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Original Research Article

A quality improvement project to assess the feasibility and practicability of training women and their relatives about home blood pressure monitoring

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ABSTRACT

Background: Women with hypertensive pregnancies have a higher chance of developing subsequent hypertension, chronic renal disease and stroke. Lack of blood pressure (BP) monitoring in the postpartum period, only augments this risk. Keeping this is mind, this study was formulated, to enable women to timely detect any such complication later on in their life.
Methods: In a tertiary healthcare hospital, postpartum women with hypertension in pregnancy and their relatives were sought consent from, enrolled into the study and trained on self-BP monitoring using an electronic BP measuring device. The feasibility outcome measures were "ease of use" of device by the participant, and the ability to correctly measure blood pressure with appropriate reporting of the value.
Results: A total 47 pairs of women and their relatives participated in this study, at the end of which, 89.4% of the patients and 78.7% of the relatives were able to handle the device properly and take their own BP, with appropriate interpretation of the value. Participants who had a higher level of education were more likely to have understood the significance of the practice and comply with it. Moreover, about 70% of patients' and 72% of relatives were willing for home blood pressure monitoring (HBPM).
Conclusions: Feasibility and practicability of training women/relatives about home blood pressure monitoring were demonstrated in this study. Thus, a postpartum remote hypertension monitoring programme, which involves educating the patient and their family members to enable them to monitor their BP at home or a nearby primary centre, is the need of the hour.

Keywords: Home blood pressure monitoring, Hypertension, Postpartum

INTRODUCTION

Hypertension in pregnancy includes pre-existing hypertension in pregnant women, gestational hypertension, preeclampsia and eclampsia- preeclampsia being a major cause of maternal and perinatal morbidity and mortality, leading to 10-15% of maternal deaths.[1]

Lack of blood pressure (BP) monitoring in the postpartum period, may cause complications and consequences to be missed. Residual hypertension may persist even after 6 months. Stroke, recurrent preeclampsia, chronic renal disease are some other consequences. A study by Marin et al revealed that women with hypertensive pregnancies may develop subsequent hypertension after an average of 13.6 years from the index pregnancy. Gestational

hypertension was the hypertensive disorder of pregnancy with the highest incidence of subsequent hypertension (54%) (p value <0.001).[2]

Additionally, preeclampsia and gestational hypertension were found to be associated with a higher risk of developing chronic kidney disease (CKD) during follow-up.[3]

The guidelines on postpartum care by the Federation of Obstetric and Gynaecological Societies of India advise monitoring blood pressure 4-6 hourly for the first 24-48 hours postpartum. BP monitoring should be continued for 6 weeks with periodic BP check-ups at 48 hours, 6 days, 15 days and 42 days.[4]

A study done in the United States of America (USA) brought to light the increased risk of postpartum readmissions secondary to severe hypertension in women with antenatal hypertension.[5] Keeping this in view, postpartum care and counselling must be given to all women with antenatal hypertension to reduce the modifiable risk factors for hypertension and cardiovascular disease.

A postpartum remote hypertension monitoring programme, involving educating the patient and their family members to enable them to monitor their blood pressure at home or a nearby primary centre, is the need of the hour, especially in situations like the COVID-19 pandemic. Home blood pressure monitoring (HBPM) is being encouraged and rapidly being implemented in the United Kingdom (UK) because of COVID-19, following guidance by Royal College of Obstetricians and Gynaecologists (RCOG).[6]

Primary objectives

The primary objectives were to evaluate the practicability, and feasibility of educating patients and their relatives about blood pressure monitoring, implemented as a quality improvement measure at the hospital level for management of hypertension in postpartum women after discharge.

Secondary objectives

Secondary objectives were to evaluate the feasibility on the part of healthcare professionals to counsel and educate patients' relatives about the correct method of HBPM, and to evaluate retention of information by the family members/patient about the monitoring of BP by self at home.

METHODS

Study type

This study is a quality improvement project, an interventional cohort study, including women/relatives for the purpose of training them in HBPM. Women, who had hypertensive disease of pregnancy (i.e. during the antepartum period), and one of their relatives were approached for the study in the postpartum period.

Study place

The study was conducted in the department of obstetrics and gynaecology, King Edwards Memorial Hospital, Mumbai from November 2021-December 2021.

Selection criteria

Inclusion criteria

Patients and relatives above 18 years of age; and patients previously diagnosed with hypertension in pregnancy, including gestational hypertension, preeclampsia, eclampsia, chronic hypertension, and a new hypertension diagnosis postpartum.

Exclusion criteria

Patients' relatives not willing to participate, not using telephonic services/devices; and patients and relatives already trained in BP monitoring.

Procedure

The sampling technique used in this study was convenience sampling, depending on the willingness and availability to take part in the study.

The BP criteria for the diagnosis of hypertension during pregnancy is systolic BP (SBP) >140 mmHg and/or diastolic BP (DBP) >90 mmHg, on two separate occasions, 4 hours apart. After giving consent to enrol in the study, women and one of their relatives were educated about the use of BP devices, by a healthcare professional. After gaining consent, maternal and obstetric sociodemographic data including education, religion, parity, maternal age, and treatment/management during the antenatal period for gestational hypertension/chronic hypertension/ preeclampsia/eclampsia, method of delivery was obtained. A patient information sheet was used for giving information to the participants with an attached consent form, both to the woman and the relative, explaining the study purpose, the possible benefits of the study, the right to withdraw at any time during the study, and that confidentiality was maintained throughout the study through coding.

For the purpose of training electronic BP measuring devices were used, which are used by the practitioners, are easy to use and record. Retainment of information was checked after 48 hours, by asking the relative/patient to demonstrate the method of taking BP correctly. In case of failure/inability to correctly demonstrate, the relative/patient was taught the procedure again carefully, imparting the knowledge given in the first session. For

each participant, the number of sessions taken by the healthcare professional was recorded. The retention of information given was checked one final time before discharge, by the same healthcare professional. The patient/relatives were educated about normal/abnormal readings and the importance of immediately going to a healthcare practitioner for a more thorough workup. All patient information recorded for study purposes was coded to maintain confidentiality.

Participants were also counselled about the need to regularly monitor their BP, even after the postpartum period, as patients are at high risk to develop hypertension later in their lives.

Ethical approval

Ethics approval for this study was granted by the institutional ethics committee (IEC) of Seth G.S.M.C and King Edward Memorial Hospital, Mumbai.

Statistical analysis

Statistical package for the social sciences (SPSS) software was used for the analysis of data.

RESULTS

A total of 94 persons participated in the study, out of whom 47 (50%) were postpartum women with hypertension during the index pregnancy and 47 (50%) were relatives of those patients (relation with the patient - 34% sister-in-law, 27.7% mother-in-law, 23.4% mother, 14.9% husband) (Table 1).

Table 1: Demographic data.

Variables	Patient (%)	Relative of the patient (%)
Mean age	26.38	39.4
Religion		
Hindu	30 (63.8)	31 (66)
Muslim	16 (34)	16 (34)
Christian	1 (2.1)	-
Level of education		
Post-graduation	1 (2.1)	-
Graduation	15 (31.9)	11 (23.4)
Intermediate	9 (19.1)	5 (10.6)
Matriculation	13 (27.7)	7 (14.9)
Middle school	5 (10.6)	15 (31.9)
Primary school	4 (8.5)	9 (19.1)

The clinical variables of the patients-parity, past history of abortion/IUFD, antepartum medications for PIH and mode of delivery were noted. The indications of cesarean section were mixed-fetal as well as maternal (Table 2).

As shown in Table 3, on day 1 after delivery, a large number of patients had stage 1 (46.8%) and stage 2 (27.7%) hypertension. 17% of patients had normal BP, whereas 8.5% had elevated BP.

Table 2: Patient's clinical data.

Variables	Range
Order of birth (%)	
1	32 (68.1)
2	11 (23.4)
3	3 (6.4)
4	1 (2.1)
Past history of abortion	
Yes	7 (14.9)
No	40 (85.1)
Past history of IUFD	
Yes	1 (2.1)
No	46 (97.9)
Obstetric outcome	
Live birth	40 (85.1)
IUFD	3(6.4)
Stillbirth	3 (6.4)
Neonatal death	1 (2.1)
History of hypertension in pregnancy	
Gestational hypertension	25 (53.2)
Severe pre-eclampsia	18 (38.3)
Impending eclampsia	1 (2.1)
Eclampsia	3 (6.4)
Drugs given in the antepartum period for pregnancy induced hypertension	
Only labetalol	26 (55.3)
Labetalol and nifedipine	4 (8.5)
Labetalol and magnesium sulphate	13 (27.6)
Labetalol, nifedipine and magnesium sulphate	4 (8.5)
Mode of delivery	
Emergency LSCS	34 (72.3)
Vaginal delivery	13 (27.6)

12 patients were discharged after three days. Patients with higher BP (stage 1 and stage 2) were admitted for longer.

Patients and relatives were equally aware of the complications of pregnancy induced hypertension (PIH) on the mother and the fetus (68%). But merely 19.1% of the relatives and 23.4% of the patients were aware of the importance of home blood pressure monitoring (HBPM) required in the postpartum period.

More patients were aware of symptoms and warning signs of high blood pressure/PIH as compared to relatives (Table 4). Nearly all participants required 30 minutes or more of training in session 1 (86.2%). Just 13.8% of participants were able to train in 15 minutes (Table 5).

After the first training session (Table 5), retention was checked after 48 hours. It was observed that more patients (64%) demonstrated tying the cuff properly than the

number of relatives (49%), with about 51% of the relatives being unable to tie the cuff correctly. Although, the difference in the two groups was not statistically significant (unpaired t-test and p value=0.074).

The following checklist points were taken into account for tying the cuff properly- patient position, arm position, cuff level, cuff tightness, tube position, and ability to read the displayed value on the device- all of which had been taught in the first training session. It was noted that all the participants were able to position the arm and the body correctly for taking blood pressure. Out of all the patients unable to tie the cuff correctly, most faced difficulty while ensuring adequate cuff tightness (12) for BP measurement. In contrast, for relatives, cuff tightness (19) and tube position (19) posed a problem for the majority.

Additionally, 5 patients were unable to read the displayed value of BP on the device, whereas all the patients could aptly do so. All the participants were scored out of 6 (checklist for tying the cuff), taking into account individual components of correctly tying the blood pressure cuff. It was found that as an aggregate, the score of patients was significantly higher than that of relatives (p value=0.033).

Furthermore, about 36% of the relatives could not correctly answer whether the BP reading displayed was normal/abnormal. As opposed to this, around 81% of the patients could do so, and merely 19% were unable. There was a significant difference between the two groups in the ability to tell if the reading displayed is normal or abnormal (unpaired T-test and p value=0.033).

Moreover, 5 relatives and 6 patients could not answer the trainer's questions regarding BP monitoring correctly.

As evident from Table 6, a total of 55% of relatives and 36% of patients were unable to correctly demonstrate the procedure of taking blood pressure using the digital device and/or answer questions that ensued and hence were trained again. Retention was checked in the third session after 48 hours and on discharge (for all participants). Out of the 17 patients who were trained again, 12 successfully tied the cuff, and the rest were unable. Similarly, out of 26 relatives, 9 were unable to tie the cuff, and 17 could do so after retraining. This difference between the two groups, patients and relatives, was not statistically significant (p value=0.365).

Hence, at the end of the session, 10.6% of the patients and 19.1% of the relatives could not tie the cuff appropriately.

Furthermore, five relatives who were unable to read the value correctly were, as a result, unable to tell if the blood pressure value was normal or abnormal. All of the patients were able to do so. Out of the 17 patients, only 1 could not answer the trainer's questions correctly, and out of 26 relatives, just 2 were unable to do so.

The results of all the participants after the two sessions were compared for any significant difference using the paired T-test (Table 7).

The ability to tie the cuff in sessions 2 and 3 were compared and found to be significantly different, with better results obtained after session 3 (p value <0.001), with a correlation of 0.153. Hence, the conclusion can be drawn that after undergoing retraining after one unsuccessful demonstration, participants who were earlier unable to tie the cuff appropriately were able to do so, giving a better outcome in session 3.

On comparing the scores of all participants in the components of tying the cuff, the mean score of session 3 (5.42) was found to be higher not lower than that of session 2 (4.33). This was significantly different with a p value of <0.001, with a correlation of 0.845. Therefore, it can be concluded that those participants who were required to be retrained, improved significantly after being trained again after session 2, and scored much better in session 3, even though not all of them could appropriately tie the cuff after session 3.

Similarly, the ability to tell if the displayed value on the device is normal/abnormal was compared after the two sessions. It revealed that more participants were able to correctly tell after the third session, after retraining, than simply after session 2, with just one training session. The difference between the two sessions was significantly different (p value<0.001), with a correlation of 0.293.

On similar lines, the ability to answer questions improved significantly after retraining with better outcomes after session 3. This difference between the two session outcomes was significantly different, leaning towards a favourable result after session 3 (p value=0.002), with a correlation of 0.467.

Hence, in toto, it can be interpreted that, participants not able to correctly demonstrate the entire procedure, including the interpretation of the reading displayed, fared better after retraining.

On discharge (Table 8), some patients were discharged with antihypertensives to be continued till review. Out of the 47 patients, most were given tablet labetalol (66%), with merely 2.1% each given tablet nifedipine, and tablet labetalol and tablet nifedipine.

About 30% did not need any anti-hypertensives to be continued. In addition to this, 61.7% of the patients were advised for strict HBPM.

Before discharge, a final session to check if the participants could measure blood pressure was undertaken. Among all the patients, 89.4% were able to do so, whereas only 78.7% of the relatives were able to measure BP correctly.

Table 3: Postpartum period BP monitoring.

BP monitoring	Normal (%)	Elevated (%)	Stage 1 HTN (%)	Stage 2 HTN (%)
Day 1 (total 47 inpatients)	8 (17)	4 (8.5)	22 (46.8)	13 (27.7)
Day 2 (total 47 inpatients)	13 (27.7)	9 (19.1)	12 (25.5)	13 (27.7)
Day 3 (total 47 inpatients)	12 (25.5)	7 (14.9)	16 (34.0)	12 (25.5)
Day 4 (35 inpatients)	10 (28.6)	10 (28.6)	7 (20)	8 (22.8)
Day 5 (19 inpatients)	7 (36.8)	2 (10.5)	7 (36.8)	3 (15.8)
Day 6 (11 inpatients)	3 (27.3)	1 (9.1)	5 (45.45)	2 (18.2)

Table 4: Pre-training session interview.

Variables	Patients (total=47) (%)		Relatives (total=47) (%)	
Awareness of complications of PIH among the participants				
Yes	32 (68.1)		32 (68.1)	
No	15 (31.9)		15 (31.9)	
Awareness of the importance of home blood pressure monitoring in the postpartum period				
Yes	11 (23.4)		9 (19.1)	
No	36 (76.6)		38 (80.9)	
Number (and frequency) of patients/relatives aware of following symptoms to be looked out for	**Yes**	**No**	**Yes**	**No**
Headache	13 (27.7)	34 (72.3)	12 (25.5)	35 (74.5)
Swelling of legs and body	26 (55.3)	21 (44.7)	19 (40.4)	28 (59.6)
Less urination	-	47 (100)	-	47 (100)
Blurred vision	9 (19.2)	38 (80.8)	-	47 (100)
Palpitations	2 (4.3)	45 (95.7)	2 (4.3)	45 (95.7)
Giddiness	11 (23.4)	36 (76.6)	9 (19.2)	38 (80.8)

Table 5: Education regarding the method of correct blood pressure recording, followed by post-training (session 2) -To check the ability to tie the cuff properly.

Variables	Range (%)			
Amount of time spent by healthcare professional in training				
15 minutes	13 (13.8)			
30 minutes	81 (86.2)			
Was the patient/relative able to tie the cuff properly?	**Patients (%)**		**Relatives (%)**	
Yes	30 (63.8)		23 (48.9)	
No	17 (36.2)		24 (51.1)	
Unpaired t-test (group 0=patients, group 1=relatives)	0.074			
Components of blood pressure measurement checked for (checklist of 6)	**Yes**	**No**	**Yes**	**No**
Patient position	47	-	47	-
Arm position	47	-	47	-
Cuff level	43	4	44	3
Cuff tightness	35	12	28	19
Tube position	37	10	28	19
Able to read the displayed value	47	-	42	5
Mean checklist score	5.4468		5.0213	
Unpaired t test (group 0=patients, group 1=relatives)	P value=0.026*			
Ability to tell if blood pressure reading displayed is normal/abnormal				
Able	38 (80.8)		30 (63.8)	
Unable	9 (19.2)		17 (36.2)	
Unpaired t-test	P value=0.033*			

Continued.

Variables	Range (%)	
Ability to answer questions regarding home blood pressure monitoring		
Yes	41	42
No	6	5

*Level of significance- p value <0.05

Table 6: Post-training- session 3- for those 43 participants unable to retain information (checked for in session 2).

Variables	Patients (%)		Relatives (%)	
Total number of patients/relatives unable to demonstrate after session 2	17 (36.2)		26 (55.3)	
Was the patient/relative able to tie the cuff properly?				
Yes	12		17	
No	5		9	
Unpaired t test	P value=0.365			
Components of blood pressure measurement checked for (checklist of 6)	**Yes**	**No**	**Yes**	**No**
Patient position	17	-	26	-
Arm position	17	-	26	-
Cuff level	17	-	26	-
Cuff tightness	12	5	17	9
Tube position	14	3	23	3
Able to read the displayed value	17	-	21	5
Mean checklist score	5.5294		5.3462	
Unpaired t test (group 0=patients, group 1=relatives)	P value=0.262			
Ability to tell if blood pressure reading displayed is normal/abnormal				
Able	17		21	
Unable	-		5	
Ability to answer questions regarding home blood pressure monitoring				
Yes	16		24	
No	1		2	

Table 7: Paired t-test: to compare session 2 and session 3 demonstration by the participants.

Pair 1	Correlation	P value
Session 2: Ability to tie the cuff	0.153	<0.001*
Session 3: Ability to tie the cuff		
Pair 2		
Session 2: Checklist score (out of 6) for tying the cuff	Mean score of session 2=4.33 Mean score of session 3=5.42 Correlation=0.845	<0.001*
Session 3: Checklist score (out of 6) for tying the cuff		
Pair 3		
Session 2: Ability to tell if value displayed is normal/abnormal	0.293	<0.001*
Session 3: Ability to tell if value displayed is normal/abnormal		
Pair 4:		
Session 2: Ability to answer questions	0.467	0.002*
Session 3: Ability to answer questions		

*Level of significance- p value <0.05

Table 8: On discharge.

Variables	Ranges		
Hypertensives given on discharge			
None	**Only labetalol**	**Only nifedipine**	**Both labetalol and nifedipine**
14 (29.8%)	31 (66.0%)	1 (2.1%)	1 (2.1%)
Home blood pressure monitoring advised by the treating unit			

Continued.

Variables	Ranges			
Yes		**No**		
29 (61.7%)		18 (38.3%)		
Final demonstration of blood pressure measurement by the participant	**Patients**		**Relatives**	
	Able	**Unable**	**Able**	**Unable**
	42 (89.4%)	5 (10.6%)	37 (78.7%)	10 (21.3%)
Unpaired t-test	P value=0.081			
Willing for home blood pressure monitoring				
Yes	33 (70%)		34 (72%)	
No	14 (30%)		13 (28%)	
Reason for not willing for HBPM (out of 14 who are not willing)				
Not confident	1		1	
Cost	7		7	
Will call doctor	6		5	

Table 9: Number of sessions required to train the participants.

Variables	Patients (%)	Relatives (%)
1 session	30 (63.8)	21 (44.7)
2 sessions	12 (25.5)	16 (34)
Unable (after 2 sessions)	5 (10.6)	10 (21.3)
Unpaired t-test		
P value	0.027*	

*level of significance- p value <0.05

Table 10: Chi-square test: association of variables with level of education and with willingness for HBPM.

Level of education	P value
Session 2: Ability to tie the cuff	P<0.001*
Number of symptoms the participant is aware of	P=0.218
Session 2: Ability to read the displayed value on the digital machine correctly	P=0.029*
Session 2: Ability to tell if the value displayed is normal/abnormal	P=0.005*
Willing for HBPM	P=0.013*
Session 3: Ability to tie the cuff	P=0.112
Session 3: Ability to read the displayed value on the digital machine correctly	P=0.208
Session 3: Ability to tell if the value displayed is normal/abnormal	P=0.208
Number of sessions required to train	P<0.001*
Unable/able to demonstrate	P=0.001*
Willing for HBPM or not	
Able/unable to demonstrate	P=0.003*
Awareness of complications of PIH	P=0.032*

*level of significance- p value <0.05

When asked about willingness for HBPM, about 70% of patients and 72% of relatives were willing for HBPM. Among those not willing, the cost was identified as to why most participants opted out of HBPM. The rest of the reasons were "will call a doctor" to get the BP checked and "not confident" in measuring BP by self.

It is evident from table 9 that more than half of the patients (63.8%) only needed one training session, subsequent to which they were able to demonstrate the correct method of taking blood pressure.

Contrastingly, under 50% of relatives were able to do so after just one training session. About 25% of patients and 34% of relatives required two training sessions. But, even after two training sessions, 10.6% of patients and about 21% of relatives were unable to learn the method.

Comparing the two groups on the number of sessions required, a significant difference was found between them (p value=0.027), implying that relatives needed more sessions than patients, which was statistically significant.

There was a significant association between the level of education and the ability to tie the cuff appropriately in the first demonstration session itself (p<0.001) (Table 10).

Moreover, the ability to read the displayed value on the digital machine correctly and tell if that value is normal or not was also significantly associated with the participant's level of education (p=0.029 and 0.005, respectively). Participants who had a higher level of education were more likely to have understood the significance of the practice and comply with it. Likewise, the number of sessions required to train the participants and the ability to demonstrate was significantly associated with the level of education (p<0.001 and p=0.001 respectively), suggesting that the exercise of training participants requires more number of sessions in people with a lower level of education as compared to those with a higher level.

Looking at the factors having an association with willingness for HBPM (Table 10), the ability to demonstrate had a significant association (p value=0.003). Participants who were unable to demonstrate the measurement were likely to opt-out of HBPM.

Moreover, awareness of the complications of PIH also had a significant association with willingness (p value=0.032). Participants who were aware were more willing than the unaware of complications. It highlights the role of patient education in HBPM.

DISCUSSION

This study was done in a tertiary health care setup. 53 patient and relative pairs were approached to participate in the study, out of which 47 pairs consented.

The mean age of all the participants of this study was 32.89, with about 65% being Hindu, 34% Muslim and 1% Christian, belonging to a spectrum of educational backgrounds ranging from primary school to post-graduation. More than half of these patients had gestational hypertension, whereas about 38% had severe pre-eclampsia. In a study by Sengodan et al, among their participants, 47.4% had gestational hypertension, 32.6% had pre-eclampsia, and 11.8% had preeclampsia superimposed on chronic hypertension.[7]

In the pre-training session interview, we found that only 21.25% of the participants were aware of the importance of BP monitoring, with none of the participants aware of all the symptoms of PIH.

An element of our training session included counselling patients and their relatives on the importance of self-monitoring of BP.

This was supported by a study by Baghianimoghadam et al about education on self-monitoring of BP based on the BASNEF model, wherein strategies to involve family members, relatives or friends in intervention programs. Affirmation of those by physicians can strongly affect the self-monitoring of patients. The study also states the importance of planning educational programs based on self-monitoring of BP.[8]

Women are still dependent on the elders in the family or the spouses to seek medical care. Hence, we decided to include relatives in our study to enhance compliance to HBPM (relation with the patient- 34% sisters-in-law, 27.7% mothers-in-law, 23.4% mothers, and 14.9% husbands).

HBPM is an important part of modern-day practice. A study on HBPM done by George and Macdonald demonstrated the following advantages and limitations of HBPM.[9]

The advantages include: avoids white coat reaction to BP measurement; allows patients to better understand the management of hypertension, which is a chronic condition and hence requires high patient compliance to treatment; reduced dropouts as distance is not relevant and incorporation in daily routine is possible; predicts cardiovascular morbidity and mortality earlier; and an diagnose masked hypertension as multiple readings at different time intervals are taken.

At the same time limitations such as device accuracy, expenditure, personal errors such as faulty cuff placement. It may also induce anxiety in patients and cause excessive monitoring.

Our study included a thorough training session of 15-30 minutes, to educate the participants about the correct method of tying the cuff using a preformed checklist-detailing the importance of correct arm position, patient position, cuff level, cuff tightness, tube position, and reading the value on the device and tell if it is normal/abnormal. They were also educated about the warning signs and symptoms of high BP- headache, swelling of legs and body, less urination, blurred vision, palpitations, giddiness- and when to contact a healthcare professional.

Although not everyone required it, multiple sessions were undertaken for those unable to train adequately with a single training session.

Furthermore, it has also been observed in this study that the understanding and the ability to self-monitor BP is higher in patients than in their relatives.

After the first session, 63.8% of patients were able to retain and demonstrate the correct method while only 44.7% of the relatives were able to do that.

This might be related to their level of education, which is significantly associated with the ability to learn to tie the cuff/read the value/tell if the value is normal or abnormal. Some studies have shown that patients with higher

educational levels demonstrated better compliance with HBPM procedure and more complete or accurate HBPM recording (Cuspidi et al, Rao et al, and Uzun et al).[10-12]

At the end of the sessions, 89.4% of the patients and 78.7% of the relatives were able to manoeuvre the device properly and take their own blood pressure, with appropriately reporting if the value was normal or not.

Apart from educating patients and their relatives on HBPM, the BP of all the patients was monitored thrice daily. By 72 hours postpartum one-fourth of the patients had normal blood pressure. And many of the patients were discharged on anti-hypertensives (70%) with the advice given for strict HBPM to be done.

89.4% of patients and 78.3% of the relatives of those patients- from different groups of age, educational background, religion, severity of hypertension and obstetric outcome, were successfully able to learn, retain the information and demonstrate BP measurement using electronic measuring device. This proves that indeed it is feasible to use home blood pressure monitoring in the postpartum period. The participants gave an average score of 7.32, on a scale of 1-10, to the "ease of use" of the digital device, indicating acceptance of the intervention.

This is in line with the study by Hoppe et al to assess the feasibility of tele-health in postpartum surveillance in women with a history of PIH.[13] Overall 87% of participants were "very" or "extremely" satisfied with the system, and 91% required "a little" or "not at all" mental effort to use the self-monitoring device provided in the study. Hauspurg et al demonstrated high compliance, retention, and patient satisfaction with the remote BP monitoring in postpartum women with hypertension.[14]

Finally, participants willingness to comply with HBPM and if not, their reasons were explored. 71% of the participants were willing for HBPM. Among the 'not willing', "cost" was identified as the most common reason, followed by "will call the doctor", and "not confident". Moreover, the willingness to self-monitor BP at home was significantly associated with the ability/inability to learn/demonstrate BP measurement correctly. Also, it was found that participants who were aware of the complications of PIH, were more likely to be willing for HBPM ($p<0.05$).

In addition, the hypertensives with positive attitudes toward taking action to lower BP used HBPM more than those who did not (55.5% versus 33.1%, $p=0.01$).

It was also found in another study that nonusers of HBPM cited failure to recognise benefits (Ayala et al and Tan et al).[15,16] This hugely calls upon the need to introduce such a training session for these patients on a more extensive scale. This is congruent with the study done by Baghianimoghadam et al, which says that education of the masses increased the intention, which in turn changed the attitude and the behaviour of the target groups.[8] Similarly, Rhodes et al, and Down and Hausenblas demonstrated a strong significant correlation between intention and behaviour.[17,18]

Limitations

The study had the following limitations.

This study was done in a tertiary care setup, feasibility of the patient training in primary health care set-up is unknown. More research is needed on this.

It is difficult to know the potential influence of the cost factor which may have affected the participants' focus on learning BP monitoring.

CONCLUSION

Feasibility and patient satisfaction were demonstrated in this study. At the end of the sessions, 89.4% of the patients and 78.7% of the relatives were able to handle the device properly and take their own BP, with appropriate interpretation if the value was normal or not.

Additionally, this study draws attention to the importance of counselling people on the complications of PIH, not only in the antenatal period but in the postpartum period as well. Appropriate training of people about HBPM prior to discharge can ensure that the discharge advice of strict self-monitoring is followed.

Hence, a postpartum remote hypertension monitoring programme, which involves educating the patient and their family members to enable them to monitor their BP at home or a nearby primary centre, is the need of the hour, especially considering the current situation of the COVID-19 pandemic.

Recommendations

Training sessions on BP monitoring can be undertaken in groups, considering the patient load and time restraints in Indian tertiary care hospitals.

During ANC visits, on OPD basis, leaflets could be given explaining HBPM to patients. Those who cannot read can be explained the importance/method by a healthcare worker using visual tools. Mobile applications can be made to train the patients and family members.

In rural settings, accredited social health activist (ASHA) and auxiliary nurse midwife (ANM) healthcare workers at the grass-root level can undertake similar training sessions for antepartum/postpartum women.

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