

Knowledge and Treatment Adherence towards Pregnancy Induced Hypertension among Pregnant Women in Ismailia City: An Intervention Study

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ABSTRACT

Background and aim: One of the most frequent pregnancy problems and a leading global cause of maternal and fetal death and morbidity is pregnancy-induced hypertension. In order to provide effective educational interventions, this research was conducted to assess and enhance the level of awareness and adherence about pregnancy-induced hypertension (PIH) among pregnant women in Ismailia city. **Method:** An interventional study (pre-test/post-test) conducted at family centers and antenatal out-patient clinic of Ismailia public hospital. It was carried out on 80 hypertensive pregnant women on treatment for at least one month. Interview closed-ended questionnaire were used to collect data which included; socio-demographic data, pregnant women's knowledge about PIH, Morisky eight-item Medication Adherence Scale for measuring adherence to PIH drugs, tool for measuring adherence to PIH health related behaviors and health system factors which may affect adherence to PIH. **Results:** Significant improvement was reported after the education to be; 35%, 30% and 35% high, medium and low adherence to PIH drugs respectively. The level of adherence to PIH health related behaviors before health education was; 18.8% high, 36.2% medium and 45% low adherence, improved significantly after the education to; 57.5% high, 38.7% medium and 3.5% low adherence. **Conclusion** The results clearly demonstrated the effectiveness of educational intervention program in promoting knowledge and adherence towards PIH.

Keywords: Pregnancy induced hypertension; PIH; knowledge; educational intervention.

INTRODUCTION

The most frequent medical issue that arises during pregnancy is pregnancy-induced hypertension (PIH), which may complicate up to 10% of pregnancies ⁽¹⁾.

All end-organ problems are considered maternal morbidities because of the hypertensive disorders of pregnancy. The most terrifying complications are those that affect the central nervous system, such as stroke, retinal detachment and blindness, or hepatic haematoma/rupture. The most common complications are pulmonary oedema, HELLP syndrome (haemolysis, elevated liver enzymes, low platelets), and placental abruption ⁽²⁾.

Pregnancy-related hypertension diseases have been linked to risky perinatal outcomes such as neonatal mortality, stillbirth, and fetal growth restriction ⁽³⁾.

Antihypertensive treatment is used to avoid severe gestational hypertension and maternal hemorrhagic strokes, despite the fact that there is no agreement on how to manage non-severe hypertension ⁽⁴⁾. The non-pharmacological therapy of pregnant women with hypertension problems takes into account nutritional therapies, lifestyle modifications (such as bed rest and stress reduction), and the setting of care ⁽²⁾.

PATIENTS AND METHODS

This was an intervention study (pre-post study) was carried out from June 2018 to August 2019. The study was carried out at family centers in Ismailia city and antenatal out-patient clinic of Ismailia general hospital. Ismailia city incorporates 4 family wellbeing centers; all of them were included in the study.

Target group: The hypertensive pregnant women at Ismailia city.

Inclusion criteria: Hypertensive pregnant women (BP $\geq 140/90$ mm Hg) above (20) weeks gestation and hypertensive pregnant women on treatment for at least one month.

Exclusion criteria: Normotensive pregnant mothers, hypertensive pregnant mothers with gestational age less than (20) weeks and hypertensive pregnant mothers with gestational age at or more than 20 weeks on treatment for a period less than one month.

Techniques for the study: The data was acquired by speaking with expectant mothers who were given a PIH diagnosis at medical institutions. The examiner went to the family centers each Monday and Wednesday by each week (these are days of antenatal care in the family centers at Ismailia city) and to the out-patient antenatal clinic of the general hospital the rest of the week. Finishing the check list took about 20 minutes, while health education took about 30 minutes. Health education was done in separate groups, depending on the number of cases by the end of the day and sometimes it was done case by case according to the patient preference.

Tools of the study: Interview closed-format questionnaire was presented using values such as **yes** /and **no** as well as choosing from options.

The instrument is divided into 4 sections:

The first section: consisted of: Socio demographic data of the participant and her husband such as age, education level, occupation, and marital status. Obstetric and past history including parity, gestational age, past history of having PIH, duration of being on treatment.

The second section: contained (18) questions of yes/no that measure the level of knowledge of the pregnant women suffering of hypertension in pregnancy about seriousness of PIH to the mother and the fetus, PIH signs, symptoms, complications, risk factors, prevention, management of PIH and knowledge about PIH treatment adherence.

Scoring: Every correct answer question by yes was given (1) and incorrect one by no was given (zero) lastly scoring for information isolated into: Adequate information when the patient gets more than 60% of aggregate score. Inadequate knowledge when the patient get under 60% of aggregate score.

The third section: contained 6 questions, 4 of them were chosen from options while 2 were yes/no. The inquiries were about health system factors which may affect adherence to PIH including health provider-patient communication during PIH diagnosis, treatment, follow-up and counselling about the use of PIH medications, as well as the cost and availability of PIH medications at medical facilities ⁽⁴⁾.

The fourth section: measured the following: **Adherence to PIH drugs:** using Morisky 8-Item Medication Adherence Questionnaire (MMAS-8). The scale consists of (8) questions; the first 7 questions are dichotomous (yes/no) while, question 8 has a five-point Likert response scale ⁽⁵⁾.

Adherence to PIH health related behaviors: including antenatal attendance, rest and sleep, as well as diet and supplements.

Antenatal attendance: included 3 items, all of them were chosen from options inquiring about first antenatal visit, missing visits and time of visits.

Rest and sleep: consisted of 6 items of chosen from options. It inquired about frequency and position of resting, sleeping and working hours daily and exposure to heavy physical activity during work and household activities.

Diet and supplementation: included 7 items of chosen from options, which asked about the frequency of eating foods containing excessive salt, frequency of eating protein foods, vegetables and fruits, dairy products, drinking caffeinated drinks and taking calcium and vitamin D supplementation.

Data collection was done in 3 stages: **Pre- test:** before health education sessions.

Health education sessions: information about signs, symptoms, complications, risk factors, prevention and management of PIH were presented to pregnant women filling the initial questionnaire. Also, benefits of adherence to PIH drugs and adherence to PIH health related behaviors were explained to the participants and they were free to ask their questions.

Post- test: after doing health education sessions by 3 weeks at least.

Ethical Approval: Each research participant provided written informed permission once the study was given the green light by the Zagazig University Ethics Board. The Declaration of Helsinki, the World Medical Association's code of ethics for research involving people, guided the conduct of this study.

Statistical design: Microsoft Excel software was used to code, input, and analyze historical data, basic clinical examinations, laboratory investigations, and outcome measurements. The Statistical Package for the Social Sciences (SPSS) version 25 software was then used to import the data for analysis. The significance of differences was evaluated using the following tests: difference and association of qualitative variable using Chi square test (X²). Comparisons of quantitative matched groups using the paired t test, Pearson's correlation, or Spearman's correlation. P value was chosen at 0.001 for very significant findings and 0.05 for outcomes that were significant.

RESULTS

Table 1: Socio-demographic characteristics of the studied group (n=80)

Variable	No	%	
1-Age groups	<18	6	7.5
	18-30	32	40.0
	31-40	26	32.5
	>40	16	20.0
2-Education	Illiterate	3	3.8
	Primary	14	17.5
	Secondary	46	57.5
	High	17	21.2
3-Marital	Married	80	100.0
4-Occupation	House wife	57	71.3
	Governmental Employee	9	11.2
	Private employee	11	13.7
	Daily wage	3	3.8
5-Husband age	20-30	40	50.0
	31-40	19	23.8
	>40	21	26.2
6-Husband education	Primary	15	18.8
	Secondary	37	46.2
	High	28	35.0
7-Husband occupation	Governmental Employee	7	8.8
	Private employee	46	57.5
	Daily wage	27	33.7

Table (1) shows that most women (72.5%) were aged between 18 and 40 years. The majority were secondary educated. All women were married and 71.3% were housewives. Most husbands (73.8%) aged between 20 and 40 years and 81.2% of them were secondary and high educated. 57.5% of the husbands worked as private employee.

Table 2: Comparing women Knowledge of the studied group about PIH before and after intervention

Intervention		Pre		Post		P
Variable (n=80)		NO	%	NO	%	
1- Pregnancy induced hypertension can cause death or serious illness of a pregnant woman	No	33	41.7	0	0.0	0.001**
	Yes	47	58.3	80	100	
2-PIH can cause death or serious illness of an unborn fetus	No	36	45	0	0.00	0.001**
	Yes	44	55	80	100	
signs and symptoms of preeclampsia: 3- Swollen face and leg	No	16	20	0	0.0	0.001**
	Yes	64	80	80	100	
4- Blurred vision.	No	75	92.5	61	76.2	0.001**
	Yes	5	7.5	19	23.8	
5- Upper abdominal pain.	No	57	71.2	55	68.8	0.73
	Yes	23	28.8	25	31.2	
6- Oliguria.	No	75	93.8	60	75	0.001**
	Yes	5	6.2	20	25	
Conditions requiring extra caution: 7 -Woman with 1st pregnancy.	No	37	46.2	32	40	0.43
	Yes	43	53.8	48	60	
8- Woman with 2 or more pregnancies	No	42	52.5	38	47.5	0.52
	Yes	38	47.5	42	52.5	
9-Woman over 35 yrs old	No	53	66.2	29	36.2	0.001**
	Yes	27	33.8	51	63.8	
10- Obese woman	No	57	71.2	31	38.8	0.001**
	Yes	23	28.8	49	61.2	
11-Woman with pre-gestational diabetes	No	50	62.5	25	31.2	0.001**
	Yes	30	37.5	55	68.8	
12-Woman with chronic hypertension	No	18	22.5	0	0.0	0.001**
	Yes	62	77.5	80	100	
13-Woman with chronic renal disease	No	77	96.2	75	93.8	0.46
	Yes	3	3.8	5	6.2	

Table 2 shows significant improvement in post education group in all knowledge items except in the awareness of women about symptoms of preeclampsia (Upper abdominal pain), Conditions requiring extra caution (1st pregnancy, 2 or more pregnancies and chronic renal disease).

Table (3): Comparing adherence to PIH medication of the studied group before and after intervention

Intervention		Pre		Post		P
Variable (n=80)		N	%	N	%	
1-Do you sometimes forget to take your PIH medicine?	No	38	47.5	43	53.8	0.42
	Yes	42	52.5	37	46.2	
2- Over the past 2 weeks, were there any days when you did not take PIH medicine?	No	42	52.5	50	62.5	0.201
	Yes	38	47.5	30	37.5	
3-Have you ever stopped taking PIH medicine because you felt worse when you took it?	No	77	96.2	80	100.0	0.08
	Yes	3	3.8	0	0.0	
4-When you travel or leave home, do you sometimes forget to bring along your PIH medicine?	No	68	85.0	77	96.2	0.015*
	Yes	12	15.0	3	3.8	
5- Did you take all your PIH medicines yesterday?	No	32	40	34	42.5	0.748
	Yes	48	60	46	57.5	
6- Do you sometimes stop taking PIH medicine when you are controlled?	No	45	56.2	80	100.0	0.001**
	Yes	35	43.8	0	0.0	
7- Do you ever feel hassled about sticking to your treatment plan?	No	49	61.2	78	97.5	0.001**
	Yes	31	38.8	2	2.5	
8- How often do you have difficulty remembering to take all your PIH medicine?	Never	39	48.8	55	68.8	0.01*
	Once	13	31.7	5	20	
	Sometimes	18	43.9	11	44	
	Usually	3	7.3	7	28	
	all time	7	17.1	2	8	
Total TTT Adherence	Low	46	57.5	28	35.0	0.007*
	Medium	21	26.3	24	30.0	
	High	13	16.2	28	35.0	

P<0.05, significant. **P<0.001, significant.

Table (3) demonstrates that adherence to medication improved significantly after education in all items except in forgetting to take PIH medicine, missed doses over the past 2 weeks, stopping taking PIH medicine because of feeling worse on taking it, and taking all PIH medicines yesterday. Generally, there was significant improvement in total adherence to medication score after intervention.

Table 4: Comparing between total score of adherence to PIH health related behaviors before and after intervention

Variable (n=80)		Intervention				P
		Pre		Post		
		No	%	No	%	
Antenatal attendance Table 6(a)	Low	17	21.2	3	3.8	0.003*
	Medium	23	27.8	26	32.5	
	High	40	50	51	63.7	
Rest and sleep Table 6(b)	Low	23	28.8	0	0	0.001**
	Medium	45	56.2	41	51.2	
	High	12	15	39	48.8	
Diet and supplements Table 6(c)	Low	41	51.3	6	7.5	0.001**
	Medium	18	22.5	17	21.2	
	High	21	26.2	57	71.3	
Total behavior adherence	Low	36	45.0	3	3.8	0.001**
	Medium	29	36.2	31	38.7	
	High	15	18.8	46	57.5	

Chi-square test was used for comparisons, *P<0.05, significant. **P<0.001, significant.

Table (4) shows that there was significant improvement in total score of adherence to antenatal care attendance, rest and sleep and adherence to diet and supplements among PIH women. Overall, there was significant improvement in total score of adherence to PIH health related behaviors.

Table 5: Correlation between female total knowledge about PIH and their adherence to medication and behaviors among the studied group

Adherence to medication and behaviors	Knowledge	
Total adherence to medication	r	0.502**
	P	0.000**
Total adherence to behavior	r	0.645**
	P	0.000**

r: Spearman's correlation coefficient

The table (5) shows that there was a strong positive correlation between women's knowledge about PIH and their adherence to medication (r=0.502**) at statistically significant level (p-value<0.001) and a strong positive correlation between knowledge of the pregnant women regarding PIH and their adherence to PIH health related behaviors (r=0.645**) at statistically significant level (p-value < 0.001).

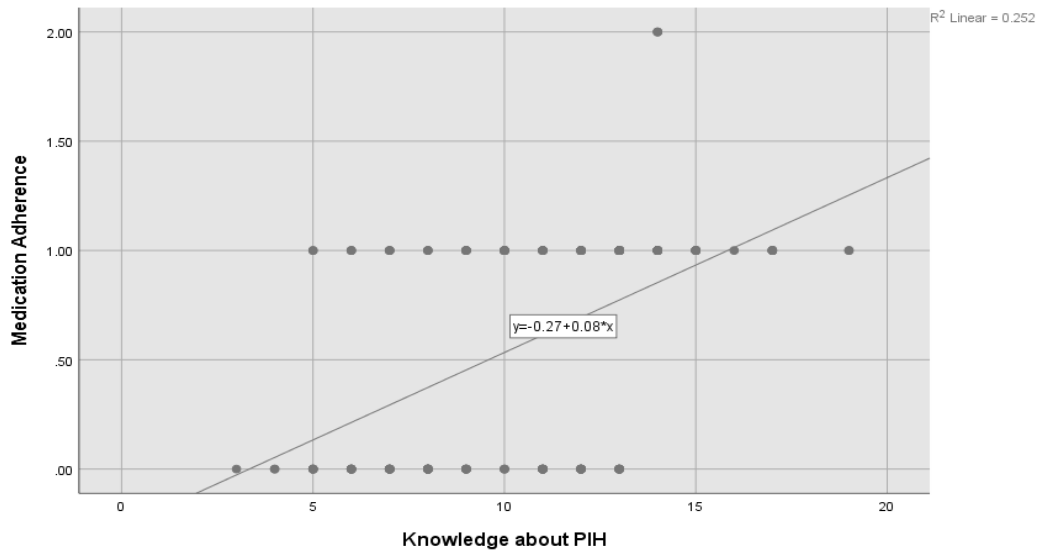


Figure (1) Correlation between female knowledge about PIH and their adherence to PIH medications

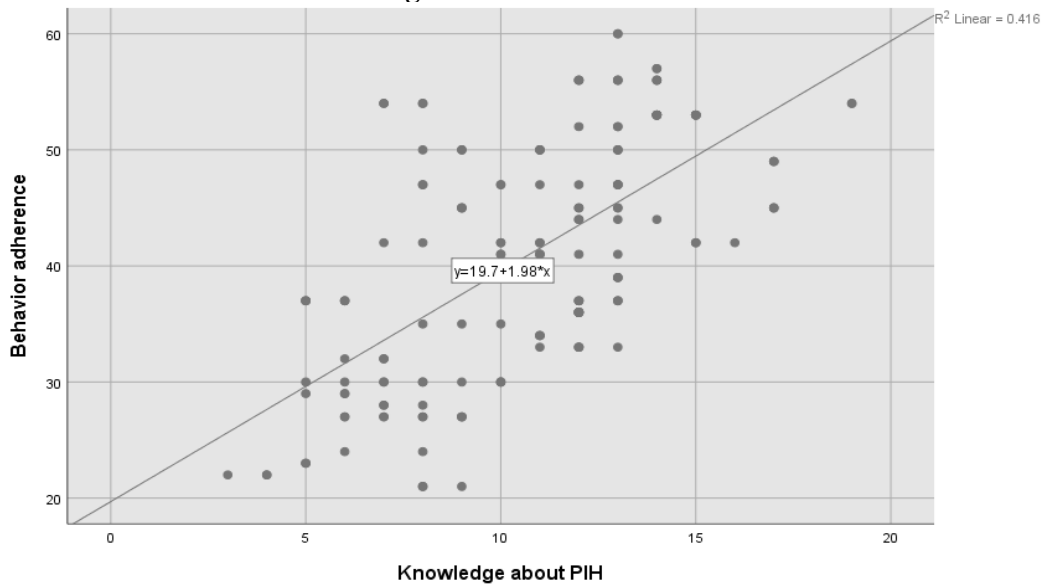


Figure (2) Correlation between female knowledge about PIH and their adherence to PIH health related behaviors

Table (6): Relation between health system and medication adherence of the studied group

Health system factors (n=80)	Medication adherence				χ^2	P
	Low		Medium and high			
	N	%	N	%		
1-Did the medical personnel explain to you clearly what the condition was?						
Very clearly(n=3)	0	00	3	7.7	6.709	0.035*
Slightly clear(n=28)	11	26.8	17	43.6		
Not clear(n=49)	30	73.2	19	48.7		
2-Did the medical personnel advice you about the importance of taking PIH drugs?						
Very clearly(n=5)	0	0	5	12.8	6.116	0.047*
Slightly clear(n=58)	33	80.5	25	64.1		
Not clear(n=17)	8	19.5	9	23.1		
3-Did the medical personnel give you clear instructions on the schedule and timing of taking those drugs?						
Very clearly(n=39)	14	34.1	25	64.1	12.797	0.002*
Slightly clear(n=38)	27	65.9	11	28.2		
Not clear(n=3)	0	0	3	7.7		

χ^2 : Chi-square test was used for comparisons, *P<0.05, significant. **Table (6)** shows that health system factors that affect patient adherence to PIH were the explanation of the disease condition by medical personnel, giving advice about the importance of taking PIH drugs by medical personnel and giving instructions on the schedule and timing of taking those drugs.

Table (7): Relation between health system and medication adherence of the studied group

Health system factors (n=80)	Medication adherence				χ^2	P
	Low		Medium and high			
	N	%	N	%		
4-Do the medical personnel follow up you or ask if you are taking your PIH drugs constantly?						
Always (n=3)	0	0	3	7.7	3.304	0.192
Sometimes (n=71)	38	92.7	33	84.6		
Never(n=6)	3	7.3	3	7.7		
5- Did you fail to take the PIH drugs because they were not available at the health facility?						
No (n=46)	33	80.5	13	33.3	18.186	0.001**
Yes (n=34)	8	19.5	26	66.7		
6-Did you fail to take the PIH drugs because of non-affordability to you?						
No (n=28)	14	34.1	14	35.9	0.027	0.870
Yes (n=52)	27	65.9	25	64.1		

χ^2 : Chi-square test was used for comparisons, **P<0.001, significant. **Table (7)** shows that health system factor that affect patient adherence to PIH was availability of the drugs at the health facility.

DISCUSSION

This was an interventional study (pre-test/post-test) conducted at family centers and antenatal out-patient clinic of Ismailia public hospital. It carried out on 80 hypertensive pregnant women on treatment for at least one month.

Morisky eight-item Medication Adherence Scale (MMAS-8) was used for measuring adherence to PIH drugs. Besides, tool for measuring adherence to PIH health related behaviors, structured tool for measuring women's knowledge and health system factors which may affect adherence to PIH.

The present study showed that majority of (72.5 %) of PIH women were in the age group of 18-35 years of age. This result was in line with an Egyptian study conducted by **Nevertity**, which reported that 78% of antenatal mothers with PIH were less than 35 years. Another Indian study ⁽⁶⁾, **Sharma et al.** reported that majority of PIH patient was in the age group of 26-30 years of age. ⁽⁷⁾

The current study revealed also that most of the studied women (57.5%) were secondary educated in disagreement with the study of **Nevertity**, which revealed that 68.7% of women had less than secondary education. This study showed that 71.3% of patients were house wives, and similar finding was obtained from the Egyptian study **Nevertity** ⁽⁶⁾.

This study revealed that 10% of PIH mothers had more than one fetus in the current pregnancy which is considered one of the risk factors of PIH. This result nearly coincided with **Sharma et al.** ⁽⁷⁾.

One fifth of PIH women had a previous birth or miscarriage within less than two years and 16.3% of them got pregnant after more than 10 years from the last birth. Time interval between deliveries more than 10 years or less than 2 years increases the incidence of PIH. These findings were in line with **Eucabeth**, who reported that 33.6% of women got pregnant within less than 2 years after the last pregnancy ⁽⁴⁾.

In the current study there was significant improvement after health education intervention in women knowledge about the seriousness of PIH to the mother and fetus. Before the education, 58.3% of women were aware about the seriousness of PIH to mother and 55% of them knew that PIH can cause death or serious illness to the fetus. However, after education, all women were aware that PIH can cause death or serious illness to the mother and fetus. This finding fit with **Eucabeth**, who found that 70.9% of women were aware about seriousness of PIH to the mother and 93.7% were aware about the seriousness to the fetus ⁽⁴⁾.

These results were similar to a Brazilian study which reported that chronic hypertension and diabetes were the most common risk factors for hypertensive diseases in pregnancy after previous history of preeclampsia ⁽⁸⁾.

As regards, knowledge about measures of prevention of preeclampsia, 82.5% of women were aware about the importance of antenatal care attendance and this significantly improved to all women after the education. 41.2% were aware about rest as a preventive measure of PIH, improving to 78.8% after intervention. These results were similar to the study carried out by **Sharma et al.** which revealed significant improvement in PIH women's knowledge about prevention measures after health education ⁽⁷⁾, although these findings were somewhat different to the results of **Nevertity**, which reported that awareness about antenatal checkup was 47.3% and for the supplements 70% ⁽⁶⁾.

Overall this study reported that there was significant improvement in the level of knowledge about PIH among pregnant women after health education intervention, whereas, the level of total knowledge about PIH before health education was 25% which improved to 67.5%. This result may reflect the effectiveness of the education program. In agreement with these results, previous study carried out in India by **Lavanya et al.** concluded that total level of knowledge

about PIH was 13.9% and improved to 97.2% after patient education ⁽⁹⁾.

The present study showed significant improvement in the level of adherence to medication among PIH women after health education. The level of adherence to medication before the health education was 42.5% (16.2% high and 26.3% medium adherence). These results agreed with the study of **Lavanya et al.** which reported that 30.6% of women with PIH were adherent to anti-hypertensive medication before intervention and improved to 86.1% after that ⁽⁹⁾.

On the contrary, the study of **Nevertity**, reported that the level of adherence to medication was higher (58.7%). This difference might be due to that only (21.2%) of women in the present study had higher level of education compared to 31.3% in the other one ⁽⁶⁾. However, **Eucabeth**, found that the level of adherence to medication among women with PIH was much lower (18.3%). This difference may be due to high educated women were only 8% in that study or may be attributed to the method of assessing the PIH adherence to medication and the different tools used to measure adherence ⁽⁴⁾.

This finding was in line with the results of Lebanese study, which reported that 89.5% of non-adherent patients missed taking antihypertensive medications due to forgetfulness ⁽¹⁰⁾. Also, these results agreed with a previous study at Ethiopia which revealed that the major reason for non-adherence was forgetfulness ⁽¹¹⁾.

Nevertheless, the results were inconsistent with the study of **Eucabeth**, who found that the most common cause for non-adherence was side-effects of PIH medication. This might be due to the type of anti-hypertensive drug used there. Here in Egypt, methyldopa is the drug of choice used in PIH, which has little side effects ⁽⁴⁾.

The current study revealed that, there was significant improvement in women's adherence towards taking PIH drugs on travelling or leaving home and in women who stopped the medicines when they were controlled. PIH women who felt hassled about sticking to their treatment plan were significantly improved and those who had difficulty remembering to take all their PIH medicine also improved significantly

These findings are in agreement with **Nevertity**, who reported a significant Pearson correlation coefficient between level of knowledge about PIH and adherence ⁽⁶⁾.

In this study only one third of women didn't miss any ANC visit. This result was lower than an Ethiopian study conducted by **Haftu et al.** which revealed that women's adherence to complete visit to antenatal care is 49.9% ⁽¹²⁾. This variation might be due to the documentation system and the geographical location. The present study revealed that 71.5% of women went to ANC clinic regular on scheduled and after health education, 86.2% of them went on scheduled and when there is dangerous sign. The present study showed

significant improvement in the level of adherence to diet and supplements among PIH women after health education intervention. This result was in line with the study of **Prathima and Anuchitra**, which revealed significant increase in mean scoring of the level of adherence to diet in the experimental group. This study reported that before health education, the total level of adherence to diet and supplements among women with PIH was 48.7% (26.2% high, 22.5% medium adherence) ⁽¹³⁾.

This agreed with the study carried out in Iran by **Behjat et al.** which reported that vitamin D supplementation was 69.4% in the control group and improved to 86.3% in the experimental one ⁽¹⁴⁾.

The present study revealed that before the education 52.5% of PIH women took calcium supplementation. However, there was significant improvement after health education. According to a systematic review and a meta-analysis carried out by **Tang et al.**, in Australia, calcium supplement consumption reduces the risk of developing preeclampsia ⁽¹⁵⁾.

This study showed no significant improvement in the frequency of eating diet with protein content. This might be due to protein is considered the most expensive elements in the diet.

In the current study, age and level of education were found to be significantly associated with adherence to PIH behaviors. These results were different from the study of **Prathima and Anuchitra**, which found no association between adherence score and demographic variables. This might be due to the difference between two societies. In this study, women in the age group 18 to 30 years were more adherent to PIH related behaviors. This may be due to that woman belonged to that age group were mostly primigravida and more educated than others ⁽¹³⁾.

Also this study found that high educated women were significantly more adherent than other less educated women towards PIH related behaviors. In agreement with this, **Banke-Thomas et al.** ⁽¹⁶⁾ reported that improving women's education increases the utilization of maternal healthcare services, including antenatal care. In a study in Sudan, it was declared that lack of maternal education increased the probabilities of non-use of antenatal care ⁽¹⁷⁾.

In the current study, 57.5% of pregnant women didn't take the medications because they were not available at health facility This finding disagreed with that of **Eucabeth**, which reported that only 12.4% of PIH women didn't take their medications because of unavailability at health facility ⁽⁴⁾.

The health system factors that were significantly associated with treatment adherence were explanation of PIH during diagnosis, advice on the importance of taking PIH medications, explanation on schedule and timing of taking the drugs.

Also, this study revealed that availability of the PIH drugs at the health facility was significantly associated

with treatment adherence; contradictory to **Eucabeth**, who reported that availability of the medication at the health facility wasn't associated with PIH treatment adherence. This result might be attributed to unavailability of antihypertensive drugs that can be used in pregnancy during the period of data collection at the private pharmacies due to deficiency of the raw materials of these drugs ⁽⁴⁾.

CONCLUSION

The main conclusion of this study is that the educational program about pregnancy induced hypertension was successful and effective in promoting knowledge and therefore adherence. There was significant improvement in the level of adherence to PIH health related behaviors including; ANC attendance, rest and sleep as well as diet and supplements after health education. Women at age group 18-30 years and high educated ones were significantly associated with adherence to PIH health related behaviors.

DECLARATIONS

- **Consent for Publication:** I confirm that all authors accept the manuscript for submission
- **Availability of data and material:** Available
- **Competing interests:** None
- **Funding:** No fund
- **Conflicts of Interest:** The authors declare no conflicts of interest regarding the publication of this paper.

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