

# EVALUATION OF THE CONCOMITANT PRESENCE OF HYPERTENSION AND OSTEOPOROSIS AND THE IMPORTANCE OF SCREENING IN LEBANON: A PILOT STUDY (Code 103)

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**Introduction:** Hypertension is both a serious medical concern, and an increasing global burden. In fact, elevated blood pressure is significantly associated with an increased risk for cardiovascular, brain, and kidney diseases. More than 1.1 billion individuals worldwide have hypertension (WHO, 2020). The World Heart Federation (WHF) states that cardiovascular diseases (CVDs) alone, contribute to 17.9 million deaths per year, making it the “world’s biggest killer” (2020). The prevalence, treatment and control of hypertension are well-established in the western world but remain below par in the middle-income countries and the Middle East (Matar et al., 2015). The World Bank classifies Lebanon as a middle-upper income country (2020). Cherfan et al., estimated the hypertension prevalence among adults in Lebanon to be approximately 31%. Also, Matar et al., while conducting a cross-sectional study in all six Lebanese provinces, estimated the hypertension prevalence to be 36% (2015). Finally, Noubani et al., estimated the prevalence to be roughly 37% in the Greater Beirut Area (2018). Hypertension-bone relationship has been linked to a disturbance in calcium metabolism, mainly an increase of calcium leak, in hypertensive individuals (MacGregor & Cappuccio, 1993). The association between hypertension and osteoporosis is still unclear. In Lebanon, the prevalence of osteoporosis in elderly men and women aged 65-85 years is 72%, based on Bone Mass Density (BMD) and vertebral fractures, which is higher than the prevalence of hypertension, dyslipidemia, CVD and diabetes (Bassatne et al., 2020). Hypertension and osteoporosis are two age-related diseases whose interlinkage are under investigated. In Lebanon, given the high morbidity and mortality rates due to cardiovascular diseases, and the low national health priority given to osteoporosis, we conducted a pilot study to investigate the relationship between the two diseases and the need to screen for them.

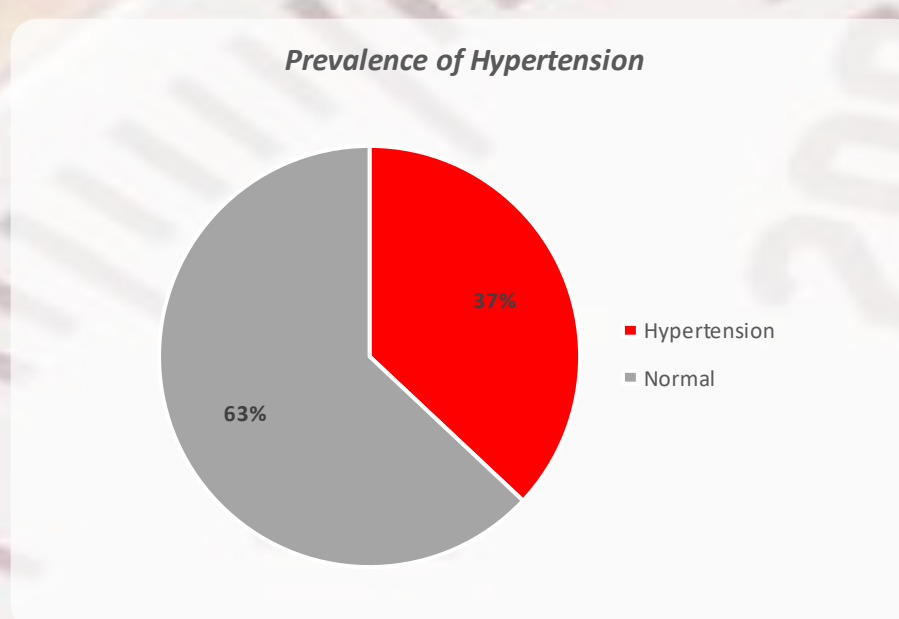
**Methodology:** In the summer of 2019, Lebanon participated for a second year in the May Measurement Month. As part of this campaign, a cross-sectional pilot study was launched based on convenience sampling. It included 730 participants of both genders, aged 18 and above; consent was obtained from all participants. Participants answered a questionnaire about blood pressure and bone health, and were screened for hypertension, following which lifestyle tips were distributed. Descriptive statistics were used to describe the population, analysis of variance and chi-square were used to measure the association between variables. The threshold for significance was set at 0.05.

**Results:** 730 participants were recruited, 46% were females and 54% were males. The mean of age of the total sample was 44.8 (±15.8) years. The mean of age of females was 41.9 years (±14.2) as for males the average was 48.12 years (±17). Descriptive statistics was used to characterise the population under study (**table 1**). Our results showed a prevalence rate of 37% of hypertensive individuals. 11.3% of participants have never measured their blood pressure when asked about their last blood pressure measurement; 19.5% of total participants have measured it over 12 months ago, and 69% of participants have measured their blood pressure within the last 12 months (**figure 1-2**). Among hypertensives, 18% did not have their blood pressure controlled when taking anti-hypertensive medication, and 45% were not aware of their hypertensive status. Concerning osteoporosis, 8.3% of participants claimed to have bone thinning, while 24.8% did not know whether they had it or not. Furthermore, 80.5% mentioned never screening for bone thinning in their lifetime (with 35.6% of them being 43 and above) (**figure 3**). High blood pressure was found to be significantly associated with diabetes, alcohol and tobacco consumption ( $P<0.001$ ). Osteoporosis and hypertension were significant risk factors for fractures ( $P=0.0068$ ,  $P=0.0178$  respectively), with an odds ratio of having osteoporosis and bone fractures being 2.2 CI (1.23-3.99). Height was significantly associated with systolic blood pressure ( $P<0.0001$ ) and diastolic blood pressure was a significant risk factor for bone fractures  $P=0.0204$ .

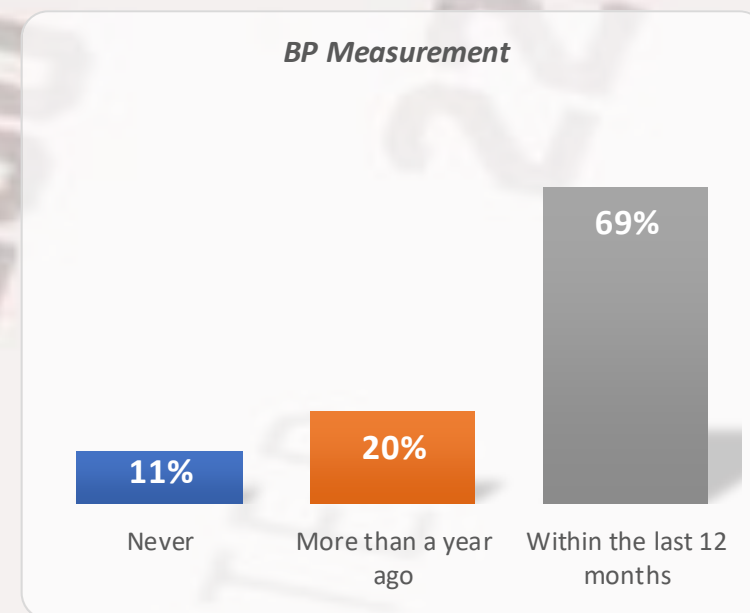
**Table 1: Descriptive table of the baseline characteristic of the population**

		N	%
Informed consent	Verbal Consent	727	100
Ethnicity	Arabic	722	99
	White	5	1
Gender	Male	393	54
	Female	331	46
Tobacco use	Yes	363	50
	No	361	50
Alcohol consumption	1-3 times per months	88	12
	once a week	74	10
	Never/rarely	560	78
BMI	Underweight	6	1
	Normal	299	43
	Overweight	251	36
Pre-eclampsia	Obese	137	20
	Yes	42	16
	No	224	84
Diabetes	Yes	75	10
	No	617	85
	Do Not Know	37	5
History of heart attacks	Yes	33	5
	No	681	95
	Do not know	4	1
Family history of Blood Pressure (BP)	Yes	365	53
	No	320	47
Family history of Osteoporosis (OP)	Yes	200	29
	No	488	71

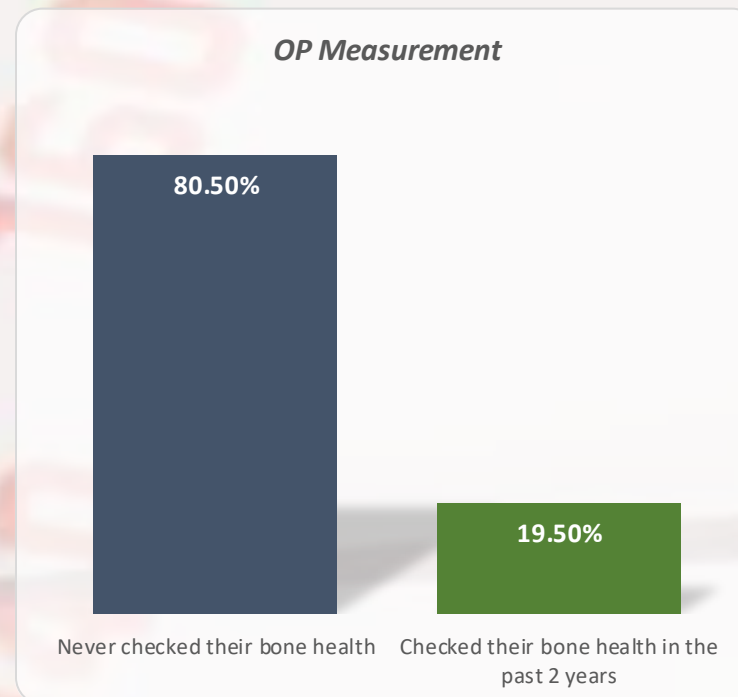
**Figure 1: Pie chart representing the prevalence of hypertension**



**Figure 2: Bar graph presenting the last time the participants measured their blood pressure**



**Figure 3: Pie chart representing the proportion of subjects who checked their bone health in the past 2 years**



**Table 2: \* Logistic regression showing the association between hypertension, age and BMI; bone fractures and diastolic blood pressure (DBP). # Linear regression showing the association with height and systolic blood pressure (SBP).**

Dependent variables	Independent variables	$\beta$	$\beta$ (SE)	P-Value
Hypertension*	Age	0.012	0.00	<0.0001
	Estimated BMI	0.00	0.00	0.0078
Bone fractures*	DBP	0.03	0.01	0.0204
Height #	SBP	0.00	0.00	<0.0001

**Conclusion:** The prevalence of hypertension remains very high in an era where treatment is available, yet not everyone is treated nor have their blood pressure under control. Efforts are still needed to spread awareness to have blood pressure systematically checked, and to highlight the importance of managing risk factors such as BMI, diabetes, alcohol and smoking. In parallel, knowledge about early detection of bone thinning and its emerging complications is warranted in a country where health is becoming a secondary concern. The association between height, bone fractures and blood pressure underline the importance of establishing a public health policy to systematically screen citizens and reduce the long term burden of those two age dependent diseases.