RESULTS

This prospective, clinical study was conducted on 300 primigravidae who attended the antenatal care clinic in Benha teaching hospital, in the period from ***June 2009 to January 2010.*** The aim was to determine the value of a single measurement of maternal serum B-hCG, done at 16-20 weeks gestation in anticipation and prediction of the occurrence of pregnancy induced hypertension (PIH) and pre-eclampsia later in pregnancy.

All the 300 primigravidae were Egyptians from the same hospital draining areas, and fulfilled the following inclusion criteria:

- No family history of pre-eclampsia or gestational hypertension.
- No pre-existing hypertension.
- No diabetes mellitus, cardiac or renal disease.
- Age 17-29 years.
- Gestational age 16-20 weeks.
- Weight 50-75kgm.
- No proteinuria in a mid-stream, clean catch urine sample, by the dipstick test.
- Singleton pregnancy.

The results of the study are shown in the following tables and graphs.

Table (1): Clinical characteristic of the studied primigravidae (n. = 300).

Parameter	Range	Mean ± SD
Age (yrs)	17-29	23.5 ± 2.1
Gestational age (wks)	16-20	18.4 ±1.4
SBP (mmHg)	100-120	112.7 ± 7.8
DBP (mmHg)	60-75	71.3 ±7.9
Weight (kgm)	50-75 kg	63.5 ± 6.3

* SBP =systolic BP. *DBP=diastolic BP.

Twenty one primigravdae (7%) developed mild pre-eclampsia later in pregnancy. No one developed severe pre-eclampsia and none had pregnancy-induced hypertension. Two hundred and seventy nine primigarvidae (279=93%), remained normotensive.

From the normotensive primigarvidae, 21 who matched the pre-eclampatic primigarvidae (n=21), were selected as controls. Stored- frozen sera, collected at 16-20 weeks gestation, from both groups were analyzed for serum B-hCG level.

Table (2): Base-line clinical characteristics of the 21 primigarvidae who developed pre-eclampsia later in pregnancy.

Case No	Age (Yrs)	Gestation (wks)	Weigh (Kgm)	proteinuria	SBP (mmHg)	DBP (mmHg)
1	24	16	68	-ve	110	70
2	21	16	63	-ve	100	70
3	19	20	70	-ve	110	80
4	27	18	73	-ve	120	70
5	18	20	55	-ve	100	55
6	25	17	65	-ve	100	60
7	29	18	82	-ve	115	70
8	27	19	73	-ve	110	70
9	22	18	67	-ve	120	75
10	24	20	66	-ve	120	80
11	28	18	81	-ve	120	70
12	20	18	70	-ve	110	80
13	19	17	75	-ve	120	80
14	20	16	55	-ve	110	70
15	23	20	85	-ve	120	80
16	25	18	73	-ve	110	75
17	18	20	68	-ve	120	80
18	16	20	57	-ve	100	65
19	30	20	90	-ve	110	75
20	21	18	60	-ve	100	70
21	24	17	66	-ve	100	60

Table (3): Clinical data in the 21 primigarvidae who developed pre-eclampsia (PE) and the time of antenatal visit at which PE was detected.

Case No	Age (Yrs)	Gestation at discovery of PE (wks)	Weigh (Kgm)	proteinuria	SBP (mmHg)	DBP (mmHg)
1	24	33	72.5	+	140	90
2	21	28	70	+	145	95
3	19	32	87	+	142	93
4	27	29	80	+	140	90
5	18	30	60	+	145	92
6	25	32	74	++	140	90
7	29	25	87	+	144	95
8	27	٢٨	78	+	140	95
9	22	30	75	+	145	100
10	24	29	72.5	+	140	90
11	28	32	87	+	140	90
12	20	33	75	+	143	92
13	19	28	84	+	145	90
14	20	36	62	+	140	90
15	23	34	90	+	145	95
16	25	27	80	+	145	95
17	18	35	73	++	140	95
18	16	32	67	+	140	90
19	30	28	101	++	141	92
20	21	36	67	+	150	95
21	24	33	74	+	140	90

NB: PE = Bp ≥140/90 mmHg with proteinuria ≥ + 1 by dipstick test, in a mid-stream, clean- catch urine sample.

Table (4): Base-line clinical characteristics of the 21 primigravidae who did not develop pre-eclampsia later in pregnancy (normotensivs).

case No.	Age (years)	Gestational wks	weight (Kg)	proteinuria	SBP mmHg	DBP mmHg
1	25	16	65	−ve	120	80
2	23	18	57	−ve	110	60
3	27	20	61	−ve	100	50
4	25	19	70	−ve	110	70
5	21	18	67	−ve	120	70
6	23	17	75	−ve	100	60
7	24	17	56	−ve	90	65
8	28	20	90	−ve	110	70
9	20	16	69	−ve	110	65
10	29	18	72	−ve	100	70
11	21	19	75	−ve	120	80
12	23	20	68	−ve	115	70
13	27	20	66	−ve	120	75
14	26	16	82	−ve	120	80
15	22	17	73	−ve	100	60
16	24	18	65	−ve	110	70
17	20	19	67	−ve	120	80
18	29	16	72	−ve	100	60
19	21	20	83	−ve	120	80
20	24	20	59	−ve	110	75
21	25	19	68	−ve	100	60

Table (5): Matching between primigravidae who developed pre-eclampsia later in pregnancy (n=21) and selected primigarvidae who remained normotensive (n=21) later in pregnancy (n=21).

Base line (16-20 w)	Group	N	Mean	St. Deviation	t	P
Age (Yrs)	Pre eclampsia	21	22.43	3.906	1.757	0.079
	Normotensive	21	24.24	2.791		
GA (Wks)	Pre-eclampsia	21	18.14	1.424	.220	.833
	Normotensive	21	18.24	1.513		
Wt (Kgs).	Pre-eclampsia	21	69.05	8.800	0.126	0.900
	Normotensive	21	69.52	8.471		

*Both groups were Egyptian primigravidae, from the same hospital drainage areas

The table shows that, both groups matched (P>0.05).

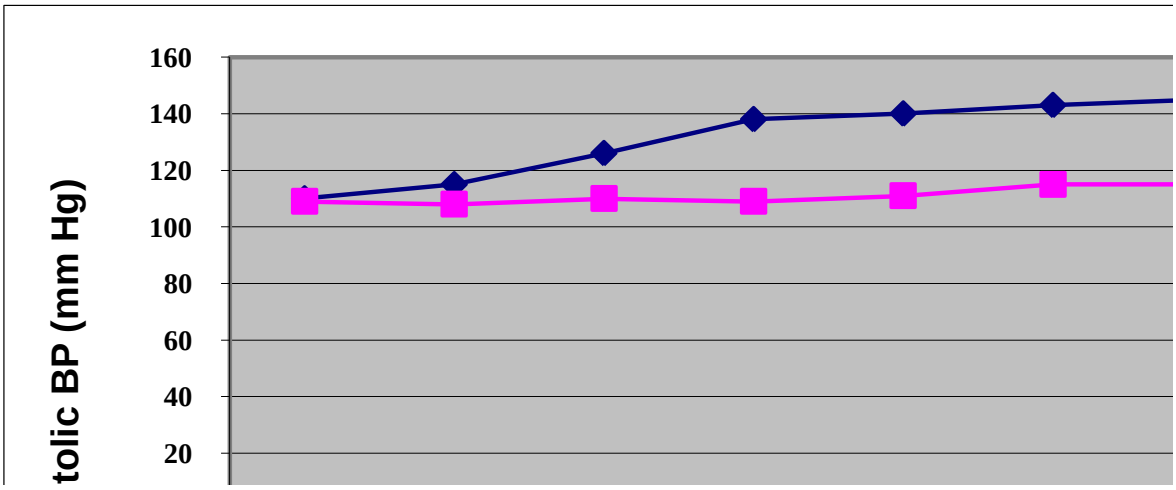
Table 6 and graphs 1 and 2 show mean(SD) changes in systolic and diastolic B.P at serial antenatal visits in primigravidae who developed pre-eclampsia (n=21) and those who did not i.e. normotensivs (n=21).

Table (6): Changes in mean (SD) blood pressure at serial antenatal visits in primigarvidae who developed pre-eclampsia (n=21) and in those who did not (normotensivs) (n=21).

Serial blood pressure at antenatal visits	Pre-eclampsia (n=21)		Normotensives (n=21)		P value
	Mean	(SD)	Mean	(SD)	
Base line					
(16-20) S	110.11	(8.106)	109.76	(9.284)	0.802
D	71.43	(6.606)	69.05	(8.605)	
(>20-24w) S	115.24	(7.496)	108.81	(8.931)	0.015
D	76.67	(5.083)	69.71	(6.612)	
(>24-28w) S	126.19	(12.40)	110.24	(9.011)	0.000
D	71.43	7.606	71.43	(7.606)	
(>28-32w) S	138.10	(8.136)	109.52	(9.201)	0.000
D	89.52	(6.501)	71.67	(7.130)	
(32-36w) S	140.24	(9.679)	111.90	(8.729)	0.000
D	89.17	(5.680)	73.10	(6.978)	
(>36-38w) S	143.25	(8.777)	11559	(15.800)	0.000
D	90.25	(9.072)	75.00	(11.319)	
(>38-40w) S	141.82	(11.017)	108.57	(8.997)	0.000
D	90.91	(7.355)	71.43	(6.268)	

Table (6): Shows that there was no statistically significant difference between the two groups regarding mean systolic or diastolic blood pressure at baseline 16-20 weeks visit ($p>0.05$). The mean B.P. however, started to be significantly higher in the pre-eclampsia group from >20-24w gestation ($p < 0.05$) and the level of significance increased with advancement of pregnancy.

Graph (1): Graph of mean systolic blood pressure changes at serial follow up antenatal visits in the pre-eclampsia (n=21) and normotensive groups (n=21).



Graph (2): Graph of mean diastolic blood pressure changes at serial follow up antenatal visits in the pre-eclampsia (n=21) and normotensive group (n=21).

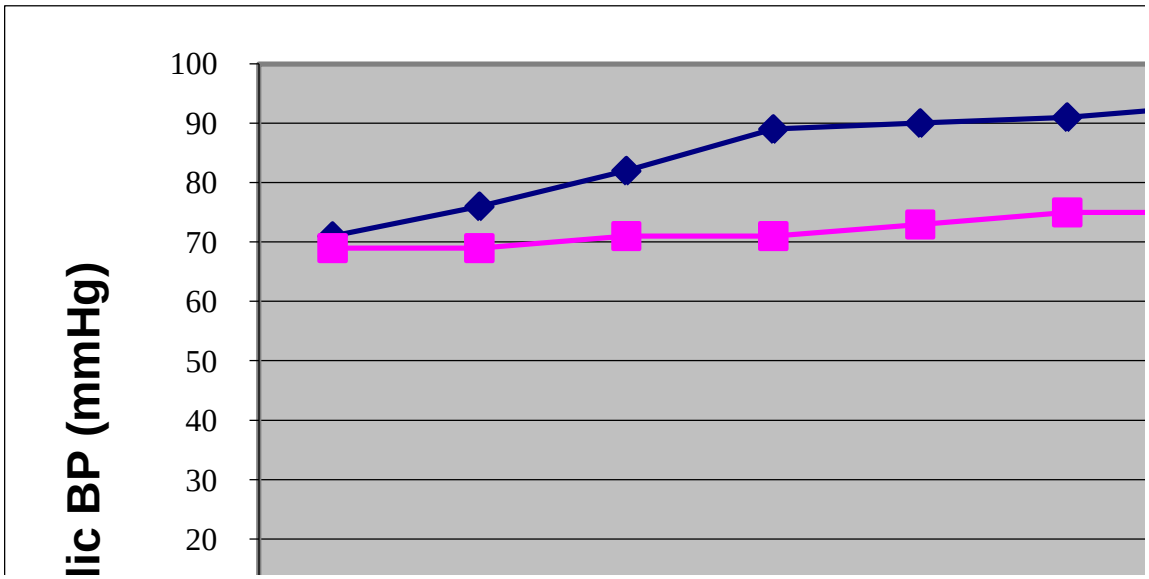


Table 7 and graph 3 show mean weight changes at serial antenatal visits in primigravidae who developed pre-eclampsia (n=21) and in those who did not i.e. normotensivs (n=21).

Table (7): Mean weight changes at serial antenatal visits in primigravidae who developed pre-eclampsia (n=21) and in those who did not (normotensivs) (N=21).

Serial weight at antenatal visits	Group	Mean	Standard deviation	P value
Base line (16-20w)	Normotensive PE	69.52 69.05	8.471 8.800	.071
(>20-24w)	Normotensive PE	71.238 72.167	8.5127 9.3599	.061
(>24-28w)	Normotensive PE	73.33 73.69	8.763 8.764	.053
(>28-32w)	Normotensive PE	77.690 78.929	8.9351 8.8081	.045
(>36-38w)	Normotensive PE	80.15 82.18	9.514 8.693	.043
(>38-40w)	Normotensive PE	78.93 80.45	6.386 6.688	.042

Table 7 and graph 3 show that at the baseline 16-20 weeks visit there was no statistically significant difference between the two groups regarding mean weight ($p>0.05$). However mean weight started to be significantly more in pre-eclampsia group starting from the >28-32 weaks and the level of significance increased with advancement of pregnancy ($p<0.05$).

Graph (3): Graph of weight changes at serial follow up antenatal visits in the pre-eclampsia and normotensive groups.

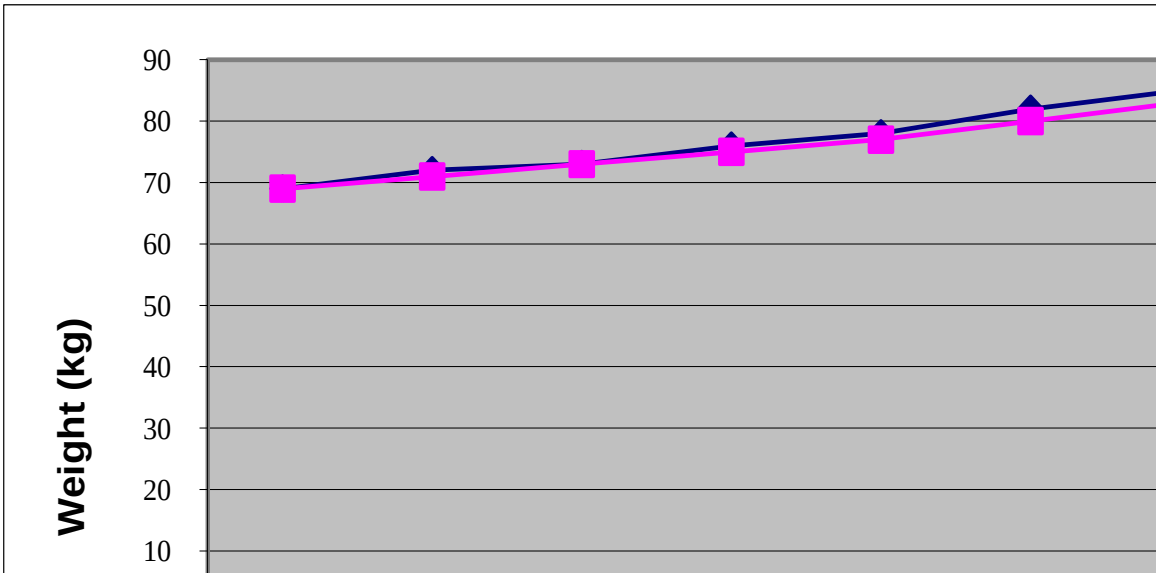


Table (8): Proteinuria at serial antenatal visits in primigarvidae who developed pre-eclampsia (n=21).

Proteinuria / Gestation (weeks)	Nil	+	++	Total
Base line (16-20)	21	0	0	21
(>20-24)	20	1	0	21
(>24-28)	10	10	1	21
(>28-32)	2	17	2	21
(>32-36)	1	17	3	21
(>36-38)	1	11	8	20*
(>38-40)	1	7	4	12*

This table shows that Proteinuria started to appear from >24-28 weeks gestation. Also, with advancement of pregnancy there were more cases with ++ Proteinuria.

*Number less than 21 because some primigravidae delivered.

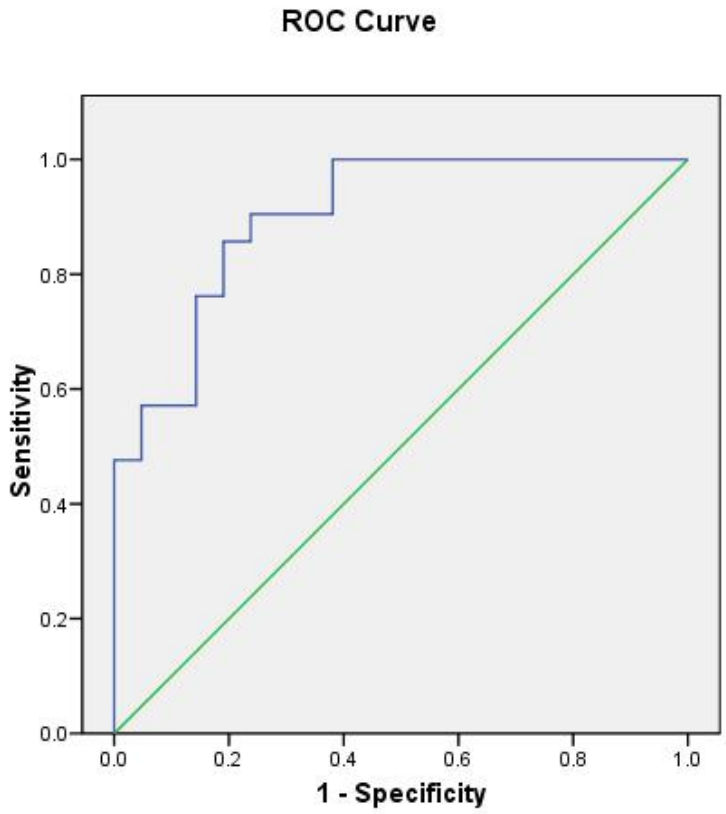
Table (9): Mean (±SD) serum B- human chronic gonadotrophin levels at 16-20 week gestation in primigarvidae who developed pre-eclampsia (n=21) and those who remained normotensive (n=21).

Data	Pre eclampsia (n=21) Mean ±SD	Normotensive (n=21) Mean ±SD	P value
Gestation (wks) at serum B-hCG measurement	18.14 ± (1.424)	18.24± 1.546	.826
Mean base line(16-20w) serum B-hCG mIu/mL	41904.76 ± 5439.713	28714.29 ± 1901.127	.0000
MoM base line serum B-hCG (16-20w)	1.9238 ± .37523	1.3089 ± .25919	.000

MoM = Multiple of the medians

Table (9) shows that pre-eclampatic cases had statistically significant higher serum mean BhCG compared to controls mean and higher MoM (P 0.000).

Receiver Operator characteristic curve (ROC curve) was done to evaluate and determine different cut-off values of the test according to required sensitivity and specificity.



According to the ROC curve, the cut-off level of base-line B-hCG MoM measurement done at 16-20 weeks gestation that was considered to have predictive value for later development of PE was 1.6 MoM, with a sensitivity of 85.7% , specificity of 81% ,+ve predictive value of 81.82% and -ve predictive value of 85% and an overall accuracy of 83.33% .

This cuve indicates that BhCG level at 16-20 weeks pregnancy is considered as a good screening and predictor test for later development of PE, with highly sensitivity and specificity.

Table (10): Delivery data in primigarvidae who developed pre-eclampsia (n=21) and those who did not (normotensivs) (n=21).

Delivery data	Normotensive (n=21)	Pre-eclampsia (n=21)	P value
Normal vaginal delivery	15 (71.4%)	12(57.1)	0.415
Caesarean section	6 (28.4)	9 (42.9)	0.411
Birth weight (kgm)	3. 285 ± 0.3031	2.990 ± 0.2216	0.0003

- This table shows that 9 prinigravidae with pre-eclampsia delivered by caesarean section for the following indications.
- Fetal distress
- Precious baby.
- Cephalo pelvic disproportion.
- Elderly primigravida with a long history of infertility.