnant women served as control group (A) and 30 pregnancy induced hypertensive women served as case group (B). Patients with pre-existing hypertension were excluded.

Results: The independent t-test was used for comparison of various parameters between group A and B. Triacylglycerol (TAG) and low density lipoprotein cholesterol (LDL-C) levels were significantly high in PIH (B) as compare to normotensive group (A). Mean serum values of TG were measured as (195.73 ± 70.28 vs 156.27 ± 55.60 mg dL⁻¹) and LDL-C vs control (87.33 ± 37.74 vs 69.45 ± 28.58 mg dL⁻¹) in PIH and normotensive groups respectively. HDL-C in PIH vs Control (47.40 ± 1.12 vs 54.43 ± 1.27 mg dL⁻¹) and Mg⁺² PIH vs control (1.36 ± 0.07 vs 1.94 ± 0.35 mg dL⁻¹) were measured respectively. High density lipoprotein cholesterol (HDL-C) and magnesium Mg⁺² levels were significantly reduced in PIH.

Conclusion: The lower serum magnesium levels and abnormal lipids profile may indicate their possible role as risk factors in the development of PIH in pregnant women. Hence initial diagnosis of hypomagnesemia in PIH cases may help in minimizing the complications and development of new cure strategies.

Keywords: Pregnancy; triglyceride; hypertensive; normotensive; dyslipidemia.

1. INTRODUCTION

Pregnancy induced hypertension is a risk factor of maternal health which leads to a lot of complication including the most adverse internal bleeding, and short term hepato-nephro complications. Currently, pregnancy induced hypertension (PIH) has become main obstetric problem for healthcare practitioners. PIH is very frequent and it often affects maternal morbidity and fetal development. Globally, 12% maternal mortality cases have been reported during pregnancy and puerperium, from which 16% in developing countries while 9% recorded in developed countries [1,2]. Hypertension is directly linked with high levels of triglycerides (TG), total cholesterol (TC), low density lipoprotein (LDL) and co- currently low level of High density lipoprotein (HDL) also [3]. Lipid profile parameters like TG, TC and LDL are reputed as bad cholesterol plays pivotal role during hypertension. Usually, hypertensive pregnant women showing high levels of TC, TG, LDL and VLDL whereas, the level of HDL is decreased as compared to normotensive pregnant women [4]. Abnormal lipoproteins' levels are responsible for damage of endothelium that leads to high blood pressure and proteinuria; these are major signs of pregnancy-induced hypertension [5]. Lipid profiles are significant parameters along with many others for identification of PIH [1,6-9]. Magnesium is an essential element it may use as an identification factor for PIH and 4th most abundant factor in our body. It may influence blood pressure by modulating vascular tone and cardiac excitability. Its deficiency may also play an important role in

pregnancy induced hypertension [10]. So in the present study we investigated the effect of altered magnesium and serum lipid profile levels in hypertensive pregnant women as compared to normotensive pregnant women.

2. METHODS AND METHODOLOGY

The study was conducted at PMRC lab Sir Ganga Ram Hospital Lahore, Pakistan and Institute of Molecular Biology and Biotechnology (IMBB), The University of Lahore. Blood samples of all individuals were collected from Sir Ganga Ram Hospital Lahore. For present study, a total of 60 participants were selected. According to their blood pressure were divided into two groups i.e. 30 for normotensive (A) pregnant women (26.30 ± 3 years) and 30 for hypertensive pregnant women (24.40 ± 3 years). Normotensive pregnant women were represented as a control group whereas; hypertensive pregnant women were taken as a test group for evaluation of serum lipid profile parameters.

2.1 Inclusion Criteria

Pregnant women age 26.30 ± 3 years, who already diagnosed with PIH and had same dietary habit due to similar socio economic status.

2.2 Exclusion Criteria

The patients with all maternal and fetal abnormalities excluded from both control and test group excluded abnormalities were renal

disease, diabetes, hepatic dysfunction, and pre-existing state of hypertension.

2.3 Biochemical Analysis

The serum levels of the lipid profile such as Total Cholesterol (TC), Triglyceride (TGs), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and Very Low Density Lipoprotein (VLDL) were measured by enzymatic kit method by using human Diagnostic's kits and serum magnesium was determined by Calmagite method by Human Diagnostic's kits, Germany [11] at Institute of Molecular Biology and Biotechnology, The University of Lahore, Lahore, Pakistan.

2.3.1 Blood pressure measurements

Blood pressure was measured with mercury sphygmomanometer by qualified obstetrics nurses in the Gynecology ward of Ganga Ram Hospital, for accuracy stethoscope used according to the guidelines of American Heart Association. All readings were recorded after giving 5 minutes of rest.

2.3.2 Sample collection and preparation

Blood samples were collected from all participants in Gynecology ward of Sir Ganga Ram Hospital, Pakistan and dispensed into vacuaiter® plain tubes and then were taken to Institute of Molecular Biology and Biotechnology, The University of Lahore, Lahore, Pakistan for serum extraction. The serum obtained after centrifugation was used for estimation of serum lipid profile.

2.3.3 Biochemical analysis of serum lipid profiles

The serum levels of the lipid profile such as TC, TGs, HDL, LDL and VLDL were measured by human Diagnostic's kits and serum magnesium was determined by Calmagite method by Human Diagnostic's kits, Germany [11] at Institute of Molecular Biology and Biotechnology, The University of Lahore, Lahore, Pakistan.

2.4 Statistical Analysis

The collected data from normotensive and hypertensive pregnant women were mounted on computer software package SPSS version 16 (SPSS, Inc., Chicago, IL, USA) and expressed

as mean \pm SD. Level of significance between case and control group were performed using the Student *t-test*. *P* value < 0.05 was considered statistically significant. The main statistical comparison was performed between normotensive and hypertensive pregnant women.

3. RESULTS

The obtained results showed that lipid profile parameters were significantly altered in PIH pregnant women as compare to normotensive pregnant women (Table 2). Demographic data obtained from selected participants regarding BP, age, weight, height and BMI was presented in Table 1. The magnesium level was significantly lower in PIH women in comparison with normotensive women. While all lipid profile parameters significantly increased including TC, TG, LDL-C, VLDL-C except HDL (Table 2).

4. DISCUSSION

In the present study we investigated the lipid profile parameters and magnesium serum levels in PIH and non- PIH pregnant women. By reviewing previous recent years literature about status of lipid profile in pregnancy, it has noted that with progression of pregnancy age the lipid profile also increases gradually among all the pregnant women. Similarly results of current study indicated as the serum levels of TG, VLDL, LDL and Total Cholesterol levels were significantly increased in the hypertensive group than the normotensive group, while level of HDL was decreased comparatively [3,4,12-14]. TG gains extraordinary position among other parameters as hypertriglyceridemia directly associated with PIH as described in early studies. Estrogen modulates hypertriglyceridemia mainly by hepatic synthesis of triglycerides and higher TG affects endothelial through generation of LDL and VLDL during hypertensive pregnancy status [2,13,15-19]. During hypertensive phase of pregnancy free fatty acids especially linolenic acid and TG concentrations are detected higher in blood. Linolenic acid is main stimulator of oxidative stress in endothelial cells by disturbing the balance of peroxidases and antioxidants. Several researchers have reported that the abnormal lipid profile and oxidative stress in endothelial cell having significant role in the pathophysiology of preeclampsia.

Table 1. Comparison of socio-demographic and reproductive characteristics among hypertensive and normotensive pregnant women

Variables	Group-A (N=30) Mean ± SD	Group-B (N=30) Mean ± SD	P-value
Age	26.30 ± 3.21	24.40 ± 3.33	0.02
BP (mm Hg)	1.16 ± 5.04	1.35 ± 7.30	0.000
Trimester	2.47 ± 0.57	2.63 ± 0.56	NS
No of pregnancies	1.20 ± 1.21	1.33 ± 1.27	NS
Weight (Kg)	61.93 ± 11.99	67.83 ± 10.99	0.05
Height (cm)	1.54 ± 5.25	1.54 ± 6.44	NS
BMI (Kg/m ²)	26.21±4.85	28.78±5.56	NS

NS: Non-significance

Table 2. Comparison of biochemical parameters in hypertensive pregnant women

Parameter	Normal range (mg dL ⁻¹)	Controls (N=30) Mean±SD	Patients (N=30) Mean±SD	P-value
TC	140-200	155.13±30.97	171.90±39.68	0.07
HDL-C	40-60	54.43±6.97	47.40±6.14	0.000***
TG	25-150	156.27±55.60	195.73±70.28	0.01*
LDL-C	100-129	69.45±28.58	87.33±37.74	0.04*
VLDL-C	5-30	31.25±11.12	37.17±10.01	0.03*
Mg ⁺²	1.5-2.5	1.94±0.28	1.36±0.40	0.000***

High density lipoproteins good for our health it help to regulates the blood pressure (BP) towards normal level. Decreased HDL level is linked with hypertriglyceridemia, where high level of TG rich HDL particles rapidly catabolized by hepatic activity. HDL was significantly reduced in hypertensive pregnant women these findings admitted the already published reports [4,20-23]. Lipid profile values and BP profound with passage of each trimester as reported in already published data. The serum magnesium level was lowered significantly during pregnancy as its utilization increased many folds. While condition is more adverse in hypertensive pregnancy. Hypo- magnesium is observed in certain cases as reported by [3,20,24-26]. Similarly, in current study the serum level of magnesium was lowered in hypertensive group as compared to normal. Lowered magnesium level and increased lipid profile parameters can be fetal for survival and growth of fetus also.

5. CONCLUSION

The findings of present study suggest that abnormal levels of lipid profile especially TG, LDL and VLDL may contribute in the promotion of hypertension in pregnant women. Especially low HDL-C and higher TG levels increase the endothelial dysfunction and oxidative stress. So,

lipid profile and magnesium serum levels should be monitored at regular interval during pregnancy. It will be helpful for early diagnosis of hypertensive status and its management. It is recommended to improve the lipid status and decrease the risk of developing high blood pressure related complications by intake of magnesium supplementation in pregnancy. Further an oral intake of magnesium as supplement may decreases the level of pathological lipids markers (especially TG) and their role in pathogenesis of hypertension.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The study was approved from Research Ethical Committee IMBB-The University of Lahore with reference to letter (IMBB/UOL/20/416).

DISCLAIMER

The products used for this research are commonly and predominantly use products in our

area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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