



## Original Article

# Comparison of the Prescription Pattern of Antihypertensive Drug Therapy over Time and its Association with Severity of Essential Hypertension

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### ARTICLE INFO

### A B S T R A C T

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**Background:** Essential hypertension is the lifestyle disorder which is spreading year by year and becoming more severe than before. Drug therapy prescription pattern is also becoming more complex to control it. Therefore, comparison of the drug therapy pattern of a particular area between the two time frames may be the indicative of severity of essential hypertension in that area. **Objectives:** To study and compare the prescription pattern of antihypertensive therapy in rural population of Haryana using data from retrospective study and prospective study to find out the latest prevalence and severity of essential hypertension, prescription pattern of drugs and associated risk factors. **Methods:** A retrospective study was carried out on the patient data from the years 2009 to 2013 at OPD of M.M. hospital, Mullana to find the previous year's prevalence of different diseases including essential hypertension and prescription pattern of antihypertensive drug therapy. Based on the results a prospective study from January 2015 to December 2016 was conducted and total 510 patients (270, essential hypertensive and 240 essential hypertensive with new onset of diabetes) were included to collect the desired data. **Results and discussion:** From the retrospective study, prevalence of essential hypertension was found around 41.21%. A shift in the drug therapy pattern from monotherapy to combination therapy was observed from retrospective data to prospective data which suggested the high severity of essential hypertension. Gender wise data of prescription pattern showed that female were more prone to develop hypertension. An increase in the percentage of females was observed from retrospective (17.26%) to prospective study (38.15%) in combination drug therapy which suggested its severity in females than male patients. Essential hypertensive with new onset of diabetes patients were also shifted to combination drug therapy. **Conclusion:** The shift in the prescription pattern of the antihypertensive from monotherapy to combination therapy in majority of patients from the year 2009 to year 2016 indicated that the severity of essential hypertension is increasing year by year and more drugs are need to be added to the therapy regimen to control it. Implementation of a large scale awareness programme is needed to combat these metabolic diseases.

**Key Words:** Essential hypertension, Antihypertensive therapy, prescription pattern, comparison.

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## 1. INTRODUCTION

Everything in this world has its two sides' i.e. a bright side and a dark side. Luxury is also one such bright side of life to mankind. To get a luxurious life humans are working hard

day and night. But a continuous chronic change in the life style pattern of individuals to live a luxurious life is leading them to a darker side of irreversible loss of human health due to appearance of different diseases. Essential hypertension is one of the life style disorders with a high mortality rate<sup>1,2</sup>. In the race for luxury, India is not lagging behind and developing serious healthcare issues. Almost 25% of urban and 33% rural Indian populations are suffering from metabolic disorder i.e. essential hypertension<sup>3</sup>. World data about the prevalence of hypertension suggested that by the year 2025, the load of hypertensive patients will increase to around 1 billion to 1.56 billion<sup>4</sup>. Essential hypertension alone is considered as the risk factor for various cardiovascular diseases and kidney disease including new onset of diabetes. Hypertension and diabetes mellitus are reported to affects the pathophysiology of each other and hence the mutual risk factor<sup>5,6</sup>. Around one third essential hypertensive patients are reported to develop diabetes in later stages of hypertension which make them 75% more dangerous than that of the single disease<sup>7,8,9</sup>. The situation is worsened and further, become more complicated with excessive use of antihypertensive drugs which are reported to induce new onset of diabetes in essential hypertensive patients after the use of 3 years or more<sup>10</sup>. Therefore, diagnosis and control of hypertension is a must to do task at priority basis to avoid its complications. Comparison of change in pattern of antihypertensive therapy gives an idea about the current status of the essential hypertension whether its prevalence is in serious or non serious conditions. In the present study, we tried to find out the prevalence of essential hypertension along with other diseases and change in the pattern of antihypertensive therapy over the course of time to access the severity of essential hypertension in the rural population of Haryana.

## 2. MATERIAL AND METHODS

### Ethics

The study was approved (IEC/670) by the Institutional Ethics Committee of M.M. University and prior written consent was obtained from all the participants.

### Study Design

The present study was carried out on the 38,500 inhabitants residing in 30 kilometer radius of Mullana block in district Ambala of Haryana State. The study was divided in two parts: first part included a retrospective analysis of data available with the hospital to find out the previous five years data of prevalence of different diseases including essential hypertension and pattern of antihypertensive therapy and second part included a prospective study to access change in drug therapy pattern and associated risk factors.

### Retrospective Study

The study was carried out in M.M. Institute of Medical Science & Research, Mullana (Haryana) situated in rural area in Mullana on patients visiting the OPD of the hospital during the years from 2009 to 2013. The retrospective data

was collected from the patient data centre of the university hospital to find out the prevalence of different diseases including essential hypertension in this rural population.

### Prospective Study

The prospective study was conducted on patients visiting the OPD of University hospital from January 2015 to December 2016. A sample size of 164 patients would be sufficient to represent the essential hypertensive population residing in the rural area under investigation with a power of 80% and a *P*-value of 0.05. We have selected 510 patients (270 essential hypertensive patients and 240 essential hypertensive with new onset of diabetes patients) who visited regularly in hospital OPD. Patients who agree to participate were explained the nature and the objectives of the study, and informed consent was obtained individually.

### Data Collection

The retrospective data was collected from the data center and prospective data was collected from the OPD of the university hospital. After the written consent from the patients various parameters like age, sex, education status, family history, and drug therapy prescribed were recorded in a given questionnaire. The information about patient's identity was not included with other data and only physician had the access to this information.

### Inclusion and exclusion criteria

Essential hypertensive patients of age group 18 years to 75 years diagnosed by the physician, with essential hypertension and were treated with antihypertensive medication either as monotherapy or combination therapy were recruited. Pregnant and lactating mothers and all individuals with the ageless than 18 years or above 75 years were not included in the study.

### Statistical analysis

Data analysis was done with the help of an SPSS version 14.5. Continuous variables are expressed as means  $\pm$  SD. Intergroup comparisons are made using students t test. *P* value  $\leq$  0.05 was considered statistically significant.

## 3. RESULTS

### Retrospective study

In the retrospective study we found the data of total of 2672 patients. Among which 1560 (58.38%) were male patients and 1112 (41.62%) were female patients. The total prevalence of various diseases including essential hypertension and essential hypertensive with new onset of diabetes among male and female rural population of mullana from the year 2009 to 2013 is given in below **table 1**:

From the retrospective data given in **table 1**, it is clearly seen that essential hypertension was most prevalent disease in 41.21% population followed by cardiovascular disease 21%, diabetes mellitus patients (15.87%), essential hypertensive with new onset of diabetes 11.83%, COPD (8.38%) and other non serious seasonal disease about 1.72% of total population (**figure 1**).

Male patient population of this rural area showed a high prevalence for both essential hypertension (21.59%) and diabetes (9.06%) as compared to females (19.61% and 6.81% respectively). Essential hypertension with new onset of diabetes was more prevalent in females (7.26%) than males (4.57%) among those visited the university hospital. CVDs, COPD and other diseases were more prevalent in male patients as compared to females. This data showed that female patients were more prone to develop diabetes and hypertension (**figure 2**).

Comparison of the antihypertensive therapy prescription pattern among the data from retrospective study (from year 2009-2013 data) and prospective study (from Jan 2015 to Dec 2016 data)

A comparison was made between prescription pattern of antihypertensive drug therapies from retrospective data analysis (**table 2**) and from prospective data analysis (**table 3**).

Among total 1101 essential hypertensive patients, 59.85% patients were prescribed monotherapy and 40.15% were prescribed on combination therapy from 2009 to 2013 as given in **figure 3**.

From the prospective study from Jan 2015 to Dec 2016, out total 270 essential hypertensive patients 40.37% patients were on antihypertensive monotherapy and 59.63% patients were on combination drug therapy. The comparison of the change in the pattern antihypertensive drug therapy is given in **figure 3**.

Gender wise prescription data from retrospective study (i.e. data from 2009 to 2013) revealed that more number of female patients was prescribed with antihypertensive monotherapy than male patients (**figure 4**) while the data from the prospective study (from Jan 2015 to Dec 2016) revealed that 13.70% males and 26.67% were prescribed with monotherapy and 21.48% males and 38.15% females were prescribed combination drug therapy (**figure 5**).

When we classify the retrospective data based on the class of drugs prescribed, it revealed that among male patients 28.31% were prescribed with BBs, 5.54% with ACEI, 27.08 with CCB, 12.92% with diuretics and 26.15% with ARB. While among female patients 33.23% were prescribed with BB, 8.68% with ACEI, 20.06% with CCB, 17.66% with diuretics and 20.36% with ARB (**figure 6**). Data revealed that female patients were most prescribed with BB followed by diuretics and ACEI while male patients were most prescribed with CCB followed by ARB.

While the data from the prospective study revealed that CCBs 45 (41.28%) were the most prescribed drugs followed by BB and diuretics which were equally prescribed in 32 (29.36%) patients. The gender wise data of patients on monotherapy showed that out of total 37 male patients BB 11 (29.73%) and diuretic 11 (29.73%) were equally and most prescribed drug therapy and CCB were prescribed in 15 (40.54%). Out of total 72 female patients same trend was observed between BB 21 (29.17%) and diuretics 21

(29.17%) and CCB 30 (41.66%) (**figure 7**). Surprisingly, ACEIs and ARBs were not prescribed to a single patient as mono therapy or in combination with other drugs.

We also consider the essential hypertensive patients with new onset of diabetes for the pattern of antihypertensive drug therapy prescribed to evaluate if there is any role of antihypertensive drug therapy in new onset of diabetes as per the conclusion drawn by many studies from the literature<sup>10, 11, 12</sup>. Among total 240 essential hypertensive with new onset of diabetes patients, 80 (33.33%) were male and 160 (66.67%) were females. Mono drug therapy was prescribed to 78 (32.50%) patients; whereas combination therapy was given to 162 (67.50%) patients (**figure 8**).

#### 4. DISCUSSION

Hypertension is considered as the responsible risk factor for various other cardiovascular diseases like heart failure, kidney failure, stroke, diabetes and its complications and in some cases hypertension may lead to the damage of the brain which makes it a fatal disease<sup>13</sup>. Even the antihypertensive on prolonged use also reported to induce the glycaemic disturbance which may further lead to new onset of diabetes<sup>10</sup>. India is also among the developing countries which are at higher risk of lifestyle disorders like hypertension. Analysis of the pattern of antihypertensive drug therapies comparing the change in the patten between the two time frames of any given area may be the indicative of change in the prevalence and pattern and complexity of essential hypertension in that area. Therefore, in the present study, we tried to access the prevalence of essential hypertension, prescription pattern of antihypertensive drugs from retrospective and prospective study data of the patients visiting the university hospital. The retrospective data suggested a very high prevalence of essential hypertension (41.21%) along with its complication diseases like diabetes (15.87%) and essential hypertensive with new onset of diabetes (11.83%) in overall population (table 1) which is slightly higher than the previous study conducted on the same population area by Gupta et al, 2011<sup>14</sup>. Male patient population of this rural was found more at risk of essential hypertension than females but an opposite scenario was observed for essential hypertensive with new onset of diabetes patients as prevalence of new onset of diabetes in hypertensive females patients were more than male patients. The comparison of pattern of antihypertensive therapy pattern between retrospective data (from 2009 to 2013 data) (table 2) and prospective data (from Jan 2015 to Dec 2016) (table 3) showed a significant change in the pattern and the drug therapy was shifted from monotherapy to combination therapy in majority of patients (figure 3). This is the case where we can extract the conclusion that during these years hypertension become more severe and uncontrollable with single drug therapy and physician added more drugs to the drug therapy regimen of patients to get better control over it. The gender wise data of the drug therapy pattern between these two study data revealed that

the situation of female patients was more severe than male patients (figure 4 and figure 5) as the number of females patients in both monotherapy and combination therapy was significantly higher than that of males in latest prospective study data as compared to retrospective data. The comparison of drug wise data showed that in retrospective study BBs were the most prescribed drug along with diuretics and ARBs. Other drugs like CCBs and ACEIs were also prescribed. But prospective data suggested that CCBs were most prescribed followed by equal share of BBs and diuretics. However, in prospective study, ACE inhibitors and ARBs were not prescribed to even a single patient. Therefore, from our data it was found that the prescription pattern of antihypertensive therapy shifted from mono therapy to combination therapy from 2009-2013 data to 2016 data which suggest the severity of the disease. The data of essential hypertensive with new onset of diabetes patients also showed a higher percentage of patients prescribed with combination drug therapy (figure 8).

**Table 1: Gender wise prevalence of different disease in the rural population of Haryana during the year 2009 to 2013**

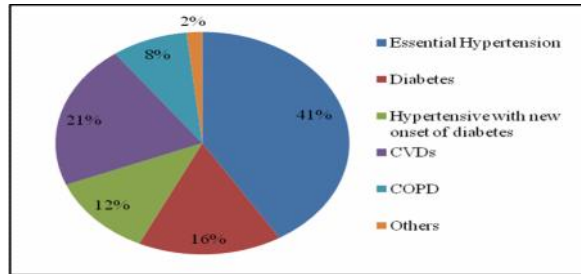
Disease	Males n (%)	Females n (%)	Total n (%)
Essential hypertension	577 (21.59)	524 (19.61)	1101 (41.21)
Diabetes mellitus	242 (9.06)	182 (6.81)	424 (15.87)
Essential hypertensive with new onset of diabetes	122 (4.57)	194 (7.26)	316 (11.83)
Cardiovascular disease	411 (15.38)	150 (5.61)	561 (21)
COPD	175 (6.55)	49 (1.83)	224 (8.38)
Other diseases	33 (1.24)	13 (0.49)	46 (1.72)
Total	1560 (58.38)	1112 (41.62)	2672 (100)

**Table 2: Prescription pattern of anti hypertensive therapy among the patients visited the medicine OPD of University hospital from 2009 to 2013**

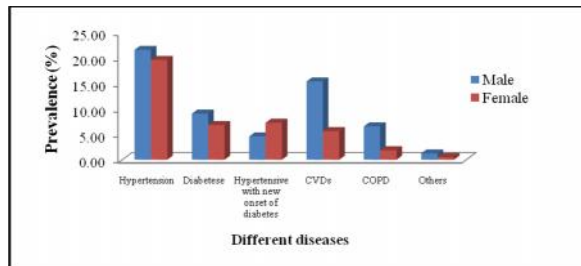
Pattern	Number of Prescriptions		Total n (%)
	Male n (%)	Female n (%)	
Monotherapy	325 (29.52)	334 (30.33)	659 (59.85)
Combination Therapy	252 (22.89)	190 (17.26)	442 (40.15)
<b>Total</b>	<b>577 (52.41)</b>	<b>524 (47.59)</b>	<b>1101 (100.00)</b>

**Table 3: Prescription pattern of anti hypertensive therapy among the patients visited the medicine OPD of University hospital from Jan 2015 to Dec 2016**

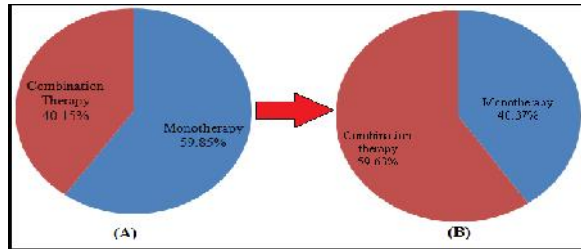
Pattern	Number of Prescriptions		Total n (%)
	Male n (%)	Female n (%)	
Monotherapy	37 (13.70)	72 (26.67)	109 (40.37)
Combination Therapy	58 (21.48)	103 (38.15)	161 (59.63)
<b>Total</b>	<b>95 (35.18)</b>	<b>175 (64.82)</b>	<b>270 (100.00)</b>



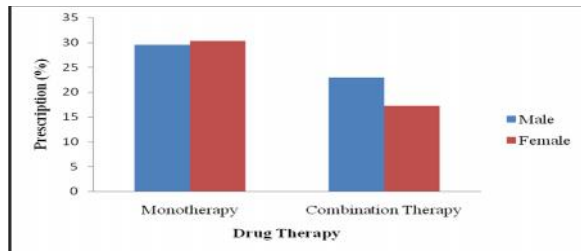
**Fig 1: Prevalence of different disease among the patients visited the medicine OPD of university hospital from 2009 to 2013**



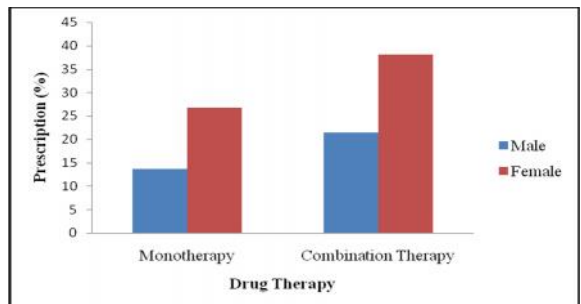
**Fig 2: Gender wise distribution of different diseases among patients visited university hospital from 2009 to 2013**



**Fig 3: Change in the pattern of antihypertensive therapy from (A) retrospective data from 2009-2013 to (B) prospective data from Jan 2015 to Dec 2016.**



**Fig 4: Gender wise prescription pattern of anti hypertensive drug therapy from the year 2009 to 2013.**



**Fig 5: Gender wise prescription pattern of anti hypertensive drug therapy from Jan 2015 to Dec 2016.**



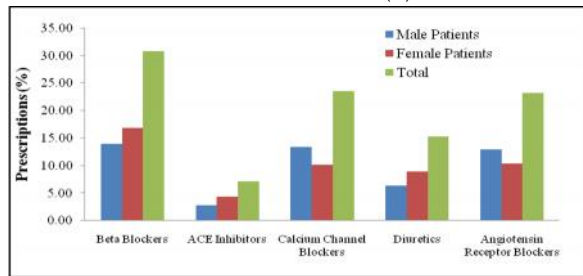


Fig 6: Gender wise prescription pattern of monotherapy among essential hypertensive patients from 2009 to 2013.

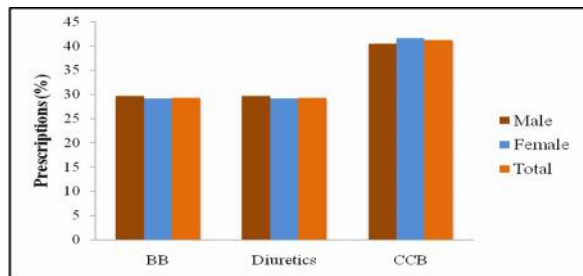


Fig 7: Gender wise distribution of anti hypertensive drugs as monotherapy

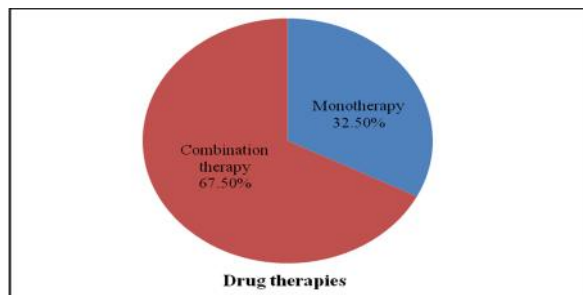


Fig 8: Anti hypertensive drug therapy prescription pattern among essential hypertensive with new onset of diabetes patients

## 5. CONCLUSION

Our study suggests that essential hypertension is the most prevalent disease in the rural population of Haryana in both males and females. The shift in the prescription pattern of the antihypertensive from monotherapy to combination therapy in majority of patients from the year 2009 to year 2016 indicated that the severity of essential hypertension is increasing year by year and more drugs are need to be added to the therapy regimen to control it.

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