INTRODUCTION: The erroneous use of the blood pressure (BP) equipment is the main source of inaccurate BP recording. The most common cause of inaccurate measurement is the use of an inappropriate cuff size [1]. The cuff length must encircle arm circumference from 75% to 100% and the arm circumference/cuff width ratio must be around 0.40, to avoid inaccurate BP recording [1].

OBJECTIVE: To compare the BP measurement in the arm with appropriate size BP cuff with standard size blood pressure cuff in the arm and forearm in obese patients.

MATERIALS AND METHOD: Patients who attended Yenepoya Medical College Outpatient department or Inpatients who had BMI above 25kg/m² participated in study. With mercury sphygmomanometer, arm BPs were recorded in right arm in sitting position by appropriate cuff size for that BMI. Following this, BP was recorded both of the arm as well as the forearm with the standard size BP cuff and values were compared.

RESULTS: Appropriate size BP cuff readings of arm were closer to forearm BP of the standard size cuff. So forearm BP may be used as a surrogate BP in obese patients.

INTRODUCTION: For measurement of appropriate blood pressure according to American association hypertension Guidelines, the sphygmomanometer cuff should be appropriate to the patient arm to ensure an accurate reading. The arm circumference measurement should be taken at the midpoint between acromion and olecranon. The cuff length must encircle arm circumference from 75% to 100% and the arm circumference/cuff width ratio must be around 0.40, to avoid inaccurate BP recording.[1]

The characteristic of cuff and bladder for blood pressure measurement in relation to arms size is still controversial. Measurement of blood pressure in obese patients remains a challenging task as appropriate size blood pressure cuff is not readily available in most of the hospital settings.

Standard blood pressure cuff does not usually fit obese patients. Even if it fits, it gives an higher value [2]. This difficulty can be overcome by checking the values by measuring the pressure at the wrist by standard cuff wrapped around the forearm and auscultation done over the radial artery [2]. With the growing obese population in India, it is important for physicians to have an idea to check accurate blood pressure in obese adults. In South Asia, obesity is defined when BMI is above 25 kg/m² [3] Obesity is a studied risk factor for cardiovascular disease. The Association of hypertension and obesity is also well established [4]. There is paucity of literate regarding the use of different sizes of blood pressure cuff in India. Since most of the hospitals are still using mercury sphygmomanometer instead of the electronic ones, this study is undertaken to find out if there is a variation in the use of standard blood pressure cuff in obese people compared to larger cuff and also the reliability between forearm and arm blood pressure. To find out which one of the two can be blood pressure value is closer to blood pressure measured by appropriate cuff in obese population is the purpose of the study.

OBJECTIVE: To compare the BP measurement in the arm with appropriate size blood pressure cuff with standard size blood pressure cuff in the arm and forearm in obese patients.

METHODOLOGY
Study design – cross-sectional study

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The blood pressure of the arm as measured by the standard size cuff was higher than appropriate size blood pressure cuff with a difference of 7.3mmHg (systolic) and 4.2mmHg (diastolic) respectively compared to blood pressure measured by the standard size on the arm.

In majority of participants arm blood pressure measured with standard size BP cuff was closer than appropriate size blood pressure cuff with a difference of 7.3mmHg (systolic) and 4.2mmHg (diastolic) between them.

DISCUSSION
Obesity affects more than 335 million adults in India. Factors affecting the prevalence of obesity are multifactorial. Obesity prevalence rate is 11.8% to 31.3% and central obesity varies from 16.9%–36.3% respectively according to ICMR-INDIAB study in 2015[5]. Prevalence of hypertension in men (27.4%) was reported greater than women (20.0%) according to Fourth District Level Household Survey. It converts into 207 million persons (men 112 million, women 95 million) with hypertension in India [6].

A study done by Irving G et al [7], to ‘find out concordance between arms and forearm blood pressure’. Their sample size included 54 patients with a body mass index > 26 kg/m2. BP measurement was done using an automated validated device OMRON 705SCP in a randomized order 3 times in each arm and forearm. In the study mean differences between arm and forearm were observed to be 5.5 mmHg for SBP and 1.53 mmHg for DBP. Hence forearm BP recording was not recommended for measuring blood pressure. However different sizes of cuff were not used. In our study we used two different sizes of blood pressure cuffs and observed that measurement of BP with standard size cuff on forearm is closer to measurement of BP in the arm with appropriate size cuff.

In another study by Pierin et al [8] on ‘BP measurement in obese patients: comparison between arm and forearm measurements’ published in BP monitoring journal in England, arm and forearm BP measurements with an appropriate cuff and standard cuff respectively were compared by the Photoplethysmography (Finapres) method. The study showed that forearm BP measurement shows a higher BP measurement than arm BP. However different BP cuff were not used on the arm. In our study manual mercury sphygmomanometer was used as it is more readily available.

A study done by Leblanc M-È, Auclair A, Leclerc J, Bussières J, Agharazii M, Hould F-S, et al. Blood Pressure Measurement in Severely Obese Patients: Validation of the oscillatory method of BP measurement in obese patients: comparison between upper arm and forearm measurements. Blood Press Monit. 2019 Jan;32(1):58–63. suggested that forearm systolic BP was in concordance with the gold standard (intra-arterial) in supine position. In our study blood pressure has been measured in sitting position and manual method is used. Our study revealed forearm BP values measured by standard size cuff in obese patients were closer to that of the arm with large size cuff placed on the arm in obese people.

CONCLUSION
The blood pressure of the arm as measured by the appropriate cuff is closer to the blood pressure measured by the standard size cuff of the forearm compared to the blood pressure measured by the standard size on the arm.

Hence, forearm blood pressure may be used as a surrogate blood pressure in obese patients when appropriate size BP cuff is not available.

The short coming of this study is a small sample size. A large sample size may be required to strengthen the data

| TABLE 1: Mean Table with all BP Variations |
|-----------------|-----------------|-----------------|
| Cuff Sizes      | Mean Systolic BP| Mean Diastolic BP|
| Arm BP with Standard Cuff | 132.8 ± 16.09 mmHg | 84.6 ± 12.52 mmHg |
| Forearm BP with Standard Cuff | 128.3 ± 16.49 mmHg | 81.7 ± 12.93 mmHg |
| Arm BP with Appropriate Cuff | 125.5 ± 17.13 mmHg | 80.4 ± 11.92 mmHg |

REFERENCES