IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 21, Issue 2 Ser.12 (February. 2022), PP 34-38
www.iosrjournals.org

Ambulatory blood pressure monitoring early after acute Myocardial infarction and its role to predict the adverse cardiac events.

Dr. Manasi Bhowmik[1], Dr.Subrata Bhowmik[2].
1.Dr. ManasiBhowmik, Medical Officer, IGM Hospital,Agartala,Tripura, India
2. Dr. SubrataBhowmik, Senior Resident, Department of Medicine, Agartala Government Medical College & GBP Hospital, Agartala, Tripura,India.
Address for communication – Dr. SubrataBhowmik, Vivekananda Lane, BhatiAbhoynagar, Opposite to Ramnagar Police outpost, P.O.-Agartala, West Tripura, India,PIN – 799002.
Corresponding author - Dr.SubrataBhowmik

Date of Submission: 08-02-2022 Date of Acceptance: 22-02-2022

Abstract

Introduction -Acute Coronary Syndrome (ACS) is a clinical syndrome which consists of Acute Myocardial Infarction (AMI) [ST segment elevation to non-ST segment elevation (Q wave & non-Q wave)] and unstable angina (ACS without enzyme or marker release).Ambulatory Blood Pressure Monitoring (ABPM) is when blood pressure is measured as someone move around, living his normal daily life. It is measured for up to 24 hours.Various studies have also suggested that the morning surge and even elevation of BP on rising may also be associated with target organ damage and cardiovascular events. Thus this study was aimed to find out this Prognostic Index (PI) can be of any utility to predict the future adverse cardiac events in patients soon after acute coronary syndrome .

Methods - The study is a cross sectional study.Subjects presented with symptoms of acute coronary syndrome above 18 years old of both sex from casualty or out-patient department of Medicine who fulfill the ESC/AHA (European Society of Cardiology/American Heart Association), third universal Definition of MI were monitored with ABPM.

RESULT - 65.45% cases had Systolic BP Dipping, followed by 29.09% cases invert dipping and 5.45 cases no dipping of their Systolic BP. 78.18% cases had Diastolic BP dipping, followed by 19.09% cases invert dipping and 2.72% cases had no dipping of their Diastolic BP. The mean 24h Diastolic BP (m24hDBP) and Prognostic Index (PI) were 66.15mmHg (SD 8.04) and 142.38 (SD 14.34) respectively among the cases with cardiac events.The p value for both m24hDBP and PI was <0.0001. Thus p value for all these four parameter were statistically significant. So thereby, m24hHR, m24hSBP, m24hDBP and PI were independent risk factor for adverse cardiac events.

CONCLUSION - The co-relation between low Prognostic Index, calculated by the data derived from ABPM with a simple equation and increase cardiac events may emerge a significant tool in future.

KEY WORDS : ABPM, SBP, DBP,PI,MI

I. Introduction

World Health Organisation (WHO) reported that Asian Indians contributed to 20% of the 14 million cardiovascular deaths worldwide[1]. It is estimated that 60% of the world's cardiovascular disease burden will occur in the South Asian subcontinent despite only accounting for 20% of the world's population[2].Due to huge mortality and morbidity burden, the identification of patients at high risk of major cardiovascular events and mortality represents an extremely important issue in cardiology, particularly for those patients who suffered a recent AMI[3].

Ambulatory Blood Pressure Monitoring (ABPM) is when blood pressure is measured as someone move around, living his normal daily life. It is measured for up to 24 hours. Various cross-sectional studies have shown that ABPM over 24 hours and night-time and daytime periods shows a better correlation with the extent of target organ damage and overall cardiovascular risk than casual blood pressure (BP) measurements[4].Various studies have also suggested that the morning surge and even elevation of BP on rising may also be associated with target organ damage and cardiovascular events.

Compared to the physiologically normal profile of a night-time BP fall (*dippers*), blunted night-time BP dipping (*non-dippers*) or a night-time rise (*inverted dippers*) have been linked to greater target organ damage in cross-sectional studies and to worse cardiovascular prognosis in longitudinal studies[4].The predictive value of low systolic blood pressure (SBP) for cardiovascular death and heart failure and acute phase of myocardial infarction (MI) is well known[5]. The possible prognostic role of monitoring of SBP and diastolic blood pressure (DBP) in the early weeks after an MI is however, little known.

ABPM can provide the following three types of information which are of potential value in the clinical field, an estimate of the mean blood pressure level, the diurnal rhythm of blood pressure and blood pressure variability. The mean heart rate during 24 hr (m24Hhr) and mean 24h DBP (m24Hdbp) are independent predictors for cardiac death and heart failure.*Antoniniet. al.* [6] in their study used a formulae defined as *Prognostic Index* (PI) based on the independent variable and found that Age , mean 24-hour diastolic blood pressure (mDBP) and mean 24-hour beat-to-beat interval (mBBI) values were independent predictors of cardiac death and symptomatic left ventricular dysfunction during the follow-up period after Acute MI.This PI could provide a simple numeric value to identify high risk populations and useful indicator for occurrence of adverse cardiac events. There are, however, little large studies on prognostic value of Ambulatory Blood Pressure Monitoring (ABPM) after MI.

Thus this study was aimed to find out the impact of different component of ABPM dataon the cardiovascular outcome. In addition the concept of Prognostic Index (PI) was retested in our population to see if it can be of any utility to predict the future adverse cardiac events in patients soon after acute MI on a short time follow-up.

Aim and Objectives:

1. To study the circadian variation of ambulatory blood pressure monitoring early after acute MI.
2. To assess the possible role of ambulatory blood pressure monitoring to predict the adverse cardiac events in patients with acute MI.

II. Methodology:

This cross sectional study included 110 consecutive patients who were diagnosed as ACS and treated at Tripura Medical College, during January 2016 to June 2017. Diagnosis of cases were done as per ESC, ACCF, AHA, third universal definition of MI, 2012[7].

Inclusion Criteria-

1. Patients above 18 years of age.
2. Having acute coronary syndrome universal definition of MI, 2012.

Exclusion Criteria:

1. Permanent arrhythmias and constant paced rhythm.
2. Diagnosis of ACS not confirmed.
3. Inability of the patient to follow the study protocol.
4. Subjects not willing to give consent.

ABPM was performed by Schiller's BR-102 plus model on 8^{th} day of index hospitalization and patients were followed up clinically for a period of one month to look for any adverse CV events. SBP,DBP and heart rate (HR) measurements were performed with a proper arm cuff every 15 minutes for 24 hours. BP reading were automatically elaborated with dedicated software.

Prognostic Index (PI) was calculated in each patient according to the formula PI= (220- age) –m24 h HR + m24 h DBP as used by Antoniet. al. Cardiac death, re-infraction, and symptomatic left ventricular dysfunction, defined as acute pulmonary oedema or development of sign and symptoms of heart failure and requiring hospitalization, were considered as a combined end point. An effort was made to find out any association between adverse events and prognostic index.Informed consent and ethical committee's approval was taken.Statistical analyses were performed using the Statistical Package for the Social Science (SPSS) 20 version.

III. Results

Over a period of one and half year from January 2016 to July 2017, data on patients who were admitted in the department of Medicine, along with 1 month follow up data were collected. Among the 110 cases 07 cases expired.Among the cases, 83% cases were male and mean age of cases was 58.9± 8.48 year. Maximum percentageof the cases (37.27%) belonged to (51-60) years . NSTEMI found in 42.73% cases, STEMI & unstable angina in 27.27% & 30% cases respectively.

Among risk factors, 76.36% of the cases were hypertensive, 67.27% & 59% were smoker & dyslipidemia respectively. Diabetes mellitus was the least common risk factor (24.54%). On admission, 46.36 % cases presented with clinical features of Killip Class 1, followed by 30%, 14.54%, and 9.09% with features of Killip Class II, III, and IV respectively.

After analyzing ABPM data, we found that Mean24h Heart Rate (m24hHR) variability among cases were 81.02 ±14.88 bpm.Mean 24h systolic Blood Pressure (m24hSBP) among cases was 120.85 ± 19.56 mmHg.Mean 24h Diastolic Blood Pressure (m24hDBP) among cases was 74. 42±11.37mmHg.

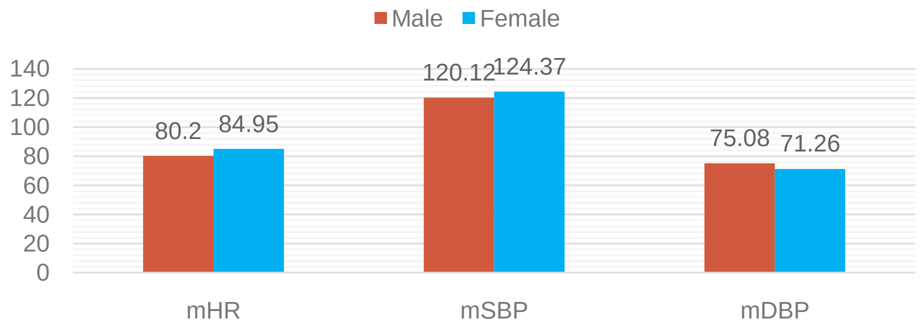

Fig 1:

24 hr awake mean SBP and asleep mean SBP among cases were 123.41 mmHg (SD 19.67) and 118.37mmHg (SD 20.58) respectively with *p value <0.001.* Awake mean 24hDBP and asleep mean 24h DBP among cases were 76.07 mmHg (SD 11.19) and 71.50mmHg (SD 12.61) respectively with *p value <0.001.* Both the p values were calculated using Unpaired T test and found to be <0.05 which were statistically significant.

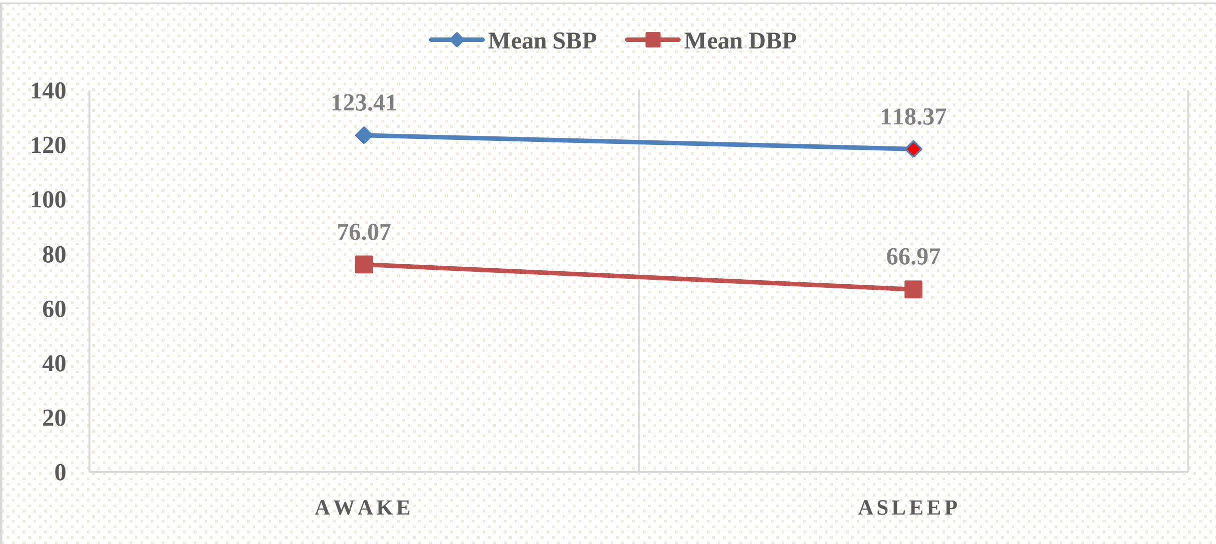

Fig 2: Mean 24hSBP and mean 24hDBP during awake and sleep.

Among the 110 cases, 65.45% cases had Systolic BP Dipping, followed by 29.09% cases invert dipping and 5.45% cases no dipping of their Systolic BP. Likewise 78.18% cases had Diastolic BPdipping, followed by 19.09% cases invert dipping and 2.72% cases had no dipping of their Diastolic BP.

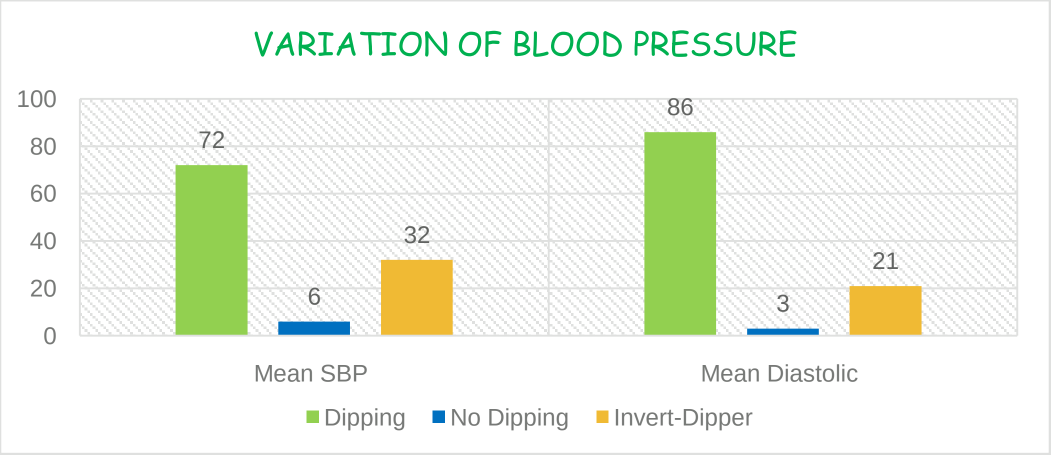

Fig 3: Variation of blood pressure.

During one month follow up, there was 26 (24%) adverse Cardiac events. Among them 11 had Heart Failure, 8 cases experienced Re-infraction, and 7 cases expired.

Main characteristics in patients with and without events during the follow-up.

Parameters	Events during Follow up	No events during follow up	P value
Age (mean)	61.15±9.07 y	58.37±8.25 y	0.145
Male	69.23%	86.90%	0.34
Female	30.76%	13.09%	0.037
Hypertension	76.92%	76.19	0.939
Diabetes mellitus	30.76%	22.61	0.399
Dyslipidemia	88.46%	85.71	0.721
Smoking history	57.69%	70.23	0.234
Family h/o CAD	34.61%	28.57	0.557
Mean 24h HR	92.85±14.96	77.36±12.89	0.000
Mean 24h SBP	108.96±20.59	124.54±17.80	0.000
Mean 24h DBP	66.15±8.04	76.98±11.06	0.000
PI	142.38±14.34	156.55±17.02	0.000
SBP Dipper	61.53%	83.33	0.158
SBP non-dipper	38.46%	29.76	0.058
DBP dipper	61.53%	83.33	0.158
DBP non dipper	50.0%	16.66	0.019

IV. Discussion

In our study, we noticed a male preponderance below the age of 70 years suggesting that it is predominately a disease of men. A total of 79 (71.81%) cases were in the age group of 51-70 years, among them 65 (82.27%) cases were male. Whereas among the cases above 70 years female outnumbered male. The present study shows that with increasing age the preponderance of male patients admitted with ACS decreases and sex ratio becomes smaller. This possibly reflects a higher percentage of females, and elderly population, and more equal distribution of risk factors for ACS in both genders at higher age group.

Hypertension was the major risk factor for ACS constituting 84 (76.33%) cases out of total 110. Smoking(67.29%) was found to be the 2nd most common risk factor followed by dyslipidaemia(59%).

After analysis different parameters of 24h ABPM data, we found that the mean variation of SBP and DBP during night time were statistically significant. On further analysing of data, we discovered that though these asleep mSBP and mDBP fall were statistically significant, 34.54% and 21.79% cases had no-dipping or invert-dipping of their mSBP and mDBP respectively.

Among the SBP non-dipper cases, 68.42% were above the age of 60 years. So, we found that increasing age had 7.85% relative risk for nocturnal non-dipping (95% confidence interval; 0.935-1.027). We didn't find any significant sex prediction among systolic non-dippers (p value 0.81)

Among the DBP non-dipper cases 58.33% were above the age of 60 years. So, we found that increasing age had 3.79%% relative risk for nocturnal non-dipping (95% confident interval; 0.874-1.77). We didn't find any significant sex prediction among diastolic non-dippers.

In the present study, we have observed an overall one month case mortality rate of 6.36%. A significant difference in the mortality rate was noted when the results were stratified by ACS type (20%, and 4.44% for participants with STEMI, and NSTEMI diagnoses, respectively).

Compared with results from the recently published ACCEPT study[12], a Brazilian follow-up study of post-ACS patients, we had higher 30-day mortality rates for STEMI patients (20.0% *vs*. 7.8%). This high mortality in STEMI might be attributed to that fact that all the cases belonged to Killip II or above. We found that 71.42% death occurred above the age 61years which establish the fact that the mortality rates increased steadily with advancing age and advanced hemodynamic class (Killip class)[74].

We observed that during one month follow up 10% and 7.27% cases presented with feature of heart failure and re-infraction respectively. 72.72% heart failure occurred to the cases who were above 60 years and almost equally prevalent among both sexes (54.54% among male). 62.5% re-infraction occurred in NSTEMI cases among them 87.5% were male. This high number of reinfarction / heart failure was observed mainly in those who could not be thrombolysed because of late presentation to our institution. This was partly due to lack of awareness and delay in transportation.

The combined cardiac events i.e., re-infraction, heart failure and death was observed among 24% cases during one month follow up. Univariate analysis showed that the female sex was to be a significant predictor for high combined cardiac event but hypertension, diabetes mellitus, dyslipidaemia, history of smoking and family history of premature CAD did not pose any statistically higher risk during one month follow up. The statistically insignificant relation hypertension, diabetes and dyslipidaemia, which differ from other study, might be attributed to higher prevalence of these risk factor among our study group.

In the multivariate analysis, m24hHR, m24hSBP, m24h DBP and PI were found to be independent predictors of combined cardiac event (p value<0.05). If we examine the single components of the PI in all cases, we found that 21 out of the 26 cases had amDBP<68mm Hg, and all had a mDBP<74mm Hg.

Many large studies point to a link between 'low' mDBP values and cardiovascular death. The Framingham data[12] analysis has shown that in patients with a previous STEMI there is a statistically significant 'U' curve between diastolic BP and new ischaemic events, and that such a curve seems to be independent from pharmacological treatment. The Multiple Risk Factor Intervention Trial (MRFIT)[13], involving more than 5000 patients with a previous STEMI and who were followed for up to 16 years, confirmed that low values of diastolic blood pressure (DBP) can correlate to an increase in cardiovascular death rate.

The causal link between low DBP and cardiovascular events may lie in the physiology of coronary circulation, whose flow takes place mostly in the diastole. Low DBP causes a reduction in the myocardial perfusion gradient, which in turn is established by the intra-coronary pressure which is opposed by extra-coronary resistances and the ventricle filling pressure.We found that 20 out 26 had a mHR was >90bpm and all had mHR>78bpm. An elevated mHR has been largely described as an independent predictor of morbidity and cardiovascular death. The multivariate analysis demonstrated in these studies, that HR, measured with a simple method, is an independent predictor of cardiovascular death[75].

V. Conclusion

Our study showed that moving BP measurements from single measurements in the "medical environment" survey to multiple readings during 24 h, predicts the clinical adverse outcome in future.

Mean rise of heart rate and mean fall of mean SBP & DBP along with DBP non-dippers inversely predicts the clinical endpoint in subsequent follow up. In addition the co-relation between low Prognostic Index which was calculated by the data derived from ABPM with increase in cardiac events appears to be a useful tool for prediction of adverse CV events.

As these finding are based on modest data and short duration follow up, we propose large case based studies with long term follow up. All the major risk factors for acute coronary syndrome found to be modifiable. A more preventive and aggressive management of risk factor may reduce the burden of the disease in future.

Bibliography

[1]. Moorthy A, Ramesh, Varghese R. Diagnostic Approach to Acute Coronary Syndrome, Medicine update. 2004; 14:43-52 Hamm CW, Bertrand M, Braunwald E. Acute coronary syndrome without ST elevation: implementation of new guidelines. Lancet 2001; 358: 1533–1538
[2]. Enas EA, Mehta J, et al. Malignant Coronary Artery Disease in young Asian Indians. Thought on Pathogenesis, Prevention and Therapy ClinCardiol 1995, 18 : 131- 135
[3]. Schwarts KM. Limited exercise testing soon after myocardial infarction: correlation with early coronary and left ventricular angiography. Ann Intern Med 1981; 94:727–734.
[4]. Mancia G, et al. Ambulatory blood pressure is superior to clinic blood pressure in predicting treatment-induced regression of left ventricular hypertrophy. SAMPLE Study Group. Circulation 1997;95 (6):1464-70.
[5]. Lee L, Woodlief L, Topol EJ. Predictors of 30 day mortality in the era of reperfusion for acute myocardial infarction: results from an international trial of 41.021 patients. GUSTO 1 investigators. Circulation 1995; 91: 1659-68
[6]. Antonini L, Colivicchi F, Greco S. Ambulatory blood pressure monitoring after acute myocardial infarction. Development of a new prognostic index. High Blood Press CardiovPrev 2003; 10:75–80
[7]. Thygesen K, Alpert JS, Jaffe AS, et al. Third universal definition of myocardial infarction. Circulation 2012;126: 2020–2035
[8]. Sancheti PV, Mangulikar SK. Study of clinical profile of ischemic heart disease patients admitted in tertiary care hospital. Int J Community Med Public Health 2017;4:3191-5.
[9]. Sharma R, Bhairappa S, Prasad SR, Manjunath CN. Clinical characteristics, angiographic profile and in hospital mortality in acute coronary syndrome patients in south indian population. Heart India. 2014;2:65-9
[10]. Trivediet. al., Clinical spectrum and risk factor profile of Acute Coronary Syndrome- An experience from tertiary care hospital of Tripura. Journal of evidence medicine and healthcare; volumn 2, Issue 54, December 07, 2015; Page 8757-62. DOI: 10.18410/jebmh/2015/1221
[11]. Dolan E, Stanton A, Thijs L, et al. Superiority of ambulatory over clinic blood pressure measurement in predicting mortality: the Dublin Outcome Study. Hypertension. 2005; 46:156–61
[12]. Piva e Mattos LA, Berwanger O, Santos ES, Reis HJ, Romano ER, Petriz JL, et al. Clinical outcomes at 30 days in the Brazilian Registry of Acute Coronary Syndromes (ACCEPT) Arq Bras Cardiol. 2013;100(1):6–13
[13]. Misiriyaet. al., The Clinical Spectrum of Acute Coronary Syndromes: Experience from a Major Center in Kerala , JAPI • MAY 2009 • VOL. 57; 377-81

Dr. ManasiBhowmik, et. al. "Ambulatory blood pressure monitoring early after acute Myocardial infarction and its role to predict the adverse cardiac events."*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(02), 2022, pp. 34-38.