

Comparison of the Prevalence of Hypertension using Three Proposed Classifications in a Single Center Primary Prevention Setting

Emily Mae L. Yap, M.D.*; Rhalp Jaylord L. Valenzuela**; and Gerald C. Vilela, M.D.***

Abstract

Introduction: The American College of Cardiology/American Heart Association (ACC/AHA) revised the thresholds for the definition and treatment of hypertension that was recommended by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) while the 2018 European Society of Cardiology/European Society of Hypertension (ESC/ESH) Guidelines for the Prevention, Detection, Evaluation, and Management of High Blood Pressure retained their previous classification but revised the recommendations for diagnosis and treatment. The impact of these changes in our setting is uncertain. This study aims to compare the prevalence of hypertension using the three proposed criteria in a primary preventive setting.

Methods: This is a cross-sectional analytical study using data at the Primary Preventive Cardiology Clinic of the Philippine Heart Center from January 1, 2002 to December 31, 2017.

Results: There were 2,082 patients in this study. The mean age is 57.1 ± 10.9 years with a female predominance

(72.5%). Most of the patients were married (67.3%, 1,401) and unemployed (67.1%, 1,398). Comorbid illnesses include dyslipidemia (48.2%) and type 2 diabetes mellitus (20.3%). The prevalence of hypertension using the JNC 7 and the 2018 ESC/ESH blood pressure (BP) classification was 56% ($n=1,167$). When the 2017 ACC/AHA BP classification was applied, there was a significant increase in the prevalence of hypertension to 80.3% ($n=1671$) ($p<0.001$) demonstrating an absolute increase of +24.2%.

Conclusion: The study shows a high prevalence of hypertension which further increased when the 2017 ACC/AHA BP classification was applied. This can impose a significant public health burden that needs to be addressed to prevent or decrease hypertension-related complications. Use of the new guidelines may affect diagnosis and treatment of hypertension with potential cost implications.

Keywords: hypertension, prevalence, filipinos, primary prevention

Introduction

Hypertension is a major risk factor for the development of coronary heart disease and cerebrovascular disease. It was reported to be the leading cause of death and disability-adjusted life years worldwide in 2010 and it continues to constitute a significant global disease burden affecting people of all ages.¹

The prevalence of hypertension continues to be increasing. In the 2017 ACC/AHA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults, the crude prevalence of hypertension in the United States increased to 45.6% (2017 ACC/AHA)

* *Fellow-in-Training, Department of Adult Cardiology, Philippine Heart Center, Quezon City, Philippines*

** *Biostatistician*

*** *Adult Cardiology - Invasive Cardiology, Philippine Heart Center, Quezon City, Philippines*

Corresponding author: Emily Mae L. Yap, M.D., Philippine Heart Center, Quezon City, Philippines
Email: emilyyap@gmail.com

from 31.9% using the blood pressure (BP) classification recommended in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) in 2003 which is known to be one of the widely used classification before the new guidelines were released in 2017.²⁻³ This was retained by the Eighth Joint National Committee (JNC 8) in 2014 when evidence-based guidelines for the management of hypertension were published.⁴

The European Society of Cardiology (ESC) and European Society of Hypertension (ESH) published new guidelines for the management of arterial hypertension in 2018 which utilized a more conservative approach in their definition for hypertension.⁵ Stage 1 hypertension was defined as having an office systolic BP (SBP) of 140-159 and/or diastolic BP (DBP) of 90-99 mmHg.⁵ In the new US guidelines, this was defined as having an SBP of 130-139 and/or DBP of 80-89 mmHg.² This notable 10-mmHg difference is one of the notable differences in the two new guidelines which resulted to variations in treatment thresholds and target BP goals.^{2,5}

Among Asians, hypertension ranges from 20.8% to 60% as reported in a large study by Chia et al. on home blood pressure monitoring in Asia. Poor blood pressure control has consistently been reported with blood pressure control achieved in <50% of cases.⁶

In 2007, a total of 3,901 adult Filipinos were screened in the Philippine Heart Association-Council on Hypertension Report on Survey of Hypertension and Target Organ Damage (PRESYON 2-TOD) study. The prevalence of hypertension was reported to be 21% using the blood pressure classification recommended in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). Furthermore, sixty five percent of these patients were on anti-hypertensive medications of which 66% were compliant. However, control of blood pressure was achieved in only 20%. Drugs used in this cohort include beta-blockers (41%), calcium antagonists (34%), angiotensin-converting enzyme (ACE) inhibitors (15%), angiotensin receptor blockers (ARB) (8%) and centrally acting agents (4%). Most patients received monotherapy (75%) while the rest received two or more anti-hypertensive medications.⁷

The more recent PRESYON 3 Target Organ Survey - Philippine Heart Association Council on Hypertension National Survey on Hypertension study showed an increase in the prevalence of hypertension from 21% to 28% based on the blood pressure classification recommended by JNC 7.⁸ Anti-hypertensive medications were taken in 75% of cases but only 27% achieved control of blood pressure.⁸ These studies highlight the increase in prevalence of hypertension and the poor control of blood pressure.

This study aims to determine and compare the prevalence of hypertension among the patients seen at the Primary Preventive Cardiology Out-Patient Department of the Philippine Heart Center based on the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 2017 ACC/AHA Guideline for the Prevention, Detection, Evaluation, and 2018 ESC/ESH Guidelines for the management of arterial hypertension. Since no prior studies have been made on the prevalence of hypertension in the Philippine Heart Center, the findings on this study will be used in coming up with better prevention and treatment strategies at our said clinic.

Methods

Study design

This cross-sectional analytical study was done at the Primary Preventive Cardiology Clinic at the Philippine Heart Center from January 1, 2002 to December 31, 2017. This study was conducted in compliance with the ethical principles set forth in the Declaration of Helsinki. Prior to the study initiation, the protocol was reviewed and approved by the Institutional Ethics Review Board of the Philippine Heart Center (PHC.

IERB.01.18.57) last July 2018.

Subject selection

All new patients who were 19 years old and above seeking consultation at the Primary Preventive Cardiology Clinic for the first time who were not previously diagnosed with hypertension were included. All patients who went to the clinic for follow-up were excluded. Patients who were diagnosed with hypertension on follow-up were likewise excluded.

Study maneuver

A retrospective review of the actual medical records of all new walk-in patients who went to the Primary Preventive Cardiology Clinic from January 1, 2002 to December 31, 2017 was done. There were 2,088 new patients seen at the Primary Preventive Cardiology out-patient clinic from 2002 to 2017. Six patients were excluded due to incomplete data. The final study included only 2,082 patients. Blood pressure levels reported in this study were all based on the average office blood pressure taken and recorded by two operators (staff nurses) in the said clinic during each patient's first consultation. Patient were seated with the elbow at the level of the heart. Blood pressure was measured after at least five minutes of rest using an aneroid sphygmomanometer with the length of the cuff's bladder covering at least 80% of the circumference of the upper arm with the lower edge of the cuff approximately one inch above the antecubital fossa.

Definition of terms

1. JNC 7 Blood Pressure (BP) Classification - This is the BP classification published in The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (3):

	SBP (mmHg)		DBP (mmHg)
Normal	<120	and	<80
Pre-hypertension	120-139	or	80-89
Stage 1	140-159	or	90-99
Stage 2	≥ 160	or	≥ 100

2. JNC 8 Blood Pressure (BP) Classification - The Joint National Committee (JNC 8) guidelines were published in 2013. Compared to JNC7, there were no changes in the blood pressure categories. However, higher blood pressure goals and less use of several types of antihypertensive medications were advised.⁹

3. 2017 ACC/AHA Blood Pressure Classification - This is the most recent guidelines by the American College of Cardiology and American Heart Association on the prevention, detection, evaluation, and management of hypertension in adults published by the American College of Cardiology and American Heart Association.² BP was classified as follows.

	SBP (mmHg)		DBP (mmHg)
Normal	<120	and	<80
Elevated	120-129	and	80-89
Stage 1	130-139	or	80-89
Stage 2	≥ 140	or	≥ 90
Hypertensive crisis	>180	and/or	DBP >120

4. 2018 ESC/ESH Blood Pressure Classification - These are the most recent guidelines by the European Society of Cardiology and European Society of Hypertension which retained their previous classification. New recommendations for diagnosis and treatment were added in their latest guidelines.

	SBP (mmHg)		and	DBP (mmHg)
Optimal	<120			<80
Normal	120–129		and/or	80–84
High normal	130–139		and/or	85–89
Grade 1 hypertension	140–159		and/or	90–99
Grade 2 hypertension	160–179		and/or	100–109
Grade 3 hypertension	≥180		and/or	≥110
Isolated systolic hypertension	≥140		and	<90

Definition of outcomes

The primary outcome of our study was the comparison of the prevalence of hypertension using the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, the 2017 ACC/AHA Blood Pressure Classification and 2018 ESC/ESH Guidelines for the Prevention, Detection, Evaluation, and Management of High Blood Pressure. Secondary outcomes include demographics and mean systolic and diastolic blood pressures.

Statistical analysis:

Descriptive statistics was used to summarize the demographic and clinical characteristics of the patients. Frequency and proportion were used for categorical variables and mean and standard deviation for normally distributed continuous variables.

Cochran's Q test was used to determine the difference in the prevalence of hypertension using the three aforementioned guidelines. Missing values were neither replaced nor estimated. A value of <0.05 was considered significant. STATA v13.1 was used for data analysis.

Results

There were 2,082 patients included in this study. The baseline clinical characteristics of the patients are summarised in Table IV.

Based on the JNC 7 BP classification, stage 1 hypertension was seen in 33% (689) and stage 2 hypertension in 22.9% (478). Pre-hypertension was seen in 38.34% (799). Only 5.7% (118) were normotensive at the time of their first consultation. The prevalence of hypertension based on this classification is 56% (1,167/2,082).

When the 2017 ACC/AHA BP classification was applied, normotension was seen in 5.7% (118), elevated blood pressure in 14.2% (295), stage 1 hypertension in 22% (458) and stage 2 hypertension in 54.4% (1,134). Hypertensive crisis was

Table IV. General characteristics of patients seen at the primary preventive cardiology out-patient department from 2002 to 2017. (N = 2,082)

	N (%)
Age in years (Mean ± SD)	57.1 ± 10.9
Gender	
Female	1509 (72.5)
Male	573 (27.5)
Civil status	
Married	1,401 (67.3)
Widow	337 (16.2)
Single	255 (12.2)
Separated	52 (2.5)
Employment status	
Unemployed	1,398 (67.1)
Employed	544 (26.1)
Retired	141 (6.8)
Educational attainment	
Grade school level	255 (12.2)
High school level	547 (26.3)
College level	613 (29.4)
Comorbid illnesses	
Dyslipidemia	1,003 (48.2)
Type 2 diabetes mellitus	422 (20.3)
Post-menopausal women	1,035 (49.7)
Heredofamilial diseases	
Hypertension	1,128 (54.1)
Coronary artery disease	772 (37.1)
Smoking history	
Current smoker	334 (16)
Former smoker	107 (5.1)
Alcoholic drinking	
Regular drinker (≥ 2)	270 (13)
Former drinker	178 (8.5)
Blood pressure in mm Hg (mean ± SD)	
Systolic	140.4 ± 22.3
Diastolic	86.5 ± 11.3

seen in 3.8% (79). The prevalence of hypertension based on this guidelines was 80.2% (1,671/2,082). (Table V)

Based on the newly published 2018 ESC/ESH Guidelines for the management of arterial hypertension, the prevalence of hypertension was 56% (1,167/2,082) which is similar to the JNC 7 classification. Optimal blood pressure was seen in 5.7% (118). Normotension was seen in 19.4% (404) while 18.9% (395) had high normal blood pressure. There were 689 patients with grade 1 hypertension (33.1%), 320 patients with grade 2 hypertension (15.4%), 158 patients with grade 3 hypertension. Isolated systolic hypertension was seen in 27.1% (316). (Table V)

There was an absolute increase of +24.2% in the prevalence of hypertension when the 2017 ACC/AHA guidelines was utilized compared to the JNC 7 and 2018 ESC/ESH guidelines which had the same prevalence as seen in Table VI. The age-distribution of hypertensive individuals is depicted in Figure 1. Most of the hypertensive patients were 45 years old and above regardless of the classification used.

Table V. Prevalence of hypertension based on the JNC 7, 2017 ACC/AHA and 2018 ESC/ESH guidelines (N=2,082)

	Total	Prevalence	95% CI
JNC 7 guidelines			
Normal	118	5.7%	1.4% to 9.9%
Pre-hypertension	799	38.3%	34.9% to 41.8%
Stage 1	689	33.1%	29.5% to 36.6%
Stage 2	478	22.9%	19.1% to 26.8%
2017 ACC/AHA			
Normal	118	5.7%	1.4% to 9.9%
Elevated	295	14.2%	10.1% to 18.2%
Stage 1	458	22%	18.1% to 25.9%
Stage 2	1134	54.4%	51.4% to 57.4%
Hypertensive crisis	79	3.8%	0.1% to 8.1%
2018 ESC-ESH			
Optimal	118	5.7%	1.4% to 9.9%
Normal	404	19.4%	15.% to 23.3%
High normal	395	18.9%	15% to 22.9%
Grade 1 hypertension	689	33.1%	29.5% to 36.6%
Grade 2 hypertension	320	15.4%	11.3% to 19.4%
Grade 3 hypertension	158	7.6%	3.4% to 11.8%
Isolated systolic hypertension	316	27.1%	22.1% to 32.1%

Table VI. Overall prevalence of hypertension based on JNC 7, 2017 ACC/AHA and 2018 ESC/ESH guidelines (N=2,082)

	JNC 7	2017 ACC/AHA	2018 ESC/ESH
Prevalence	56%	80.2%	56%
95% CI	53.8% to 58.2%	78.4% to 81.9%	53.8% to 58.2%
Total	1,167	1,671	1,167

Cochran's Q = 698.52; p-value = <0.001

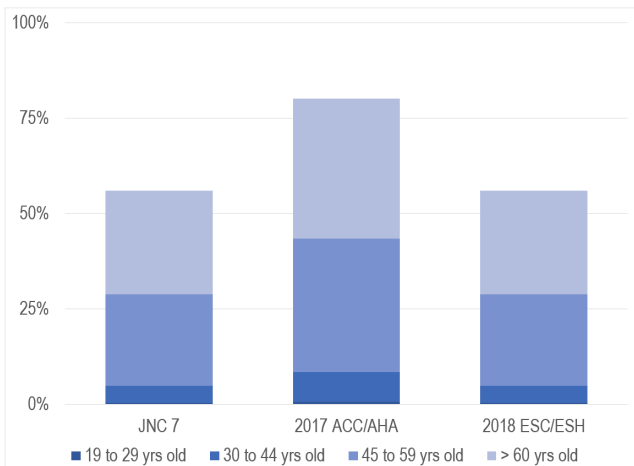


Figure 1. Age distribution of patients at the Primary Preventive Cardiology Clinic at the Philippine Heart Center, 2002-2017 (N=2,082)

Discussion

The results of this study demonstrated a significant increase in the prevalence of hypertension when the 2017 American College of Cardiology/American Heart Association (ACC/AHA) Guidelines for the Prevention, Detection, Evaluation and Management of High Blood Pressure was applied. On the other hand, there was no significant difference in the prevalence of hypertension using the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure Guidelines and the 2018 European Society of Cardiology/European Society of Hypertension (ESC/ESH)

Guidelines for the Prevention, Detection, Evaluation, and Management of High Blood Pressure. The marked increase in the prevalence of hypertension using the 2017 ACC/AHA guidelines was brought about by the lower cut-off levels for hypertension, notably the 10-mm Hg lower level in defining hypertension. Hypertension was then defined as having a systolic blood pressure of 130-139 mm Hg or a diastolic blood pressure of 80 to 89 mm Hg using the new threshold which the authors believe will have potential cost implications.

Target organ damage as a result of hypertension has been reported to occur at a lower BP range which prompted the reclassification of hypertension in the new guidelines. The SPRINT trial is notable for recommending lower BP targets.⁹ In this study, a target SBP of <120 mmHg resulted to lower cardiovascular (CV) events and death from any cause compared to a target BP of <140 mmHg among patients with high CV risk but without type 2 diabetes mellitus (T2DM).⁹ In patients with T2DM at high risk for CV events, the ACCORD trial reported no significant difference in non-fatal myocardial infarction (MI), non-fatal stroke, or CV mortality among those who had intensive BP control (SBP <120 mmHg) versus standard BP control (SBP <140 mmHg).¹⁰

The number of hypertensive individuals substantially increased with the 2017 ACC/AHA guidelines. Khera et al. (2017) studied the impact of this new guideline on hypertension in the United States and China using nationally representative cohorts from the National Health and Nutrition Examination Survey (NHANES) in 2013-14 and 2015-16 and the China Health and Retirement Longitudinal Study (CHARLS)

conducted in 2011-12.¹¹ After adopting this new guideline, the prevalence of hypertension was reported to be 63% among Americans and 55% among Chinese adults who were between 45 to 75 years old. These represented an increase in prevalence of hypertension by 26.8% (23.2% to 30.9%) in the US and 45.1% (41.3% to 48.9%) in China.¹¹

In another large study in Nepal, the prevalence of hypertension among 13,519 participants similarly increased from 21.2% (n=2869) to 44.2% (n=5977) with the JNC 7 and 2017 ACC/AHA guidelines respectively.¹² The median interquartile age was 38 (26-53) years which is significantly lower to the mean age of our cohort (57.12+10.91 years). In another study in Bangladesh, the prevalence of hypertension among 1,843 adults increased from 17.9% (95% CI: 16.2-19.7) to 40.7% (95% CI: 38.5-43.0) using the JNC 7 and 2017 ACC/AHA guidelines.¹³ The median age was 38 years, similar to the study in Nepal.¹² Early screening and detection of hypertension in these countries may be a plausible reason for the younger age compared to our cohort. Moreover, there were slightly more women in the previously cited studies, ranging from 52% to 57.9%.¹¹⁻¹³ Our study reported a higher prevalence of women to have hypertension (72.5%) which can be explained by our primary preventive setting wherein a lesser number of women with overt cardiovascular diseases are referred to the subspecialty clinics.

In our cohort, the prevalence of hypertension increased to 80.2% using the 2017 ACC/ AHA guidelines. This is more than two times higher compared to earlier studies among Filipinos (PRESYON 2-TOD study, 21% and PRESYON 3-28%) which is alarming. The lack of published data on the prevalence of hypertension among Filipinos in a primary prevention setting preclude a better comparison of the results. Nonetheless, regardless of the classification used, the prevalence of hypertension in our study is significantly higher compared to the other studies which used the new US guidelines.¹¹⁻¹³ Studies using the new European guidelines are still not available as of this writing. With the use of the new guidelines, identification and treatment of hypertension at a lower threshold may translate to better outcome with lesser complications and may potentially lower the prevalence of hypertension in future studies.

All of these studies consistently show a rise in hypertensive individuals mandating better prevention and treatment strategies. Efforts to prevent and control hypertension must be intensified to address the increasing prevalence. Nationwide campaigns geared to increase awareness of hypertension and its complications may prevent or reduce progression of this disease. Educating the patients especially in a primary preventive care setting and having them commit to their treatment plan will improve outcome.

The strength of this study includes its large sample size which has allowed the authors to provide a good estimate of the prevalence of hypertension. This is the first study on the

prevalence of hypertension in the Philippine Heart Center. Study limitations include its retrospective nature and the use of data from a single center. The authors would therefore like to recommend a prospective multi-center study to determine the clinical impact on the application of these new guidelines, including long-term outcomes and potential cost implications.

Conclusion

The findings in our study show a high prevalence of hypertension among Filipinos regardless of the blood pressure classification used. This imposes a significant public health burden that needs to be addressed to prevent or decrease hypertension-related morbidity and mortality. This has also prompted our Preventive Cardiology Clinic to find ways on improving hypertension prevention and management strategies

Adopting the new guidelines may impact both diagnosis and treatment practices of hypertension in our setting. Better prevention and treatment strategies to address this increasing prevalence are needed.

Disclosure

The authors did not receive any funding in conducting this paper and declare no conflict of interest.

Acknowledgement

The authors would like to thank the following hospital staff who assisted in the completion of this paper: Romeo Mejia, R.N. and Clint Nepomuceno, R.N. for their support.

References

1. **Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, et al.** A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012; 380:2224-60.
2. **Whelton PK, Carey RM, Aronow WS, Casey DE, Collins KJ, Himmelfarb CD, et al.** 2017 ACC/AHA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. *J Am Coll Cardiol*. 2018; 71(19): e127-e248. DOI: 10.1016/j.jacc.2017.11.006.
3. **Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, et al.** Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension*. 2003 Dec;42(6):1206-52. Epub 2003 Dec 1.
4. **James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, et al.** 2014 evidence-based guideline for the management of high blood pressure in adults: Report from the panel members appointed to the Eighth Joint National Committee (JNC 8) *JAMA*. 2014;311:507-20.
5. **Williams B, Mancia G, Spiering W, Rosei EA, Azizi M, Burnier M, Clement DL, et al.** 2018ESC/ESH Guidelines for the management of arterial hypertension. *European Heart Journal*, Volume 39, Issue 33, 1 September 2018, Pages 3021-3104, <https://doi.org/10.1093/eurheartj/ehy339>

6. **Chia YC, Buranakitjaroen P, Chen CH, Divinagracia R, Hoshide S, Park S, et. al.** Current status of home blood pressure monitoring in Asia: Statement from the HOPE Asia Network. *J Clin Hypertens.* 2017;19:1192–1201. DOI: 10.1111/jch.13058.
7. **Sison J, Arceo LP, Trinidad E, Bautista A, Buan E, Chua P, et. al.** Philippine Heart Association-Council on Hypertension Report on Survey of Hypertension and Target Organ Damage (PRESYON 2-TOD). *Philippine Journal of Cardiology.* January-June 2007;35(1):1-9.
8. **Sison JA.** Philippine Heart Association—Council on Hypertension Report on Survey of Hypertension (PRESYON 3). A report on prevalence of hypertension, awareness and treatment profile. 2013. <http://philheart.org/44/images/sison.pdf>. Accessed December 15, 2016.
9. **The SPRINT Research Group.** “A randomized trial of intensive versus standard blood-pressure control”. *The New England Journal of Medicine.* 2015. 373(22):2103-2116.
10. **ACCORD Study Group.** “Effects of intensive blood-pressure control in type 2 diabetes mellitus”. *The New England Journal of Medicine.* 2010. 362(17):1575-1585.
11. **Khera R, Lu Y, Lu J, Saxena A, Nasir K, Jiang L and Krumholz H.** Impact of 2017 ACC/AHA guidelines on prevalence of hypertension and eligibility for antihypertensive treatment in United States and China: nationally representative cross sectional study. *BMJ* 2018; 362 doi: <https://doi.org/10.1136/bmj.k2357> (Published 11 July 2018)
12. **Kibria GM, Swasey K, KC A, Mirbolouk M, Sakib MN, Sharmeen A, Chadni MJ and Stafford KA.** Estimated Change in Prevalence of Hypertension in Nepal Following Application of the 2017 ACC/AHA Guideline. *JAMA Network Open.* 2018;1(3):e180606. doi:10.1001/jamanetworkopen.2018.0606 (Published 13 July 2018)
13. **Islam JY, Zaman MM, Haq SA, Ahmed S, and Al-Quadir Z.** Epidemiology of hypertension among Bangladeshi adults using the 2017 ACC/AHA Hypertension Clinical Practice Guidelines and Joint National Committee 7 Guidelines. *Journal of Human Hypertension* (2018). <https://doi.org/10.1038/s41371-018-0087-5>. (Published 19 July 2018)
14. **Cenko E, Ricci B, Kedev S, Vasiljevic Z, Dorobantu M, Gustiene O, et. al.** Reperfusion therapy for ST-elevation acute myocardial infarction in Eastern Europe: the ISACS-TC registry. *European Heart Journal – Quality of Care and Clinical Outcomes* (2016) 2,45–51.
15. **Poffo MR, de Assis V, Fracasso M, Filho OML, Alves M, Bald AP, et. al.** Profile of Patients Hospitalized for Heart Failure in Tertiary Care Hospital. *International Journal of Cardiovascular Sciences.* 2017;30(3):189-198.