OPEN ACCESS

Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) | ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Prevalence of White Coat Hypertension amongst Patients in the Kurdistan Region of Iraq-Erbil

Shwan Othman Amen PhD[1], Banan Qasim Rasool[2*], MD. Alaa Mohammed Rashid[3], Sara Shwan Shakir[3], Aya nasih Mohammad[3], Ziad R Affas[4], MD. Gazang Noori Abdullah[2], Maryam Ramzi Othman[3], Ibrahim Mohamad Chaheen[3], Vinwar Hameed Abdullah[3], Heleen Araz Hussein[3], Kosar Zeyad Rashad[3], Bareq S. Al-Lami[3], Rawen Hemin Akram[3], Baran Karwan Sulaiman[3], Kares Abduljabbar Nooraddin[3], Don Eliseo Lucero-Prisno III[5]

[1]Head of Cardiology Unit at Surgical Specialty Hospital, Cardiac Center-Erbil-Iraq, 44001
[2]Kurdistan Regional Government, Ministry of Health, Erbil-Iraq, 44001
[3]Hawler Medical University, College of Medicine, Erbil-Iraq, 44001
[4]Department of Internal Medicine, Henry Ford Health System, Michigan, USA
[5]Department of Global Health and Development, London School of Hygiene and Tropical Medicine, London, United Kingdom, Faculty of Management and Development Studies, University of the Philippines (Open University), Los Baños, Laguna, Philippines

DOI: 10.36348/sjm.2022.v07i08.008 | **Received:** 23.07.2022 | **Accepted:** 16.08.2022 | **Published:** 22.08.2022

***Corresponding Author:** Banan Qasim Rasool
Kurdistan Regional Government, Ministry of Health, Erbil-Iraq, 44001

Abstract

Background: White coat hypertension (WCH) is a condition in which people exhibit an elevation in blood pressure (BP) in a clinical setting, although they do not show such elevation in other settings. This study aims to provide new insight into determining the prevalence of WCH amongst patients with or without any cardiovascular risk. ***Method:*** This is a cross-sectional study of convenience sampling study design where 300 patients were involved based on their consultation to a Tertiary Healthcare Unit between November 2021 to March 2022 in Erbil city. Patients were classified according to the ESC into different categories of BP patterns by comparing the first BP reading that was taken at clinic with their average AMBP readings which were taken at home. ***Results:*** A total of 300 patients were included in the study where 58% of the population was male and 42% of the population was female. Of the population, 16% had WCH, 12.3% had sustained HTN, 59.3% were considered to be normotensive (NT), and 12.3% among them were categorized as masked hypertension. From the total of 47 patients that were diagnosed with WCH, 55.3% were male and 44.7% were female patients. The overall average Systolic Blood Pressure in WCH was 125.79±15.30 mmHg, and in Hypertensives it was 147.70±17.15 mm Hg with a P-value of <0.001. The Mean Arterial Pressure in WCH was 94.63±8.87 mmHg and in Hypertensives it was 112.16±13.62 mmHg with a P-value of <0.001. The average Pulse Pressure in WCH was 75.27±9.42 mmHg, and in Hypertensives it was 76.35±9.11 mmHg with a P-value of 0.001. ***Conclusion:*** WHC is significantly prevalent in Erbil city; therefore AMBP monitoring should be performed for those with certain indications to limit the prescription of unnecessary long-term medications with possibly significant side effects to patients with WHC.

Keywords: White coat hypertension (WCH), normotensive, blood pressure (BP), patients.

INTRODUCTION

Hypertension (HTN) is the most catastrophic risk factor for the development of stroke and coronary artery disease (CAD), causing significant morbidity and mortality worldwide. It contributes to about 13.5% of overall mortality globally [1]. Therefore an accurate and early diagnosis of hypertension is vital in its management [2], as well as to avoid the severe consequences and the burden hypertension has on the body. It is more effective to recognize the disease early on in the population, as early management can result in better outcomes [3]. The diagnosis of hypertension is usually established by the use of 'in-office' and home self-monitoring or ambulatory blood pressure measurements. The use of these devices can also help identify many conditions including white coat hypertension [4].

White coat hypertension (WCH) is a phenomenon in which patients are observed to have hypertension by office blood pressure measurements. However, their 24-hour ambulatory readings show a normal range in individuals who were not on any antihypertensive medications before. According to the European Society of Cardiology (ESC), WCH is defined as combined office blood pressure >140/90 mmHg and mean 24-hour values <125/79 mmHg or home blood pressure <132/82 mmHg [5]. The underlying mechanism responsible for this phenomenon is thought to be related to a neuroendocrine reflex, triggered by the anticipation of having blood pressure measured and the fear that the result of the measurement may indicate an illness [6].

This phenomenon can occur in the normal population, as studies have shown that the prevalence of WHC is about 10-15% in the general population worldwide. This percentage increases in hypertensive patients by about 30%. Furthermore, it can also be present in patients that use antihypertensive medications [7].

Previously, WHC was considered to be a relatively benign phenomenon that does not increase the risk of cardiovascular disease (CVD) [8]. However, recent studies have shown that in patients without antihypertensive treatment, WCH is associated with a long-term risk of CVD; it has also been linked with adverse metabolic risk factor profile and more asymptomatic organ damage [7, 8]. Furthermore, individuals with WHC have a higher morbidity and mortality rate compared to normotensive individuals [9]. Hence, WCH is no longer considered an innocent clinical phenomenon, but a warning sign of future health problems [7]. In addition, a misdiagnosis of hypertension, as it can occur in the cases of WCH, can lead to unnecessary lifelong medical treatment with harmful side effects [9]. With an increasing prevalence of this phenomenon, there is yet a limited number of studies conducted on the issue, especially within our locality. Researching the prevalence of WCH in Erbil city will contribute to understanding the size of the problem and establishing baseline data for future studies. This study was carried out to calculate the prevalence and determine the risk factors associated with WCH in a cardiology clinic in Erbil, Iraq.

MATERIALS AND METHODOLOGY

1.1 Time and Setting

The study was carried out between November 2021 to March 2022 in Erbil city, Kurdistan Region, Iraq.

1.2 Study Design and Study Sample

This is a cross-sectional study of convenience sampling study design where 300 patients were involved based on their consultation at a Cardiology Outpatient Clinic (Tertiary Healthcare Unit). It was mainly conducted amongst patients who had certain indications for ambulatory blood pressure monitoring (ABPM) including newly diagnosed HTN, decision to start antihypertensive medications, suspicion of WCH, and uncontrolled HTN who are on medication. The patient's age group ranged from 13 to 90 years old with a random selection of males and females. Patients were classified into different categories of blood pressure (BP) patterns using ABP monitoring by comparing the first blood pressure reading that was taken at the clinic with their average readings which were taken at home in order to see the difference between office and 24-hour blood pressure monitoring. Normotension was defined as daytime ambulatory pressure of <135/85 mm Hg and night-time ambulatory pressure of <120/75.5 White Coat Hypertension was defined as BP of 140/90 mm Hg or more when measured in an office setting but otherwise normal daytime ambulatory pressure <135/85 mm Hg [5]. Hypertension was defined as daytime ambulatory pressure of >135/85 mm Hg and night-time ambulatory pressure of >120/70. Masked HTN was defined as office BP of less than 140/90, but daytime AMBP of more than and equal to 135/85 [10]. Initially, patients had their BP measured by a physician at the office with a mercury sphygmomanometer and then afterward were put on ABPM on a typical working day with BP recording every 30 minutes for the first 2 hours and then hourly for the rest of the 24 hours. A comprehensive questionnaire was designed and information was obtained from the registry database of patient records collected from the tertiary clinic. The remaining data were completed through further surveys with the patients after gaining their oral consent. Amongst the 300 participants, 176 of who had certain factors which were analyzed as predictors for developing white coat hypertension.

1.3 Statistical Analysis of Data

The studying data had been analyzed using the Statistical Package for Social Science version 25 (SPSS, IBM, Armonk, NY, USA). Quantitative data had been expressed as mean∓ standard deviation while qualitative data as frequency and percentages (%). Fisher's exact and Chi-square tests had been performed to test for differences in proportions of categorical variables between the two groups and a P-value of ≤0.05was considered statistically significant.

RESULTS

A total of 300 patients were included with a mean age of 51.08 ± 14.87. The patient population was skewed towards males with 58% (174 people) of the population being male and 42% (126 people) of the population being female.

The population was divided into the following blood pressure statuses: White coat hypertension (WCH), Sustained Hypertension, Normotensive, or masked hypertension. Of the population, 48 people (16%) had white coat hypertension, 37 people (12.3%)

had sustained hypertension, 178 people (59.3%) were considered to be normotensive (NT), and 37 people (12.3%) among them were categorized as masked hypertension. Patients were further classified according to dipping features into 4 categories: 83 (27.7%) reverse dippers, 164 (54.7%) non-dippers, 48 (16%) dippers and 5 (1.7%) extreme dippers. The frequencies of gender, dipping, and blood pressure categories with guideline classification are shown below in Table 1.

The mean and standard deviation of office BP and ambulatory BP readings among the 300 patients included were as follows; The office systolic blood pressure (SBP) was 136.09± 25.68 mmHg and the diastolic blood pressure (DBP) was 83.56± 16.92 mmHg. The whole day SBP was 128.23± 15.69 mmHg while the DBP was 79.86±10.53 mmHg. The daytime SBP was 130.21± 15.53 mmHg and the DBP was 82.12± 11.92mmHg, and lastly the average night- time SBP of all patients was 125.82± 16.56 mmHg and the DBP was 76.93± 11.85 mmHg.

Table 1: Shows the frequencies of gender, dipping, and blood pressure categories with guideline classification among the 300 participants

Variable	Value	Patients NO.	%
Gender	Male	174	58
	female	126	42
Dipping	reverse dippers	83	27.7
	Non-dippers	164	54.7
	dippers	48	16
	extreme dippers	5	1.7
BP categories	WCH	48	16
	sustained HT	37	12.3
	normotensive BP	178	59.3
	None of them	37	12.3
Average In-Office readings	less than 140/90	215	71.7
	more than or equal to 135/85	85	28.3
Average day-time ABPM	less than 135/85	225	75
	more than or equal to 135/85	75	25
Average night-time ABPM	less than 120/75	154	51.7
	more than or equal to 120/75	145	48.3
Average whole-day ABPM	less than 130/80	199	66
	more than or equal to 130/80	101	34

The results and ambulatory data of the research conducted among 300 patients showed that from a total of 47 patients that were diagnosed with WCH, 26 (55.3) were male and 21 (44.7%) were female patients and the result of the Chi-square association showed that (*P*-value = 0.685). Meaning that the deviation was insignificant as shown in Figure 1. The mean age of patients who suffered from WCH was shown to be 51.87 with a standard deviation of ±17.38, while the mean age of WCH-free patients is 51.86 with a standard deviation of ±14.39. Levene's test for equality of variances presented a 0.073 *P*-value, indicating insignificant deviations. As for the comparison of BP variables between patients of different BP categories, the results are shown in Table 2, where the overall average Systolic Blood Pressure in Normotensives was 122.63±10.88 mm Hg, in White Coat Hypertensives was 125.79±15.30 mmHg, and in Hypertensives it was 147.70±17.15 mm Hg with a P-value of <0.001. The overall average Diastolic Blood Pressure in Normotensives was 75.57±7.75 mm Hg, in White Coat Hypertensives was 77.35±7.36 mmHg, and in Hypertensives it was 93.27±10.51 mm Hg with a P-value of <0.001. The Mean Arterial Pressure in Normotensives was 92.32±8.73 mm Hg, in White Coat Hypertensives was 94.63±8.87 mmHg and in Hypertensives it was 112.16±13.62 mmHg with a P-value of <0.001. The average Pulse Pressure in Normotensives was 73.12±8.51 mmHg, in White Coat Hypertensives was 75.27±9.42 mmHg, and in Hypertensives it was 76.35±9.11 mmHg with a P-value of 0.001.

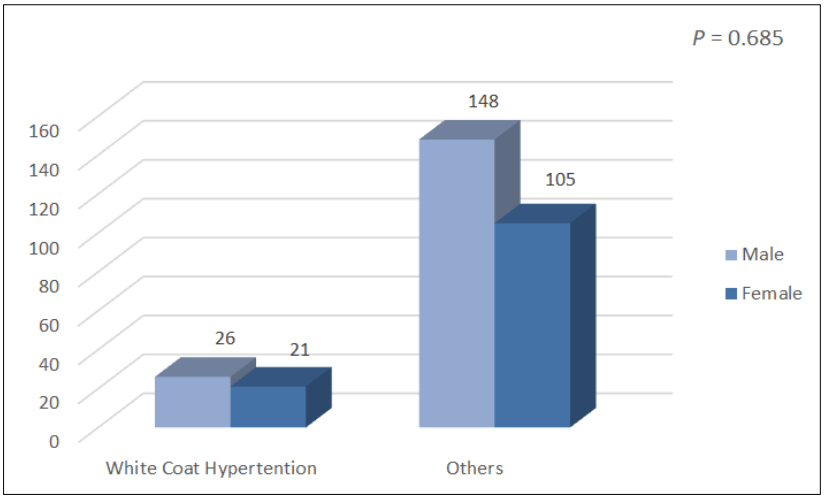

Figure 1 shows the proportion of males and females who had White Coat Hypertension and who were WCH-free

Table 2: comparison of blood pressure variables between patients of different blood pressure categories

	WCHT	Sustained HT	NT	Masked HT	P value
Day-Time ABPM Profile					
Average SBP	128.56±12.55	150.38±16.48	123.60±11.39	143.97±7.50	<0.001
Average DBP	79.56±10.66	95.86±10.41	77.36±8.89	94.59±7.78	<0.001
Average PP	77.25±10.74	80.51±13.34	75.04±9.68	83.40±10.20	<0.001
Average MAP	95.48±8.24	114.86±13.00	93.48±8.85	110.14±9.24	<0.001
Night-Time ABPM Profile					
Average SBP	124.67±16.86	143.92±23.03	121.09±12.50	131.95±11.00	<0.001
Average DBP	75.73±10.21	88.56±14.28	73.53±10.23	82.62±7.88	<0.001
Average PP	71.90±9.49	71.62±8.98	69.97±9.42	72.62±8.09	0.281
Average MAP	93.58±11.90	108.62±18.17	90.83±10.99	100.00±9.00	<0.001
Whole-Day ABPM Profile					
Average SBP	125.79±15.30	147.70±17.15	122.63±10.88	138.86±13.88	<0.001
Average DBP	77.35±7.36	93.27±10.51	75.57±7.75	90.38±6.82	<0.001
Average PP	75.27±9.42	76.35±9.11	73.12±8.51	78.90±6.98	0.001
Average MAP	94.63±8.87	112.16±13.62	92.32±8.73	106.51±7.49	<0.001
In-Office BP Profile					
Average SBP	161.44±22.61	164.49±19.14	124.68±19.30	129.73±15.55	<0.001
Average DBP	100.56±14.54	103.95±15.35	75.78±11.27	78.54±10.22	<0.001

Association of dipping with BP categories shows that 60.4% of the non-dippers had white coat hypertension, 48.6% had sustained hypertension, 54.5% were normotensive and lastly, 54.1% of the non-dippers within the dipping categories had masked hypertension. This was significant with a *P*-value equal to 0.025.

Risk factors

Of the selected population, 173 (57.67%) people were further evaluated for the presence of certain risk factors that pertain to White Coat Hypertension. Of the 173 patients, 27 fell under the WCH category, and the other 146 patients fell into other categories. For the first risk factor, the percentage of smokers among WCH was 14.8% while it was 18% among others with a *P*-value of 0.868. Secondly, the percentage of diabetic patients among WCH was 14.8% while it was 13.0% among others with a *P*-value of 0.762. However, in the third risk factor, none of the patients with renal disease had WHC while their percentage was 2.1% among others with a *P*-value of 1.00. The percentage of the fourth risk factor which was Family History of HTN among WHC was 44.4% while it was 43.2% among others with a *P*-value of 0.901. The percentage of chronic HTN at ABPM date among WHC was 63.0 % while it was 61. 0% with a *P*-value of 0.844. Lastly, the presence of cardiovascular events before ABPM among WHC showed a percentage of 22.2% while it was 28.8% among others with a *P*-value of 0.485.

DISCUSSION

Out of the 300 people that were included in this study and who underwent 24-hour ABPM, 47 people (16 %) were concluded to have been diagnosed with WCH. This is in line with studies such as the ones conducted by Johansson *et al.*, and Godil *et al.*, [11, 12] which found similar results of prevalence of around 12.6% and 16.6% respectively to fall into the WCH category. However, the prevalence of WCH can be

inconsistent and depends on the selected sample population.

In another study conducted in Spain, the WCH category included only 3.6% of the sample population while other studies conducted in Nigeria and Morocco, showed a prevalence of 36.7% and 33% respectively [13-15]. Overall, studies have shown that the prevalence range lies between 12% and 54% which can be explained by the age restriction, sample population, and geographical differences [16]. For example, in the study conducted by Johansson *et al.*, only middle-aged people were included in the study [11]. This is different from the latter and the current study, where the inclusion criteria do not have any restriction on the age limit. Other factors that pertain to WCH were investigated in this study such as age, gender, and the presence of any risk factors.

One of the main factors analyzed in this research was the age which was found to not have a significant correlation with the prevalence of WCH. This finding can be seen in similarity with other studies conducted by Takah *et al.,* [17]. In contrast, studies conducted by Johansson *et al.,* and Gorostidi *et al.,* contraindicated this finding showing that there was a significant correlation between WCH and certain age groups where both studies concluded that patients diagnosed with WCH are more frequently older [11, 18].

Another factor focused on in this study was gender. It was noted that there was no significant correlation between the gender of a patient and the presence of WHC. This is supported by different studies conducted by Takah *et al.,* in which they concluded that the patient's gender does not influence the prevalence of WCH [17]. On the other hand, contraindicating findings were found in studies conducted by Johansson *et al.,* Khalil *et al.,* and another study conducted by Gorostidi *et al.,* in which it was emphasized that WCH is predominantly more prevalent among females than males mentioning that the reason was not clear [11, 15, 18].

In addition to the points mentioned above, this study showed that the WCH category falls in between the NT and the HT categories. Factors that are important for prognostic determination including the pulse rates and mean arterial pressure (MAP) were significantly higher in the patient population that fell into the WCH category when compared to the patients that fell into the NT category. A different finding can be seen when comparing the WCH population to the HT population. Patients who fell into the WCH category had lower pulse rates and mean arterial pressure when compared to the patient population included in the HT category in our study. Comparing the patient profiles for those categories, a sequence from NT to WCHT to HT can be noticed. Similar results were also shown in a study conducted by Godil *et al.,* [12].

Regarding dipping status, the study's result was similar to the one conducted by Khalil *et al.,* [15], where it showed that the non-dipping group was predominant in the WCH group. Our study, similar to the study conducted in Pakistan showed that the prognostic factors including MAP, pulse pressure, and the loss of nocturnal dip were higher in WCH and hence these groups were at higher risk of developing hypertension in the future [12]. Similarly, it has also been shown that WCH is a risk factor for the development of HTN in other studies such as the ones conducted by Ohkubo *et al.,* and Gustavsen *et al.,* [12, 19, 20].

The presence of certain risk factors that were mentioned above and their relationship to the development of White Coat Hypertension was also investigated. This study showed that no significant correlation can be made between these two points. A similar study conducted by Takah *et al.,* had the same results regarding risk factors [17]. However, other studies have shown that female gender, older age group, diabetes, family history, and grade I hypertensive patients are more likely to develop WCH according to multiple studies [11, 21-23]. While not conclusive, it is still important to consider screening patients using such risk factors as tools to indicate the likelihood of developing WCH.

Limitations and Strengths

This study was done for patients who visited a tertiary clinic in Erbil city and had undergone ABMP. The study could not collect a randomized sample size from the general population in Erbil but included all the patients who did ABMP within a selected period of time regardless of the purpose of doing the ABPM. A dramatic difference in the prevalence of WCH in the whole population was unlikely. The study was a cross-sectional study meaning that it could prove cause and results. The study fully depended on office blood pressure measurements and ambulatory blood pressure measurements so that the case definitions were accurate.

RECOMMENDATIONS

It can be recommended that physicians stick to the guidelines of diagnosing essential hypertension and whenever in doubt or if white coat hypertension is suspected, send for ambulatory blood pressure measurement to compare with office blood pressure readings. This would help reduce unnecessary long-term antihypertensive medications and more accurately diagnose the disease. Risk factors for White Coat Hypertension have contradicting evidence from different studies; a prospective cohort study among a general population might settle some of the opposing evidence for risk factors for White Coat Hypertension.

CONCLUSION

In conclusion, WHC is significantly prevalent in Erbil. This study didn't identify any statistically significant correlating factor with WCH. Doctors should make sure to not overlook the WCH phenomenon in order to avoid prescribing unnecessary long-term medications with possibly significant side effects to patients with WHC.

REFERENCES

1. Arima, H., Barzi, F., & Chalmers, J. (2011). Mortality patterns in hypertension. *Journal of hypertension*, *29*, S3-S7. doi: 10.1097/01.hjh.0000410246.59221.b1. PMID: 22157565.
2. Pioli, M. R., Ritter, A. M., de Faria, A. P., & Modolo, R. (2018). White coat syndrome and its variations: differences and clinical impact. *Integrated blood pressure control*, *11*, 73-79. DOI: 10.2147/IBPC.S152761. PMID: 30519088; PMCID: PMC6233698.
3. Lawes, C. M. (2001). Vander hoorn S, Rodgers A. *Global burden of blood-pressure-related disease*, (9623), 1513-1518. Doi: 10.1016/S0140-6736(08)60655-8.
4. Unger, T., Borghi, C., Charchar, F., Khan, N. A., Poulter, N. R., Prabhakaran, D., ... & Schutte, A. E. (2020). 2020 International Society of Hypertension global hypertension practice guidelines. *Hypertension*, *75*(6), 1334-1357. DOI: 10.1161/HYPERTENSIONAHA.120.15026. PMID: 32370572
5. Grassi, G. (2014). White-coat hypertension: Not so innocent. *European Society of Cardiology*, 2014. https://www.escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume-14/White-coat-hypertension-not-so-innocent
6. Bloomfield, D. A., & Park, A. (2017). Decoding white coat hypertension. *World journal of clinical cases*, *5*(3), 82-92. doi: 10.12998/wjcc.v5.i3.82. PMID: 28352632; PMCID: PMC5352963.
7. Huang, Y., Huang, W., Mai, W., Cai, X., An, D., Liu, Z., ... & Xu, D. (2017). White-coat hypertension is a risk factor for cardiovascular diseases and total mortality. *Journal of hypertension*, *35*(4), 677-688. doi:10.1097/hjh.0000000000001226
8. Mancia, G., Facchetti, R., Bombelli, M., Cuspidi, C., & Grassi, G. (2021). White-coat hypertension: pathophysiological and clinical aspects: excellence award for hypertension research 2020. *Hypertension*, *78*(6), 1677-1688.
9. Briasoulis, A., Androulakis, E., Palla, M., Papageorgiou, N., & Tousoulis, D. (2016). White-coat hypertension and cardiovascular events: a meta-analysis. *Journal of hypertension*, *34*(4), 593-599. doi: 10.1097/HJH.0000000000000832. PMID: 26734955.
10. O'Brien, E., Parati, G., Stergiou, G., Asmar, R., Beilin, L., Bilo, G., ... & Zhang, Y. (2013). European Society of Hypertension Working Group on Blood Pressure Monitoring. Guidelines European Society of Hypertension Position Paper on Ambulatory Blood Pressure Monitoring. *J Hypertens*, *31*, 1731-1768. doi:10.1097/HJH.0b013e328363e964
11. Johansson, M. A., Östgren, C. J., Engvall, J., Swahn, E., Wijkman, M., & Nystrom, F. H. (2021). Relationships between cardiovascular risk factors and white-coat hypertension diagnosed by home blood pressure recordings in a middle-aged population. *Journal of Hypertension*, *39*(10), 2009-2014. doi:10.1097/HJH.0000000000002888
12. Godil, S. S., Tabani, H., Khan, A. H., & Almas, A. (2011). White coat hypertension is not a benign entity: a cross-sectional study at a tertiary care hospital in Pakistan. *Journal of the Pakistan Medical Association*, *61*(9), 938.
13. Contreras, M., JJ, C. M., Alvarez, P., Vázquez, I., Guevara, B., & Rodríguez, J. (2006). Prevalence of white-coat hypertension and masked hypertension in the general population, through home blood pressure measurement. *Atencion Primaria*, *38*(7), 392-398. doi:10.1016/s0212-6567(06)70531-5
14. Dele-Ojo, B., Kolo, P., Ogunmodede, A., Bello, H., Katibi, I., Omotoso, A., & Dada, S. (2019). Prevalence and Predictors of White Coat Hypertension among Newly-Diagnosed Hypertensive Patients in a Tertiary Health Centre in Nigeria. *Ethiopian Journal of Health Sciences*, *29*(4).
15. Abir Khalil, S., Zaîmi, S., Tazi, M. A., Bendahmane, S., Bensaoud, O., & Benomar, M. (2009). Prevalence and predictors of white-coat hypertension in a large database of ambulatory blood pressure monitoring. *EMHJ-Eastern Mediterranean Health Journal*, 15 (2), 400-407.
16. Aguirre-Ramos, R., Trujillo-Hernández, B., Huerta, M., Trujillo, X., Vásquez, C., & Millán-Guerrero, R. O. (2002). Frecuencia de hipertensión de bata blanca y sus factores de riesgo en pacientes hipertensos recién diagnosticados. *Gaceta Médica de México*, *138*(4), 319-324.
17. Takah, N., Dzudie, A., Ndjebet, J., Wawo, G., Kamdem, F., Monkam, Y., ... & Kengne, A. P. (2014). Ambulatory blood pressure measurement in the main cities of Cameroon: prevalence of masked and white coat hypertension, and influence of body mass index. *The Pan African Medical Journal*, 19, 240. doi:10.11604/pamj.2014.19.240.4887
18. Gorostidi, M., Vinyoles, E., Banegas, J. R., & de la Sierra, A. (2015). Prevalence of white-coat and masked hypertension in national and international registries. *Hypertension Research*, *38*(1), 1-7. doi:10.1038/hr.2014.149
19. Ugajin, T., Hozawa, A., Ohkubo, T., Asayama, K., Kikuya, M., Obara, T., ... & Imai, Y. (2005). White-coat hypertension as a risk factor for the

development of home hypertension: the Ohasama study. *Archives of internal medicine*, *165*(13), 1541-1546. doi:10.1001/archinte.165.13.1541

20. Gustavsen, P. H., Høegholm, A., Bang, L. E., & Kristensen, K. S. (2003). White coat hypertension is a cardiovascular risk factor: a 10-year follow-up study. *Journal of human hypertension*, *17*(12), 811-817.
21. Hwang, E. S., Choi, K. J., Kang, D. H., Nam, G. B., Jang, J. S., Jeong, Y. H., ... & Park, C. H. (2007). Prevalence, predictive factor, and clinical significance of white-coat hypertension and masked hypertension in Korean hypertensive patients. *The Korean Journal of Internal Medicine*, *22*(4), 256.
22. Alves, L. M. M., Nogueira, M. S., Godoy, S. D., Hayashida, M., & Cárnio, E. C. (2007). Prevalence of white coat hypertension in primary health care. *Arquivos brasileiros de cardiologia*, 89(1), 28-35.
23. Segre, C. A., Ueno, R. K., Warde, K. R., Accorsi, T. A., Miname, M. H., Chi, C. K., ... & Mion Júnior, D. (2003). White-coat hypertension and normotension in the League of Hypertension of the Hospital das Clínicas, FMUSP: prevalence, clinical and demographic characteristics. *Arquivos Brasileiros de Cardiologia*, 80(2), 122-126. doi:10.1590/s0066-782x2003000200001