



CODEN [USA]: IAJPBB

ISSN: 2349-7750

INDO AMERICAN JOURNAL OF  
PHARMACEUTICAL SCIENCES<http://doi.org/10.5281/zenodo.3936724>Available online at: <http://www.iajps.com>

Research Article

IMPACT OF AVERAGE PULSE-PRESSURE IN 24 HOURS ON  
CARDIAC FUNCTION AMONG PATIENTS PRESENTED  
WITH ISOLATED SYSTOLIC HYPERTENSION<sup>1</sup>Dr Muhammad Abdur Rehman, <sup>2</sup>Dr Hafiza Saima Nawaz, <sup>2</sup>Dr Hafiz Muhammad Adnan<sup>1</sup>Sheikh Zayed Hospital Rahim Yar Khan<sup>2</sup>THQ Hospital Khanpur

Article Received: May 2020

Accepted: June 2020

Published: July 2020

**Abstract:**

**Objective:** The aim of this study is to find out the impact of average pulse-pressure during 24 hours on cardiac function in elder patients with ISH (Isolated Systolic Hypertension).

**Methodology:** In this research work, a total of 172 elder patients with Isolated Systolic Hypertension were studied. The purpose was to determine the average pulse-pressure with the monitoring of 24-hour ambulatory BP (Blood Pressure). We carried out the analysis of the cardiac function by nuclide pool imaging of cardiac blood.

**Results:** There was negative correlation between 24-hours average pulse-pressure with the LVEF (Left-Ventricular Ejection Fraction) ( $r = -0.46$ ,  $P$  value  $< 0.01$ ), and also with PFR (Peak Filling Rate) ( $r = -0.41$ ,  $P$  value  $< 0.05$ ). With the increase of the average pulse-pressure, the adverse effect on the cardiac function was noticed ( $P$  value  $< 0.01$ ).

**Conclusion:** 24-hours average pulse-pressure was a vital factor forecasting danger of cardiac dysfunction in elder age patients presented with Isolated Systolic Hypertension.

**KEY WORDS:** Average Pulse-Pressure, Dysfunction, Isolated Systolic Hypertension, Blood Pressure, Ejection Fraction, Cardiac Function.

**Corresponding author:**

**Dr. Muhammad Abdur Rehman,**  
Sheikh Zayed Hospital Rahim Yar Khan

QR code



Please cite this article in press Muhammad Abdur Rehman et al, *Impact Of Average Pulse-Pressure In 24 Hours On Cardiac Function Among Patients Presented With Isolated Systolic Hypertension.*, Indo Am. J. P. Sci, 2020; 07(07).

**INTRODUCTION:**

Increase in the systolic BP is an important risk factor that increases the risk related to the enhanced diastolic BP in the patients of elder age present with HTN (Hypertension) [1]. Isolated Systolic Hypertension was an anomaly elaborated as SBP (Systolic Blood Pressure) was higher than 140.0 mmHg but DBP (Diastolic Blood Pressure) was less than 90.0 mmHg. Pulse-pressure (PP which is a difference between SBP and DBP) is the active discussion area now a days which is an important risk factors for various cardiovascular complications [2, 3]. An enhanced PP always showed decreased vascular acquiescence of large arteries and it was also increased in the patients present with Isolated Systolic Hypertension.

We carried out this research work to check the ambulatory BP in the patients of elder age suffering from Isolated Systolic Hypertension and calculated the systolic and diastolic function of the left ventricular by using nuclide pool imaging of cardiac blood for the analysis of association between 24 hours average PP and cardiac function.

**METHODOLOGY:**

The patients of elder age suffering from Isolated Systolic Hypertension who got admission in Sheikh Zayed Hospital Rahim Yar Khan from March 2017 to September 2019 were the participants of this research work. All the patients who were fulfilling the WHO standard for Isolated Systolic Hypertension, had the systolic blood pressure higher than or equal to 140 mmHg with diastolic blood pressure of less than 90 mmHg, were included in this research work. There was no presence of other serious complication in these patients. We included 172 patients of elder age present with Isolated Systolic Hypertension with complete data. There were eighty-nine males and eighty-three female patients with the age range of 65-79 years, the average age of the patients was  $70.8 \pm 5.3$  years. No patient took anti-hypertensive treatment which can have impact on the cardiac function within two weeks before the start of this research work. The ethical committee of the institute gave the permission to conduct this research work. We took the written consent from the patients after explaining them the purpose of this research work.

We used the mercury sphygmomanometer having many choices for cuff size for the measurement of the casual BP. After the selection of proper cuff size, which was completely encircling the arm without any overlapping, we applied the cuff snugly around arm with lower edge of the instrument was above cubital space and we inflated it approximately 30 mmHg greater than the points which disappeared the radial pulse. Then we released the pressure in the cuff at rate of about 2-3 mmHg per second whereas we performed the auscultation over brachial artery. We took the 1<sup>st</sup> sound of Korotkoff as systolic pressure and 5<sup>th</sup> phase like diastolic pressure. We measured the minimum 3 values for the calculation of the average values, we performed each measurement for each other minute.

We monitored the 24 hours' ambulatory blood pressure for 172 patients. We used the SpaceLabs0-90202 ABP monitor for every patient to monitor the 24 hours BP. We followed the standard procedure for monitoring of this variable. We used the SPOPHY DS-7 SPECT (Single Photon Emission Computed Tomography) for the measurement of the cardiac function in every patient. We measured the LVEF, PER (Peak Ejection Rate) and PFR (Peak Filling Rate) for all the patients. SPSS was in use for the statistical analysis of collected information. We presented various parameters in averages and standard deviations. We used the ANOVA for analysis of correlation.

**RESULTS:**

A total of 172 patients, fulfilling the research protocol, were selected for this research work. The main characteristics of demography of the patients are present in Table-1. Table-2 displays the parameters of cardiac function of the patients based on 24 hours MPP (Mean Pulse Pressure). We divided the patients into three groups on the basis of their 24 hours' value of MPP, MPP of the Group-A was much equal or lower than 60 mmHg, mean pulse-pressure of Group-B was higher than 60 mmHg whereas equal to or less than 100 mmHg and mean pulse-pressure of Group-C was higher than 100 mmHg.

**Table-I: Characteristics of The Patients (n=172)**

Variable	No / Mean	% / SD
Mean age(yr.)	70.8	5.3
Sex (% , males)	88	51.2
BMI (kg/m <sup>2</sup> )	24.7	2.3
Hypertension duration(yr.)	9.5	5.8
Casual SBP/DBP (mmHg)	168.5	14.3
Casual PP (mmHg)	82	17.2
24 Hours SBP/DBP (mmHg)	150.7	13.35
Daytime SBP/DBP (mmHg)	158.5	11.8
Nighttime SBP/DBP (mmHg)	138	12.6
Pulse rate (beats/ min)	74.5	13.8

**Table-II: Comparison of The Cardiac Functional Parameter Among Three Groups**

Group	N	Age(years)	BMI (kg/m <sup>2</sup> )	LVEF (%)	LVEDF (ML)	PER (l/s)	PFR (l/s)
A	60	69.3±6.2	24.9±2.2	0.70±0.11	161.62±54.71	3.19±0.64	2.36±0.66
B	58	70.5±5.4	24.6±2.4	0.56±0.13	183.35±61.26	2.94±0.66	2.11±0.49
C	54	71.4±5.1	24.5±2.3	0.50±0.12	197.47±62.14	2.94±0.66	1.98±0.51

The analysis of correlation between Casual pulse-pressure, 24 hours MPP and cardiac function's parameters are present in Table-3. The casual pulse-pressure and 24 hours MPP assessed by ambulatory BP monitoring negatively associated with some features of diastolic and systolic function and its determination carried out by nuclide pool imaging of cardiac blood. Correlation between 24 hours MPP and the cardiac function's parameters was positive as compared to the casual pulse-pressure.

**Table-III: The Correlation Coefficient Between the Casual PP, 24 H Mean PP and The Parameter of Cardiac Function (r)**

The PP type	LVEF	LVEDF	PER	PFR
Casual PP	-0.29	-0.17	-0.2	-0.31
24 h mean PP	-0.46	-0.2	-0.24	-0.41

## DISCUSSION:

Currently, research on hypertension has shifted its concentration from vessels resistance to large arteries, which is a vital reason for the development and progression of HTN and it has a large amount of complications due to non-compliance [4-6]. Indirectly the level of PP can reflect the alterations in arterial compliance. An enhanced PP always shows the decreased large arteries vascular compliance. Some research works in the medical fields have proved that rise of the casual PP has relation with the dysfunction of left ventricle, whereas there are seldom reported research works about the association between 24 hours average PP and cardiac function by the procedure of ambulatory BP. We have stated the association between 24 hours diastolic and systolic BP overload and alterations in the cardiac function; the rise of the SBP or DBP load degree can have influence diastolic function of the patients from mild to moderate hypertension, later was more noticeable.

In the meantime, diabolic BP degree of load associated significantly with diastolic function of ventricle and it can be utilized as an important marker for the prediction of the cardiac function of the patients [7]. In accordance with the research work, we discovered the Isolated Systolic Hypertension in the patients of elder age, which can impact cardiac systolic and diastolic function. The alterations of the cardiac function have correlation with 24 hours average pulse-pressure, which is very significant risk marker for the prediction of cardiac dysfunction. Our findings displayed that the feature of systolic function of left ventricular were high or normal when there was a slight increase in pulse-pressure. This result showed that systolic hyperfunction, left ventricle's overloading and high output viewed as the hemodynamic alteration in initial duration of Isolated Systolic Hypertension [8]. About 50% of the elder patients having more than 60 years of age are present with HTN, in whom

50% are present with Isolated Systolic Hypertension [3].

Majority of the prospective research works have displayed that high systolic BP has correlation with the CHD (Coronary Heart Disease), failure of kidneys and stroke independently [9]. The main cause of the Isolated Systolic Hypertension in the patients of elder age is the stiffness of the large arteries. Decreased compliance of the arteries contributes to a rise in the pulse wave and velocity of the pulse wave, which is the cause of the rise in systolic and PP and reduces the diastolic pressure. These issues can lead to the functional abnormality between vessels and heart and enhance the left ventricle's systolic stress with the outcome that target organ like brain or heart are impaired due to cardiac wall's thickness, remodeling of cardiac activities and reduced coronary artery perfusion [10, 11].

### CONCLUSION:

It is well-established fact that increased PP is an important marker for the identification of cardiovascular risk in the elder population. The most important therapeutic target is to determine how to alter wave reflex, decrease PP, and reverse arteriosclerosis and reduction in the damage of the function of cardiac system.

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