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Dietary intake of Calcium and Magnesium in subjects with Pregnancy Induced Hypertension

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Background

- Pregnancy Induced Hypertension (PIH), comprising of both proteinuric (preeclampsia or PE) and nonproteinuric (gestational hypertension or GH), is one of the major complications of pregnancy which, if uncontrolled, may lead to eclampsia with potentially life threatening consequences for the mother as well as for the child.
- It complicates 3-5% first pregnancies and 1% of subsequent pregnancies with around 5-10% cases being severe.

  The incidence of PIH is particularly high in developing countries due to lack of proper antenatal care and it is thought to be nearly 20% among Bangladeshi pregnant women.
- Geographic, social, economic and racial differences are responsible for an incidence that is up to three times higher in some populations
- Recent studies have emphasized the possible role of general nutritional deficiency or imbalance of several specific nutrients in the etiology of the disease.
- Inadequate calcium (Ca) and magnesium (Mg) intake is considered a public health problem in some vulnerable groups, especially pregnant women.
- Balanced diet during pregnancy with adequate Ca and Mg should be the ideal solution and to proceed in this direction evidence is required on the nature and extent of Ca and Mg deficiency in the diet of PIH mothers.

Aim of the Study

- To assess the dietary intake of Ca and Mg in PIH (compared to Non-PIH) mothers.
- To explore the factors affecting the intake of those nutrients.

Materials and methods

Study design

- Observational analytic study with a group comparison design.

Place of study

- The study was conducted under joined supervision of the Institute of Nutrition and Food Sciences (INFS), Dhaka University and Bangladesh University of Health Science (BUHS).
- The study subjects were collected from the Out-Patient Departments of four secondary/tertiary level hospitals of Dhaka city after approval of institutional heads and ethical review committee as appropriate.

Study subjects and area

- In this study, we recruited 300 Bangladeshi pregnant women including GDM in two groups (with and without PIH).
- Of the total, 150 subjects were normal Non-PIH women and 150 subjects were PIH women.
- All of them were aged between 20-40 years, at the 3rd trimester of pregnancy who had attended selected urban heath centers in Dhaka

Methods of data collection

- The history of the subjects includes detailed sociodemographic data, family history and medical history were assessed by an interviewer-administered questionnaire.
- Anthropometry measurement was also recorded.

Dietary Assessment Technique

(Assessment of Ca and Mg rich dietary intake):

- By using food frequency method, dietary history (daily/weekly/monthly/1st 6 months of pregnancy/never) and frequency of Ca and Mg rich foods intake among the pregnant women were assessed.
- There was about 100 food items include in the questionnaire regarding intake of Ca and Mg rich vegetables, green leafy vegetables, fruits, cereals, legume and animal foods etc.
- In order to estimate the amount of usual Ca and Mg intake during pregnancy, the fractional portion size of each food consumed per day was multiplied by its Ca and Mg content, obtained from the national food composition table (Gopalon, Helen Keller, Swaminathan).
- The value were then summed up to obtain an estimate of an individual's total daily Ca and Mg intake.

Results

- The dietary Ca intake [(mg/day), Median (Range)] was significantly lower [265(111-487)] in the PIH than in the Non-PIH [350(201-984); (p<0.001)] group.
- Mg (mg/day), was also found to be significantly lower in the PIH [235(122-391)] than in Non-PIH [309(306-497); (p<0.001)].
- On bivariate analysis, the dietary Ca and Mg intakes had significantly negative correlation with mean blood pressure which considered an indicator of the severity of PIH(r=-0.276;p<0.001) and(r=-940;p=021) for Ca and Mg respectively.
- On regression analysis, PIH was found to be significantly associated with lower intake of Ca (=-0.009;p<0.001) and Mg (=-0.016;p<0.001) when the effects of age, family history of HTN, diabetes and family income were adjusted.

Table 1: Socio demographic characteristics of the study subjects (n=300)

Characteristics	Non PIH	NPIH	p value
Location			
Urban	92(61.3)	56(37.3)	<0.001
Rural	49(32.7)	75(50)	
Semi Urban	9(6)	19(12.7)	
Educational status			
Illiterate	7(5)	10(6.7)	0.288
Primary	31(21)	28(18.7)	
6-10 class	38(25.3)	34(22.7)	
Secondary	42(28)	37(24.7)	
Higher secondary	18(12)	20(13.3)	
Graduate	14(9.4)	21(14)	
Occupation			
House wife	130(86.7)	136(90.7)	0.622
Service Holder	6(4)	5(3.3)	
Business	6(4)	3(2)	
Student	5(3.3)	2(1.3)	
Maidservant	3(2)	4(2.7)	
Monthly income			
Low income	18(12)	36(24)	0.022
Middle	92(61.3)	89(59.3)	
Upper middle	34(22.7)	22(14.7)	
Upper	6(4)	3(2)	
Family history of HTN			
Yes	33(22)	66(44)	<0.001
	104(69.3)	48(32)	

Figure 1: The distribution of area in the study subjects (n=300)

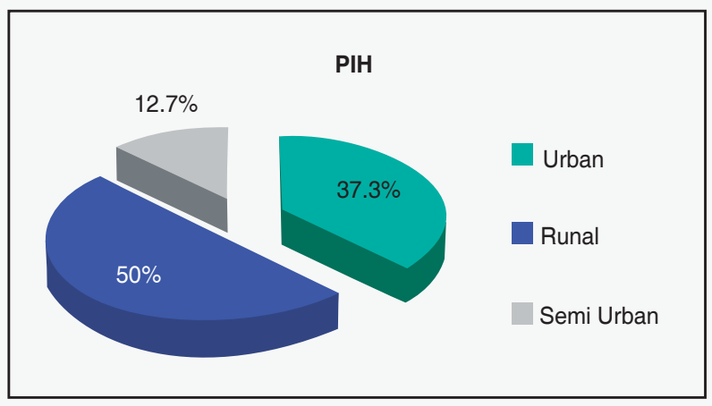

Table 2: The Clinical characteristics of the total study subjects (n=300)

Characteristics	Non PIH	PIH	P value
Age (yrs)	25±5	26±5	0.299
BMI (kg/m2)	26±3.5	34±3.7	<0.001
SBP (mm of Hg)	120(58-130)	150(130-230)	<0.001
DBP (mm of Hg)	70(62-90)	100(80-140)	<0.001
MBP	86(70-100)	120(105-170)	<0.001

Results are expressed as Mean±SD and median (range) as appropriate; n= number of subjects; Independent t-test, Mann-Whitney U test were done as tests of significance, according the nature and distribution of variables. BMI=Body Mass Index, SBP=Systolic Blood pressure, DBP=Diastolic Blood Pressure

Table 3: The daily dietary Ca and Mg intake of the study subjects (n=300)

Variables	Non PIH (n=150)	PIH (n=150)	P value
Dietary intake of Ca (mg/day)	390.8±160	272.9±69	0.001
	350(201-984)	265(111-487)	0.001
Dietary intake of Mg (mg/day)	313.6±72	237.1±52	<0.001
	309(306-497)	235(122-391)	0.001

Results are expressed as Mean±SD and median (range) as appropriate; n= number of subjects; Independent t-test, Mann-Whitney U test were done as tests of significance, according the nature and distribution of variables

Table 4: The main sources of Ca intake of the study subjects (n=300)

Variables	Non PIH (n=150)	PIH (n=150)	P value
Cereal	47.7(19.45-95.9)	45.5(19.47-79.7)	0.008
Legume	33.4(1.64-194.2)	27.5(0.57-85.5)	0.011
GLV	5.7(.08-38.3)	5.7(0.21-33.7)	0.839
Veg	17.1(6.38-75.4)	17.8(3.02-63.9)	0.890
Fruits	9.5(2.62-143.9)	9.1(2.96-43.4)	0.672
Fish	138.1(41.49-345.9)	128.9(24.35-376.2)	0.008
Meat & Dairy	43.8(2.45-603)	15.6(1.06-345.7)	<0.001
Other (betel leaves etc)	1.3(0.00-66.9)	1.8(0.00-20.3)	0.017

Results are expressed as median (range); n= number of subjects; Mann-Whitney U test were done as tests of significance, GLV-Green leafy vegetables; Veg-vegetables

Table 5: The main sources of Mg intake of the study subjects (n=300)

Variables	Non PIH (n=150)	PIH (n=150)	P value
Cereal	139.8(67.57-293.6)	135.2(63.97-287.6)	0.211
Legume	32.7(1.08-174.5)	26.6(.73-86.2)	0.060
GLV	4.6(.62-15.4)	4.6(1.06-15.4)	0.911
Veg	9.7(4.83-37.08)	9.8(1.45-27.6)	0.675
Fruits	42.7(2.5-208.9)	43.2(0.75-476.2)	0.351
Fish	0.5(.00-2.03)	0.3(.00-3.0)	0.096
Meat & Dairy	8.7(1.13-88.9)	5.3(.70-47.2)	<0.001
Other (betel leaves etc)	1.3(0.00-129.4)	1.2(0.00-27.3)	<0.001

Results are expressed as median (range); n= number of subjects; Mann-Whitney U test were done as tests of significance, GLV-Green leafy vegetables; Veg-vegetables

Table 6: The correlation coefficient of Ca intake with other variables in the Non PIH and PIH groups (n=300)

Parameter	Non PIH (n=150) r	Non PIH (n=150) P	PIH (n=150) r	PIH (n=150) p
Age (yrs)	0.046	0.580	0.025	0.763
BMI (kg/m2)	-0.112	0.476	-0.030	0.733
Gestational week	-0.154	0.060	0.036	0.666
FHHTN	0.061	0.459	0.081	0.323
Family Income	0.430	0.002	0.246	<0.001
SBP	-0.056	0.498	0.075	0.361
DBP	-0.056	0.496	-0.051	0.536
MBP	0.045	0.638	-0.276	<0.001

Spearman's correlation coefficient's test was done as a test of significance. FHHTN=Family history of hypertension, SBP=Systolic Blood pressure, DBP=Diastolic Blood Pressure. MBP=Mean Blood Pressure

Table 7: The correlation coefficient of Mg intake with other variables in the Non PIH and PIH groups (n=300)

Parameter	Non PIH (n=150) r	Non PIH (n=150) P	PIH (n=150) r	PIH (n=150) p
Age (yrs)	0.083	0.319	0.049	0.551
BMI (kg/m2)	0.045	0.636	0.158	0.070
Gestational week	-0.090	0.273	-0.065	0.430
FHHTN	0.044	0.595	0.119	0.147
Family Income	0.128	0.120	0.312	<0.001
SBP	0.003	0.969	0.040	0.624
DBP	0.001	0.990	0.096	0.244
MBP	0.957	0.066	-0.940	0.021

Spearman's correlation coefficient's test was done as a test of significance. FHHTN=Family history of hypertension, SBP=Systolic Blood pressure, DBP=Diastolic Blood Pressure. MBP=Mean Blood Pressure

Table 8: Association of PIH with various parameters as explored by binary logistic regression (n=300)

Variable	β-Value	P value	Exp(B)	95.0% CI Lower	95.0% CI Upper
Age (yrs)	0.026	0.384	1.026	0.968	1.088
Family history of HTN	0.187	0.001	1.206	1.095	1.328
Family Income	0.178	0.460	1.195	0.745	1.918
Dietary intake of Ca	-0.009	<0.001	0.991	0.988	0.995
Dietary intake of Mg	-0.016	<0.001	0.984	0.979	0.989

Spearman's correlation coefficient's test was done as a test of significance. FHHTN=Family history of hypertension, SBP=Systolic Blood pressure, DBP=Diastolic Blood Pressure. MBP=Mean Blood Pressure

Conclusion

The data lead to the following Conclusions:

- Dietary consumption of Ca and Mg during pregnancy are much lower than those recommended in our population.
- PIH seems to have an association with dietary deficiency of Ca and Mg in our pregnant women.
- Inadequate of Ca and Mg are related to low intake of fish meat and dairy products which, in turn, may have a linkage with family income of a woman.