

Screening for Hypertension in Asymptomatic Individuals in Nepal: An Expert Consensus Statement

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Abstract

Hypertension affects a substantial proportion of the general population in Nepal with prevalence ranging from 20 to 30 percent. Early diagnosis and treatment are essential for undiagnosed hypertension and is possible through hypertension screening. The aim of this paper is to provide unified consensus recommendations for the effective screening of hypertension in Nepal. In two National Advisory expert consensus meetings, a total of 42 experts participated, discussed and voted on the key statements for formulating the consensus. Each key statement was scored on a Likert scale ranging from 1 to 9 and a mean score was calculated. The consensus statement was accepted if the mean score was seven or more with the voting of more than two-thirds of the experts. The main consensus recommendations are the following. First, screening for hypertension should start among adults from 18 years of age. Second, effective screening of hypertension can aid in the early diagnosis, control, and improve the cardiovascular disease outcomes. Third, in asymptomatic adults, re-screening is necessary every 3 to 6 months and every 3 to 5 years for initial blood pressure levels of 130-139/80-89 mmHg and <130/85 mmHg, respectively. Fourth, hypertension screening is cost-effective in a resource-limited setting. The use of consensus recommendations will help in a unified community screening of hypertension among the asymptomatic adult population of Nepal. Screening of hypertension should be promoted by all the stakeholders in healthcare services.

Keywords: Blood Pressure, Hypertension, Nepal, Screening

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Introduction

Hypertension is a global catastrophe contributing significantly to cardiovascular disease morbidity and mortality.¹ In the majority of the population, hypertension remains silent without any symptoms and sometimes it may present as hypertensive emergency.² The increasing prevalence of hypertension in the younger age group is of global concern. Multiple studies from across the globe have indicated an increasing prevalence of hypertension in young adults as well as school-going children.³⁻⁶ Despite a high prevalence, the awareness, treatment, and control of hypertension remains poor.⁷ Given its significant prevalence across the globe, screening for hypertension

can be helpful to diagnose asymptomatic individuals and help reduce the burden of hypertension and associated complications.⁸ Nepal witnesses a significant prevalence of non-communicable diseases including hypertension among adults.⁹ A meta-analysis of studies among adults in Nepal identified the prevalence of hypertension to be 28.5%.¹⁰ The STEPS survey conducted in 2019 identified the prevalence of raised blood pressure to be 9.5% among adults of 15 to 24 years. More than three-fourths of the patients in the STEPS survey were unaware of the presence of high blood pressure and only 4.1% of them had treatment and control of blood pressure.¹¹ Current evidence also indicates that not only adults but, school-going children are also being diagnosed with hypertension.⁶ This

is a worrisome situation and demands necessary actions to identify undiagnosed hypertension to prevent morbidity and mortality. As the pandemic of COVID-19 affected patients across the globe. There was more than 20% decline in the consultations for hypertension with the increase in the new onset hypertension in the post-COVID period.^{12,13}

Screening asymptomatic individuals is important to identify undiagnosed hypertension. However, there are certain gray areas in screening for hypertension and the lack of national guidelines for effective screening of hypertension led to the formulation of this consensus. The experts from cardiology and allied fields discussed the current evidence and formulated a unified consensus to guide primary care physicians in the effective screening of hypertension in asymptomatic individuals.

Hypertension definition

We advise defining hypertension according to the International Society of Hypertension (ISH) guidelines 2020¹⁴ (Table 1)

New BP categories are: 1) normal (<130 systolic and <80 mm Hg diastolic), 2) high normal (130–139 systolic and 85–89 mm Hg diastolic), 3) grade 1 hypertension (140–159 systolic or 90–99 mm Hg diastolic) and grade 2 hypertension (\geq 160 systolic or \geq 100 mm Hg diastolic). These categories should not be based on BP readings at a single point in time but rather should be confirmed by two or more readings (averaged) made on at least two separate occasions. Individuals are classified according to their highest systolic or diastolic BP category. Out of office BP readings (home or ambulatory BP monitoring) should also be obtained for comparison with office BP readings.

Table 1: Classification of hypertension as per ISH guidelines 2020

Category	Blood pressure reading (mmHg)
Normal BP	<130 and <80
High-normal BP	130-139 and/or 85-89
Hypertension – grade I	140-159 and/or 90-99
Hypertension – grade II	\geq 160 and/or \geq 100

Need for the consensus

In Nepal, the current evidence indicates that hypertension affects one out of four individuals aged 15 to 65 years.¹¹ Despite its high prevalence, the awareness of treatment and control of hypertension remains poor.^{10,11} It has been identified that increasing awareness of hypertension can improve control of blood pressure. At the same time since hypertension is affecting younger adults more frequently, it is necessary to identify them early for effective intervention that will provide long-term benefits. Thus, to identify undiagnosed asymptomatic hypertension in individuals who are unaware of existing disease, screening for hypertension is essential. Given the general lack of guidelines providing effective recommendations for screening hypertension, the experts felt a need for a unified consensus to provide nationwide recommendations for screening hypertension in the asymptomatic Nepalese population.

Methodology: Approach to consensus development

This consensus was conceptualized by a core group of experts to advance the screening of hypertension in a more unified and effective manner. The expert panel included advisors from various specialties such as cardiology, nephrology, endocrinology, and internal medicine. Each expert had clinical experience of more than 10 years in hypertension diagnosis and management. Overall, 42 experts participated in two National Advisory Board meetings.

Creation of consensus statements

The core group of experts identified key statements for formulating the consensus. They considered current guidelines from the European Society of Cardiology and European Heart Association,¹⁵ American College of Cardiology and American Heart Association,¹⁶ and Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC)¹⁷ as well as relevant literature evidence for formulating each consensus statement. The core group identified six areas and constructed consensus statements for discussion during the advisory meetings. To arrive at a consensus, the core group adopted a mix of Delphi and Child Health and Nutrition Research Initiatives (CHNRI) methods. The key statements were formulated to meet the criteria of answerability, effectiveness, translation to clinical practice, novelty, and impact on health care burden.^{18,19} Based on the expert discussion, each key statement adhered to these criteria and was included in this consensus.

Arriving at a consensus

The core group experts identified relevant literature for each statement and shared the same with the other expert members before the meetings. During the conduct of advisory meetings, one expert presented the current status and evidence to the panelists. After discussing the key statements, every expert provided his or her opinion on each statement. Experts scored each key statement on a Likert scale ranging from 1 to 9. After the second meeting, a mean score was calculated for each key statement. The consensus statement was considered accepted if the mean score was seven or more with the voting of more than two-thirds of experts. Figure 1 demonstrates the consensus development process. After the meetings, a manuscript draft was prepared by core group experts and was shared with all the experts for their review and comments. The final draft was reviewed and finalized by the core group experts.

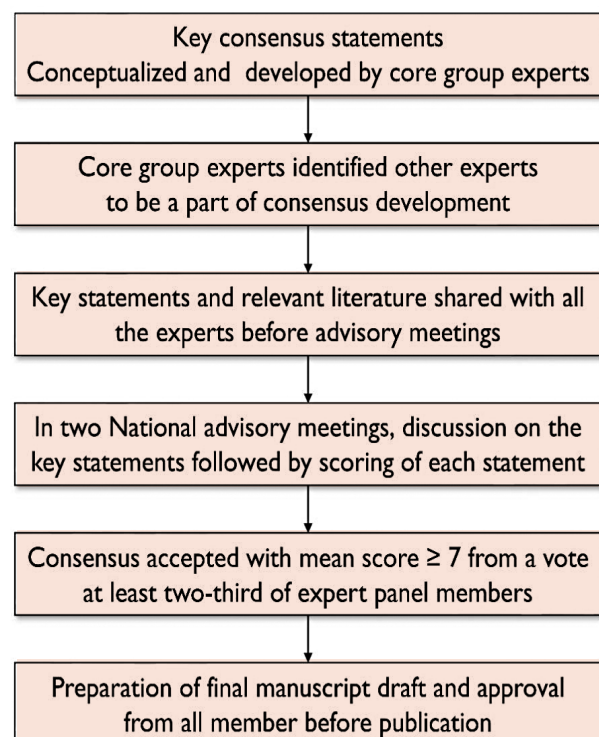


Figure 1: Approach to the consensus development

Consensus Statements

Below we discussed each finalized consensus statement with relevant literature evidence. **Table 2** provides a summary of each consensus statement.

Consensus Statement 1: Screening of hypertension in Asymptomatic adults in Nepal is required.

Hypertension is a globally prevalent non-communicable disease and a significant cardiovascular risk factor. In Nepal, a recent meta-analysis identified that in the past two decades, the prevalence of hypertension increased by 6%. Current estimates indicate the prevalence of prehypertension to be 27.5% and 28.5%.¹⁰ The STEPS survey conducted in 2019 identified the prevalence of HTN among adults aged 15 to 69 years to be 24.5% with a greater prevalence in men (29.8%) than in women (19.7%).¹¹ Another systematic review of 23 studies identified hypertension prevalence to be 27.3%.²⁰ Despite the significant prevalence of hypertension in Nepal, the majority of them are unaware, undertreated, and uncontrolled.^{10,11} Importantly not only adults but hypertension affecting school-going children is a concern. A recent study from Nepal identified stage-one and stage-two hypertension in 32.3% and 9.8% of school-going adolescents.⁶ With the COVID-19 pandemic, we have witnessed an increase in the prevalence of new-onset hypertension. It also resulted in a more than 20% decline in hypertension consultations in Nepal.^{12,13} At the same time, COVID-19 has affected children and adolescents with observations of increasing systolic and diastolic blood pressure among affected individuals.²¹ Thus, a substantial presence of hypertension, its unawareness, poor control of blood pressure along with increasing prevalence of hypertension in younger adults and adolescents necessitates the identification of hypertension early through effective screening. Screening for hypertension has been adopted by various organizations such as the World Health Organization and the World Hygiene League (WHL).^{22,23} The NCD-STEPs survey of 2019 conducted in Nepal recommends screening for hypertension in asymptomatic individuals.¹¹ Also, the Ministry of Health and Family Welfare (MoHFW) of India advocates screening for non-communicable diseases.²⁴ It is difficult to estimate the population that may undergo effective screening for hypertension at any given point and therefore screening for high blood pressure in the Nepalese population is necessary. The voting of 100% of experts for this statement having a mean score of 8.6 indicates that this consensus statement is accepted.

- o **Consensus recommendation: Screening of hypertension in asymptomatic adults in Nepal is recommended.**

Consensus statement 2.1: Active screening reduces the burden of hypertension.

Blood pressure is a dynamic physiological parameter that is affected by multiple factors including diurnal variation. Screening of asymptomatic individuals to assess their blood pressure levels provides an understanding of the current state in terms of the stage of hypertension. Active screening may identify undiagnosed hypertension, prehypertension, or those who are normotensive.

Prehypertension is considered a precursor to hypertension. However, the use of effective lifestyle interventions can reduce the progression of pre-hypertension to hypertension.²⁵ Certain key comorbid features can help identify the pre-hypertensives that can progress to hypertension. Studies have identified that higher BMI, older age, low exercise capacity, and male sex have a higher likelihood of progression to hypertension.^{26,27} Identifying pre-hypertension through screening might help adopt effective lifestyle interventions to prevent progression to hypertension. When compared to pre-hypertensive patients, normotensives are less likely to progress to hypertension.²⁸ Therefore, regular screening of blood pressure levels can help lower the incidence of hypertension. This consensus was accepted with a vote from 68.3% of experts with a mean score of 7.

- o **Consensus recommendation: Active screening is recommended to reduce the burden of hypertension.**

Consensus statement 2.2: Active screening may reduce the burden of complications associated with hypertension.

Reducing blood pressure is associated with reduced cardiovascular complications and mortality. The intensity of blood pressure reduction determines the benefits in terms of fatal and non-fatal CV events. This has been proved in the recent SPRINT trial that observed reducing systolic BP intensively to the target of less than 120 mmHg results in fewer CV events and all-cause mortality.²⁹ As the BP was measured in the absence of a doctor or nurse few researchers have raised the question of the methodology of the SPRINT trial.³⁰ However, the benefits of lowering BP below 140/90 mmHg are well established. With screening, there can be benefits in terms of the incidence of hypertension. In a study of Danish men who were aged between 65 and 74 years, a population screening for cardiovascular disorders such as abdominal aortic aneurism, peripheral arterial disease, and hypertension was associated with lower mortality than those who did not undergo screening.³¹ Another study from Canada evaluated individuals aged 65 years and above from 39 midsize communities of these 20 received cardiovascular health awareness program (CHAP) intervention and 19 did not receive any intervention. After a year, there was a 9% relative risk reduction in the composite endpoint of higher admissions for acute myocardial infarction, stroke, and congestive heart failure.³² In another study of a rural county in Maine, adults aged 40 years and above were taken as a part of cardiovascular disease prevention programs and health outcomes. Over four decades ranging from 1970 to 2010, there was a significant improvement in the control of hypertension with an absolute increase of 24.7%. This was associated with lesser hospitalization per capita and lower predicted mortality.³³ These data indicate that screening for hypertension can reduce the cardiovascular disease burden and contribute to improved control of hypertension. In this context, early detection of hypertension can contribute to early intervention strategies, especially in a younger population that further will reduce the CVD burden. The consensus was accepted with a mean score of 8.5 after a vote of 97.5% of experts.

- o **Consensus recommendation: Active screening is recommended to reduce the burden of complications associated with hypertension.**

Consensus statement 3: Initial age for hypertension screening should be ____ years.

As discussed, blood pressure is dynamic, and it has a linear correlation with age.³⁴ With increasing age, blood pressure levels tend to increase because of the loss of elasticity in vessels. Evidence indicates that by the age of nearly 70 years, almost one in two individuals may have hypertension.³⁵ With the increasing hypertension prevalence in young age and adolescents in Nepal, it is essential to promote self-screening for hypertension.³⁶ Thus, initiating screening at an earlier age can be beneficial in detecting hypertension at an early stage. Across the globe, various recommendations exist for the ideal age for hypertension screening. The US task force,³⁷ and the International Society of Hypertension (ISH)¹⁴ advocate the initial age of 18 years to start hypertension screening. The Ministry of Health and Family Welfare guidelines. Guidelines from India advocate the age of 30 years to initiate screening for non-communicable diseases.²⁴ Besides this, there are differences in considering the initial age among various studies conducted for the screening of hypertension in Nepal and the world. In Nepal, a study from Agarwal, et al.³⁸ identified the initial age of screening to be than 18 years, whereas Sharma et al reported the age of screening to be more than 20 years. Dhungana et al.³⁹ evaluated individuals aged 15 years or more for screening hypertension.

In the discussion of this consensus statement, there was some disagreement among the experts. Some experts suggested that with an increasing prevalence of hypertension in young adults and adolescents, the initial age of screening for hypertension should be lowered to the age of 15 years. However, other experts suggested that lowering down to this age group may not be feasible and appropriate as it may lose focus on the population at a greater risk of hypertension. They suggested that the prevalence of hypertension below 18 years of age may not be at the levels compared to the population above 18 years. Given these differences in considering the initial age of screening for HTN, the consensus arrived to be 18 years with a mean score of 7.3 obtained from a vote of 84.8% of experts.

- o **Consensus recommendation: The initial age for hypertension screening should be 18 years.**

Consensus statement 4: Regarding an approach to BP measurement for screening

Screening of hypertension can be taken irrespective of the place whether it is a community hall, workplace, hospital, mass gathering, or shopping mall.^{40,41} It is not advisable to exclude any person from hypertension screening because of the place or the setting. Blood pressure can be taken in any arm in a seated position with the arm and back supported. For adults, cuff size should be adequate, and clothing over the arms should be minimal.¹⁴ Individuals undergoing screening may be advised to empty the bladder before taking blood pressure readings. Conducting screening at a large gathering and even a door-to-door screening has been successfully implemented by the researchers. In addition, other healthcare professionals, such as dentists, or paramedical staff who are trained in BP measurement can also be a part of screening activities.⁴² In assessing blood pressure, the instrument used for BP measurement is also important along with the number of readings to be taken. The majority of primary care physicians in Nepal still use the manual sphygmomanometer.⁴³ In experienced hands, these can still provide substantially accurate BP readings. On the other hand, electronic BP recorders are sensitive and do not require any expertise to record BP. Some guidelines suggest the use of either device for recording BP.²³

In assessing this consensus statement, a mean score of 8.3 and 7.1 was derived from the voting of 100% and 71% of experts. This suggests that both electronic as well as manual sphygmomanometer devices can be used for BP measurement. However, there remains another question regarding the number of BP readings. Recent guidelines from ACC/AHA recommend recording two BP values at least one to two minutes apart. The mean of the two values is considered as a final reading for the blood pressure.¹⁵ The International Society of Hypertension 2020 guidelines advocate three readings with an average of the last two readings to determine the BP level in a given individual.¹⁴ The ESC/ESH guidelines of 2018 recommend three BP readings, one to two minutes apart. And the average of the last two readings to be taken as the final BP level. They further advocate additional blood pressure readings if the difference between the first two readings is more than 10 mmHg.¹⁵ In the NCD-STEPS survey conducted in Nepal, BP was measured with a digital automated BP monitor. They recorded three readings with an interval of three minutes during each reading. The mean of the 2nd and 3rd values was considered the final BP value.¹¹ One important aspect of the use of electronic BP recording devices is that very few of them are validated. Also, the ones that are in routine use need to be validated at appropriate intervals to improve diagnostic accuracy.⁴⁴ A recent Association for the Advancement of Medical Instrumentation/European Society of Hypertension/International Organization for Standardization (AAMI/ESH/ISO) Collaboration Statement recommends that a device is considered acceptable if its estimated probability of a tolerable error (≤ 10 mmHg) is at least 85%.⁴⁵

In consideration of this evidence, experts advocated two to three BP readings, taken one to two minutes apart for consideration of blood pressure level at any point of time (Score 7.4 for 2 readings and 7.8 for three readings from voting of 83.3% and 86.7% of experts, respectively). BP measurement in both arms was consensus with an 8.5% mean score from 100% voting of experts.

- o **Consensus recommendation: In the approach to BP measurement for screening, the use of either a validated electronic BP apparatus or sphygmomanometer can be considered. Two to three readings are to be taken one to two minutes apart with the average of the last two readings to be considered the final BP value. While recording BP, the standard protocol should be followed.**

Consensus statement 5: Regarding the rescreening approach

It is important to consider rescreening for those who have undergone initial screening. This is a concern for me for the patients who are prehypertensive or normotensive at the initial screening. There is a likely possibility of increasing hypertension diagnosis with increasing rescreening interval. The prolonged waiting period after the initial screening may lead to the non-detection of hypertension compared to those with regular rescreening. The ACC/AHA guidelines recommend rescreening every 3 to 6 months for BP levels of 120-129/ <80 mmHg, and those with BP of 130-139/80-89 mmHg whereas it is yearly for those with BP $<120/80$ mmHg.⁴⁶ The ESC/ESH guidelines advise rescreening every 5 years, 3 years, and 1 year for BP levels of $<120/80$ mmHg, 120-129/80-84 mmHg, and 130-135/85-89 mmHg, respectively.¹⁵ The US Task Force report advises rescreening in adults >40 years every year whereas for those with 18-39 years of age and BP level $<130/85$ mmHg, rescreening is to be done every 3 to 5 years [36]. From India, MOHFW advised rescreening every year for those who are >30 years of age.²⁴ Another consensus statement from India reported rescreening every 3 to 5 years for asymptomatic adults with BP $<130/85$ mmHg and every year for those with BP of 13-139/85-89.⁴⁷

Considering these data, experts rated the consensus statement. In adults with normal BP reading ($<130/85$ mmHg), and elevated BP (130-139/85-89 mmHg) rescreening is to be done every 3 to 5 years (mean score 7.2, 75% experts voting) and every 3 to 6 months (mean score 8.2, 94.4% expert voting) respectively.

- o **Consensus recommendation: In asymptomatic adults (≥ 18 years) with BP levels of $<130/85$ mmHg, and 130-139/85-89 mmHg, rescreening is to be done every 3 to 5 years and every 3 to 6 months, respectively.**

Consensus statement 6: Hypertension screening is cost-effective even in a resource-poor setting.

Assessing the cost-effectiveness is essential to determine which interventions are effective and can reduce the potential disease burden without incurring extra costs and are relatively inexpensive.⁴⁸ In Nepal, chronic NCDs contribute to a substantial socioeconomic burden with major healthcare funding being managed mainly from out-of-pocket expenditures.⁴⁹ Given the resource-limiting disadvantage, there can be a potential burden on healthcare society when tasked with disease screening activities. However, a recent global initiative, May Measurement Month, from ISH and WHL, to screen BP among adults (≥ 18 years) in Nepal identified a hypertension prevalence of 27.5% and showed that large community-based HTN screening campaigns are possible.⁵⁰ Recently, a study from Bhutan demonstrated that expanding screening coverage from 70% to universal screening is more cost-effective in resource-limited settings for chronic diseases like hypertension and diabetes.⁵¹

In this regard, experts identified the same that screening for hypertension is cost-effective in a resource-poor setting which was confirmed with a mean score of 7.9 from 92.7% of expert voting.

- o **Consensus recommendation: Hypertension screening is cost-effective in resource-poor settings and is recommended.**

Table 2: Key consensus statements

Consensus statements	N	Score ≥ 7 (%)	Mean score
1. Screening of hypertension in asymptomatic adults in Nepal is recommended.	42	42 (100.0)	8.6
2.1. Active screening is recommended to reduce the burden of hypertension.	41	28 (68.3)	7.0
2.2. Active screening is recommended to reduce the burden of complications associated with hypertension.	40	39 (97.5)	8.5
3. Initial age for hypertension screening should be ≥ 18 years.	33	28 (84.8)	7.3
4. Approach to BP measurement for screening?			
Device			
Aneroid sphygmomanometer	37	37 (100.0)	8.3
Electronic BP recorder	31	22 (71.0)	7.1
No. of BP readings in a single setting			
2	30	25 (83.3)	7.4
3	30	26 (86.7)	7.8
Arm BP measurement			
Both arms	35	34 (97.1)	8.5
5. Rescreening approach			
Adults with initial normal BP reading ($<130/85$ mmHg)			
3-5 yearly	32	24 (75.0)	7.2
Asymptomatic adults with elevated BP (130-139/85-89 mmHg)			
Every 3-6 months	36	34 (94.4)	8.2
6. Screening for hypertension cost-effective in the resource-poor setting	41	38 (92.7)	7.9

N: Total number of experts voting on key statement

Conclusion

Hypertension is one the strongest cardiovascular risk factors that is associated with increased morbidity and mortality affecting the global population. In developing countries like Nepal, hypertension diagnosis is mostly limited to clinics or hospitals with limited active ongoing community screening programs. This leads to unawareness, underdiagnosis, undertreatment, and thereby poor control of hypertension. Through this consensus, we identify that hypertension screening undertaken in adults from the age of 18 years can be effective for early diagnosis and interventions that will help reduce the community burden of CVDs. Moreover, regular rescreening as per current blood pressure level can aid in the early detection of hypertension or potentially uncontrolled hypertension. Hypertension screening is cost-effective even in resource-poor settings and should be implemented adequately to identify the disease at the earliest with the involvement of all healthcare stakeholders in the community.

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