

Ambulatory blood pressure monitoring: A useful tool to diagnose hypertension and supervise its treatment

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ABSTRACT

Automatic ambulatory blood pressure monitoring (ABPM) for the diagnosis and treatment of hypertension (HTN) is not common in Nepal. The purpose of this study is to evaluate various characteristics of hypertensive patients undergoing ABPM before starting antihypertensive treatment and evaluate the adequacy of the blood pressure (BP) control during antihypertensive treatment. ABPM was performed in 108 consecutive patients attending the hypertension clinic of Nepal Medical College Teaching Hospital from 1st March 2005 to 30th April 2007 with DynaPulse 5000A (version 3.20q) for approximately 24 hours. Male female ratio was 59:49 and age (mean \pm SD) was 47.8 \pm 16.4 years. The maximum use of ABPM (25.9%) was noted in the age group of 40-49 years. Body mass index was 25.7 \pm 3.8. Diabetes was noted in 13 % patients. Maximum use of ABPM was observed in Newar ethnic group (56.5%). ABPM was used for the diagnosis of HTN in 62.0% patients and for follow up in 38.0% patients. Severe HTN was seen in approximately half (47.2%) of the hypertensive patients. Majority of the patients (88.0%) had dipper type of HTN. Beta-blocker (35.6%), ACE inhibitor/Losartan (31.1%) and calcium channel antagonist (26.7%) were the usual antihypertensive agents used. Single antihypertensive agent was used in the majority of patients (64.1%). In a small number of patients (42, 38.9%) undergoing ABPM during antihypertensive therapy, the adequacy of control of HTN was very poor.

Keywords: hypertension (HTN), ambulatory blood pressure monitoring (ABPM).

INTRODUCTION

The incidence of hypertension (HTN) continues to increase in all developed and developing societies as the population grows older and more obese.¹ The Framingham Study and other epidemiological surveys have clearly defined HTN as an important cause of morbidity and mortality.²⁻⁴

In Nepal also, the incidence of HTN seems to be increasing. A prolonged health camp (duration 9 weeks, 1989) based incidence of HTN in Mid Western Nepal (Surkhet), was reported to be very low (< 0.3%; Royal health camp, 1989)⁵. Later on (2001), in a community based study in urban and rural area of the same area, the prevalence of HTN was 9.9%.⁶ In a Teaching Hospital based observation in Nepal, 3.9% (109/2829) of the admitted patients were suffering from HTN and had mortality rate of 1.8% which was higher than that of rheumatic heart disease.⁷ Similarly in a descriptive hospital based study conducted in 3 central hospitals of Nepal, HTN was detected in 36.0% of stroke, 31.0% of heart failure, 17.0% of blindness/visual impairment and 16.0% of renal failure.⁸ To prevent various complications, HTN must be properly diagnosed and adequately treated. If untreated, about 50.0% of hypertensive patients die of coronary heart disease or congestive failure, about 33.0% of stroke, and 10.0 to

15.0% of renal failure.⁸⁻¹⁰

As HTN is usually symptomless, the diagnosis is usually ascertained by the measurement of blood pressure (BP). Though considered inappropriate, clinic measurement continues to be an important aspect of the diagnosis of HTN in developing countries like Nepal. Though home measurement of BP is recommended for better diagnosis and treatment of HTN,^{11,12} such practice may be difficult in illiterate societies. Ambulatory blood pressure monitoring (ABPM) has emerged as an important tool for the diagnosis and treatment of hypertension.^{13,14} In Nepal also, ABPM has been recently introduced in clinical practice. This study is conducted to evaluate the usefulness of ABPM in diagnosing HTN and monitoring the adequacy of antihypertensive treatment in a group of Nepalese patients.

PATIENTS AND METHODS

One hundred and thirty ABPM were performed in 111 consecutive patients attending the hypertension clinic of Nepal Medical College Teaching Hospital from 1st March 2005 to 30th April 2007. DynaPulse 5000A for windows application version 3.20q (Pulse metric Inc, USA) was used for approximately 24 hours ABPM. Nonhypertensive patients (3) were excluded from the study. Twelve patients cooperated in 19 repeated ABPM

(10 patients underwent repeated ABPM for monitoring antihypertensive therapy and 2 underwent ABPM for diagnostic purpose). These patients constituted our patient population.

RESULTS

Total of 127 ABP recordings of 108 consecutive patients were available for the evaluation. Out of 108 patients, sixty seven patients (62.0 %) underwent ABPM for the diagnosis of HTN and 41 (38.0%) underwent ABPM during follow up of antihypertensive therapy. Male female ratio (M:F) was 59:49 and mean age(Mean±SD) was 47.8±16.4 years. Body mass index, BMI was 41.1±5.9. Diabetes was noted in 13.0% patients. Day to day physical activities was encouraged to be undertaken by the patients during the monitoring. Patients were encouraged to undergo repeat ABPM after starting anti-hypertensive medication to evaluate the adequacy of BP control with the prescribed anti-hypertensive medications.

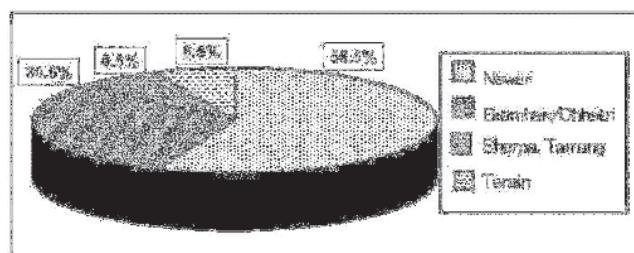


Fig. 1. Ethnic group wise distribution of ABPM users Nepal

Ethnic group wise distribution of ABP user is shown in Fig. 1. Maximum use of ABPM in HTN was observed in *Newar* 56.5%, followed by *Brahman* and *Chhetri* (30.6%) (Fig. 1). Age group of 40-49 years was on the maximum user of ABPM (26.7%) followed by the age group of 50-59 years (20.8%) as shown in Fig 2.

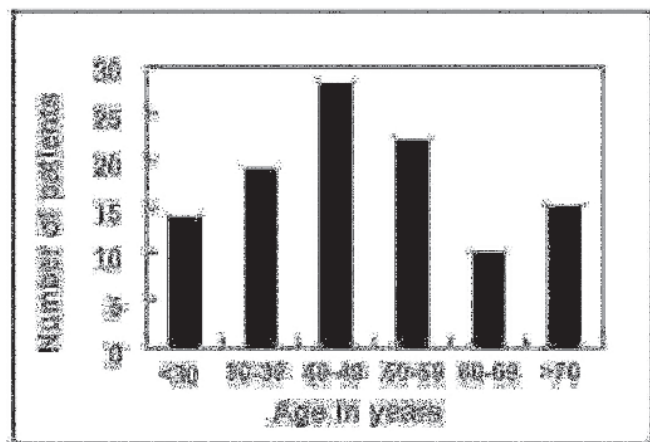


Fig 2. Age group wise distribution of ABPM user in hypertension in Nepal

The maximum and minimum systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse rate

Table-1: Distribution of maximum and minimum SBP, DBP and PR.

Parameters	Values (Mean ±SD)
Maximum SBP (mm Hg)	181.4 ± 25.9
Minimum SBP (mm Hg)	94 ± 11.9
Maximum DBP (mm Hg)	100.9 ± 14.7
Minimum DBP (mm Hg)	41.1 ± 12.0
Maximum pulse rate (beats/min)	107.5 ± 14.9
Minimum pulse rate (beats/min)	56.3 ± 7.2

(SBP systolic blood pressure, DBP diastolic blood pressure, PR pulse rate)

(PR) are shown in Table 1. Almost all (88.0%) patients showed features of dipper type and a nominal patients (12.0%) had non-dipper type of HTN. Nepalese patients had relatively higher SBP [stage 3 European Society of Hypertension- European Society of Cardiology (ESH-ESC) classification]¹⁵ than DBP (stage 2 in ESH-ESC classification) as shown in Table-1.

Severe hypertension (ESH-ESC classification Stage 3) was seen in approximately half (47.2%) of the

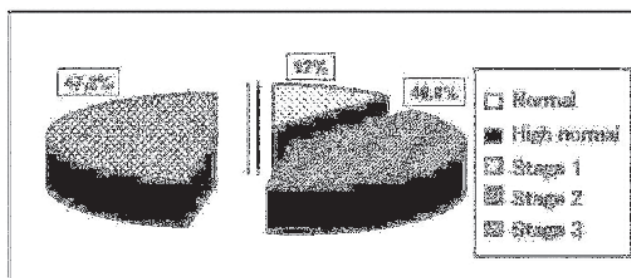


Fig. 3. Distribution of various stages of hypertension (ESH-ESC classification).

hypertensive patients.

Types of antihypertensive agents used were shown in Fig 4. Beta-blocker (32.1%), Angiotensin Converting Enzyme Inhibitor (ACEI) /Angiotensin Receptor Blocker, (ARB) Losartan (30.4%) and calcium channel blockers (26.8%) were the usual antihypertensive agents used as shown in fig.3. Use of diuretics (8.9%) and alpha-blockers (1.8%) were rare.

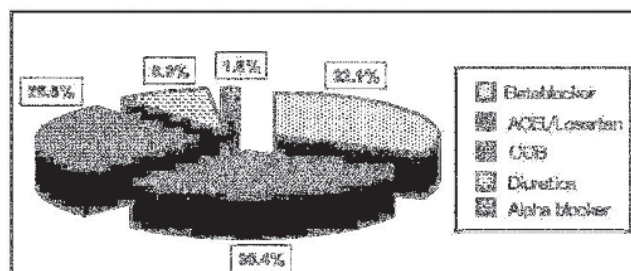


Fig. 4. Distribution of antihypertensive agents among the hypertensive patients.

Among beta-blocker users (n=18, 32.1%) both Metoprolol (44.4%) and Atenolol (38.9%) were used in equal number however, carvedilol were used less frequently (16.7%). Single antihypertensive agent was used in the majority of patients (64.1%).

Only a small number of patients (n=42) were available for the evaluation of the adequacy of antihypertensive agents in controlling HTN. If stricter control of BP is followed (<140/90 mm Hg), the adequacy of antihypertensive agents in controlling HTN was 0%.

Few interesting uses of ABPM:

1. Encourage antihypertensive therapy: ABPM has been useful also to encourage the patient to take regular treatment. Showing the BP recording values or the graph with high and low BP recordings in 24 hours has been very convincing to the patient for the diagnosis of HTN and hence the need for therapy. Only 5 patients (n=108, 4.6%) did not comply with the recommendation for treatment. All of them were medical personnel (three doctors and two lab technicians). Four patients did not initiate antihypertensive therapy and one patient did not increase the dosage of antihypertensive therapy. However, one patient was suggested to defer antihypertensive treatment by a physician but the patient was so eager to start antihypertensive treatment after seeing the graphic presentation of ABPM.
2. Solve the confusion of discontinuation of antihypertensive therapy: One hypertensive patient required minimal antihypertensive therapy after surgical removal of renal stone and nonfunctioning kidney. ABPM was useful to document residual HTN and encourage continued antihypertensive therapy.
3. Two patients had funny presentations but ABPM discovered their hidden HTN. One young lady complaining of shortness of breath in absence of frank wheezes noticed severe HTN during ABPM. Another middle aged lady having mitral valve prolapse, frequent premature ventricular ectopic beats and usually low blood pressure on few occasions noticed to have HTN during ABPM. Appropriate antihypertensive therapy led to the marked symptomatic relief of these patients.

DISCUSSION

The incidence of HTN seems to be increasing throughout the world including Nepal. Well conducted observational studies, preferably community based studies in various parts of Nepal will be necessary to better understand the incidence of HTN in Nepal.

In a community based study in urban and rural area of

the Mid-western region of Nepal, the prevalence of HTN was 9.9%. However, previously in a prolonged health camp of about 9 weeks duration in early 1989 in the same area, HTN was not observed to be a common disease (<0.3% hypertension)⁵. The reason may be increase in the incidence of HTN in Nepalese community or difference in the sampling either in the form of community based study or the health camp based study. Further well conducted prospective studies will be necessary to confirm this finding.

ABPM is a more sensitive predictor of cardiovascular outcome than conventional measurement¹⁶ and is to be encouraged in both specialized care centers and primary care centers.^{17,18} However, ABPM has just been recently introduced in Nepal.

Maximum use of ABPM in *Newar* ethnic group (56.5%) was observed in this study (Fig. 1). It may reflect higher incidence of HTN in *Newar* ethnic group or it may be related with better economic prosperity and better access to the health care. Community based study will be necessary to know the incidence of HTN in various ethnic groups.

Age groups of 40-49 years (25.9%) and 50-59 years (20.4%) were the usual ABPM users (Fig. 2). It may mean higher incidence of HTN after 40 years however, number of young hypertensive (<30 yr, 13.0%) and elderly hypertensive (>70 yr, 13.9%) were similar in this hospital based study. Short life expectancy in Nepalese elderly people and higher incidence of secondary HTN may have contributed to this finding however, community based studies will be necessary to answer this question.

Severe HTN (ESH-ESC classification Stage 3) was seen in approximately half (47.2%) of the hypertensive patients in this study despite excluding severe hypertensive patients in pre-treatment ABPM. Prevalence of severe hypertension may be higher in Nepalese patients. This observation demands the need for more aggressive investigation and treatment of HTN in Nepalese patients.

Majority of the patients in this study had dipping type of HTN (88.0%). Relative absence of non-dipper type of HTN may be due to case selection bias which deliberately excluded severe type of HTN demanding urgent treatment and deferring treatment for pre-treatment ABPM which was considered unsafe and unjustified. Considering the relatively low minimum diastolic blood pressure in Nepalese population (Table 1), they may be more prone to stroke based on the report of increased risk of cardiovascular morbidity in excessive dipping or no dipping.¹⁹

ABPM has been useful not only to diagnose HTN but also useful to encourage the patient to take regular treatment. Noting the fact that by showing the BP recording values or the graph with high and low BP recordings in 24 hours, it has been very convincing to the patient for the diagnosis of HTN and hence initiate antihypertensive therapy. Only 5 patients (All of them were medical personnel) did not comply with the recommendation for treatment. Two preferred to undergo life style modification in stead of treatment and one refused to increase the dose of antihypertensive medication considering reasonably controlled BP recording in few occasions BP at clinic or home.

Beta-blockers (32.1%), ACEI/ ARB (30.4%) and Calcium channel blockers (26.8%) were the usual antihypertensive agents used in this study population. Approximately one third (32.1%) of the patients under antihypertensive therapy were beta-blocker users. Metoprolol (44.4%) was used slightly more than Atenolol (38.9%). Probably poor outcome of Atenolol in comparison to losartan in Losartan Intervention For End point reduction in hypertension study, LIFE trial,²⁰ has resulted in recently lesser use of atenolol. Persistent use of atenolol may partly be due to the outcome of promotional activities of pharmaceutical companies to encourage the use of atenolol.

Use of beta-blockers like Metoprolol and carvedilol may still be acceptable in presence of ischemic heart disease and heart failure.²¹⁻²⁴ All beta-blockers may not be same²⁵ and proper use of lipid soluble beta-blocker may still have their role in special situations. Carvedilol was used only in few selected patients (16.7%) with features of heart failure.

About one third of hypertensive patients were receiving ACEI and ARB (30.4%). Evidences with better outcomes of the use of ACEI²⁶ and ARB with atenolol may have encouraged their use²⁰ Despite the recommendation of the 7th report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, JNC7 for the use of thiazide diuretic as the initial drug of choice and better clinical outcome in low dose thiazide diuretic,²⁷ and similar efficacy as compared to lisinopril or amlodipine in the Antihypertensive and Lipid Lowering Treatment to Prevent Heart Attack Trial, ALLHAT study,²⁸ use of diuretic was rare (4.4%). Even though, thiazides are cheap and have additional benefit such as protection against osteoporosis, it may have lagged behind in promotional activities among pharmaceutical companies. Use of alpha-blockers were rare (2.2%) and limited to patients suffering from prostate enlargement and symptoms of prostatism.

Based on a small group of patients (n=42), the adequacy of antihypertensive agents in controlling hypertension. was noted to be quite low (0%). In the setting of controlled clinical trial, better control of HTN in 65.0% patients has been achieved with aggressive efforts as reported.²⁹ A more intensified efforts to diagnose and treat HTN with an aggressive antihypertensive therapy should be attempted however, it could not be achieved in real clinical practice in Nepalese societies. A liberal use of ABPM was usually not possible because of the lack of cooperation from the patients due the additional financial cost and some uneasiness during ABPM to carry day to day activities and sleep disturbance at night. Despite the recent reports of better patient acceptance of ABPM with minimal extra cost in foreign countries^{17,30} poor Nepalese patients do not behave similarly because of their poor affording capacity and negligible existence of health care insurance in Nepal.

The main limitation of this study is the noninclusion of severely hypertensive patients before offering treatment. Deferring the urgent anti-hypertensive treatment in patients with extremely high systolic or diastolic blood pressure was not considered safe and hence avoided to prevent serious complications. ABPM data of such patients were not available before antihypertensive therapy. Only during the antihypertensive therapy, ABPM were available to monitor the adequacy of the treatment in them.

Even though the use of ABPM for diagnosis of HTN and supervision of it's treatment has some additional financial burden, it provides lots of crucial information. So use of ABPM should be maximized for better management of hypertension.

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