# Prevalence and associated factors of single pill combination therapy among people with hypertension in a tertiary hospital

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## ABSTRACT

**Introduction: Effective management of hypertension often requires pharmacological intervention, which can involve either single pill combination therapy (SPC) or multiple pill combination therapy (MPC). However, the choice between SPC and MPC can be influenced by patient demographics, clinical characteristics, comorbid conditions and physician preferences. This study was aimed at exploring the prevalence of SPC versus MPC usage among people with hypertension in a tertiary hospital and its associated factors.**

**Materials and Methods: A cross-sectional study using a validated questionnaire was conducted among the hypertensive patients aged 18 years and on antihypertensive medication(s) for at least six months attending various speciality clinics at Hospital Sultan Abdul Aziz Shah, Selangor.**

**Results: The prevalence of patients using SPC was 27.9% (78/280). In univariate analysis, factors that were found to be associated with the use of SPC were presence of diabetes mellitus (p < 0.001), presence of chronic kidney disease (p = 0.033), physician's own preference for SPC (p = 0.027) and duration of hypertension (p = 0.003). The independent factors associated with SPC use was the presence of chronic kidney disease, physician's own preference for SPC and absence of diabetes mellitus (p < 0.05).**

**Conclusion: The use of SPC is only 27.9%. The independent factors associated with SPC use was the presence of chronic kidney disease, physician's own preference for SPC and absence of diabetes mellitus. Hence, this study's findings can be applied by healthcare providers who should consider these factors when prescribing hypertension treatments. Tailoring the treatment plan to the individual patient's needs and circumstances can enhance adherence and efficacy.**

**KEYWORDS:**
*Single pill combination therapy (SPC), Multiple pill combination therapy (MPC), Prevalence, Factors, Malaysia*

## INTRODUCTION

Hypertension is defined by the World Health Organization (WHO) as high or elevated blood pressure, and is a medical condition characterised by consistently heightened pressure within the blood vessels. According to Carey et al., in their review published in JAMA, primary drug treatment for hypertension typically involves using a thiazide or thiazide-like diuretic, like hydrochlorothiazide or chlorthalidone, an angiotensin-converting enzyme inhibitor or an angiotensin receptor blocker, such as enalapril or candesartan, along with a calcium channel blocker like amlodipine.[1] These drugs can be given as a single pill combination or multiple pill combination. Single pill combination or fixed dose combination therapy (SPC) contains two or more different medications of various doses in a single pill.[2] Example with include innovator drug such as Twynsta® which contains variable doses of telmisartan and amlodipine in a single pill. Multiple pill combination (MPC) therapy is defined as the specific use of two or more drugs for a chronic condition in an individual.[3] Examples will include innovator drugs such as Micardis® (which contains telmisartan) and Norvasc® (which contains amlodipine).

International hypertension guidelines increasingly recommend SPC therapy as the preferred initial pharmacological treatment for most patients with hypertension who require more than one antihypertensive agent. The WHO 2021 Hypertension Guideline recommends initiating treatment with combination therapy, preferably as an SPC, because it improves medication adherence, treatment persistence, and blood pressure control compared with free-drug combinations.[4] The guideline also highlights that combining antihypertensive agents from complementary drug classes at lower doses provides greater blood pressure reduction while reducing dose-dependent adverse effects.[4]

Similarly, the 2024 European Society of Cardiology (ESC) Guidelines for the management of elevated blood pressure and hypertension recommend that most patients with hypertension should begin treatment with a low-dose two-drug combination, preferably as a single-pill combination.[5-6]

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The guideline emphasizes that SPC therapy achieves more rapid blood pressure control, improves long-term adherence and persistence, and reduces therapeutic inertia. The recommended first-line combinations include an angiotensin-converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB) combined with either a calcium channel blocker (CCB) or a thiazide/thiazide-like diuretic. These recommendations are particularly relevant for patients with diabetes mellitus and chronic kidney disease, who frequently require combination therapy to achieve stricter blood pressure targets and reduce cardiovascular and renal complications.[5-6]

The decision to focus on people with hypertension in tertiary hospitals in this study was because people with hypertension may need to consume a lot of medicine which can lead to patient compliance and mistakes in taking the medication. Understanding the factors associated with the choice between SPC and MPC is vital for optimising treatment adherence, patient outcomes, and healthcare resource utilisation.

This study was aimed at determining the prevalence and associated factors of multiple pill combination versus single pill combination therapies among people with hypertension in a tertiary hospital. The result of this study will provide information on the currently prescribed patterns of managing hypertensive conditions in a tertiary hospital. The findings stand to optimise patient outcomes and contribute to the refinement of current medical practices in tertiary healthcare settings. In addition, this research can help healthcare professionals optimise hypertension therapy strategies.

## MATERIALS AND METHODS

A cross-sectional study was conducted at the family medicine, general and subspecialties internal medicine clinics at Hospital Sultan Abdul Aziz Shah (HSAAS), Selangor, from December 2023 to June 2024. The study included people with hypertension who had been on antihypertensive medication for at least six months and were able to understand Malay or English language. Patients with cognitive impairment or acute psychiatric illness were excluded. Systematic random sampling was used for participants selection, and a validated self-administered questionnaire was employed to collect sociodemographic, lifestyle and clinical data. The systematic random sampling procedure over the one-month data collection involves setting a fixed time or participant interval and picking a random starting point to ensure every participant has an equal chance of being selected.

Sample size calculation was based on the number of total patients with hypertension expected to be seen in the study site over the study period which was 600 patients. Using the Raosoft® sample size calculator, the estimated required sample size will be 280 participants, after accounting for 20% possible non respondents.

Upon giving consent, the participants were then provided with a questionnaire to answer. The estimated time to answer the questionnaire was approximately 5 to 10 minutes. This validated questionnaire consisted of three sections as above. The languages used in the questionnaire are English and Malay. Validation process of the questionnaires involved both content validation and face validation. Content validation was done with an expert panel of two primary care physicians, two geriatricians and on biostatistician. Face validation was done with 30 adults (about 10% of the estimated sample size, accounting for additional 20% non-respondent) who attended the clinic. Changes recommended during the content and face validation were incorporated into the final version of the questionnaire. The Cronbach's alpha of the relevant sections in the questionnaire ranged from 0.82- 0.88, therefore indicating good reliability. Pilot testing was done prior to actual data collection to enable the study to be conducted with minimal disruptions to the clinic operations.

One of variable used was Physician preference, which means the specific choices a doctor makes regarding either advocating SPC or MPC. However, the final choice of the type of medication used may still be subjected to availability and additional cost. For the dependant variable, participant classified as SPC user may also include those that are on additional antihypertensive agents as long as they are using SPC antihypertensive therapy.

IBM Statistical Package for Social Science (SPSS) software version 29.0 was used for statistical analysis. Descriptive data was described as frequency and percentages. Chi-square or Fisher's exact test was used in the univariate analysis to analyse the categorical independent variables. For multivariate analysis, multiple logistic regression analysis was used. Independent variables with a p-value of <0.25 from univariate analysis was included into final multiple logistic regression analysis to determine the independent factors associated with SPC use. The statistical significance was accepted at p-value of <0.05. Patient confidentiality was maintained by labelling questionnaires with identification numbers instead of personal information. Ethical approval was obtained from the Universiti Putra Malaysia Ethical Committee (JKEUPM). The study ensured ethical standards by obtaining informed consent from participants and safeguarding data through secure storage and restricted access. The potential benefits and risks of participation were explained to the patients, and assistance was provided to vulnerable participants in completing the questionnaires.

## RESULTS

The response rate was 100%. In this study, the prevalence of people with hypertension that used SPC therapy was 27.9% (78/280), while 72.1% of the participants used MPC therapy. Table I shows the socio-demographic, lifestyle and clinical characteristic of the participants. The majority of the participants were male (55.5%), unemployed (mainly retirees) (42.3%), and of Malay ethnicity (75.2%), with a significant proportion falling within the age range of above 60 years old (83.9%). Most of the participants are married (83.2%) and have attained tertiary education (71.6%). Household income distribution shows that 58.4% of the participant earn between RM4,850 and RM10,970 (i.e. falling into M40 category). Additionally, a large majority of participants have never consumed alcohol (91.2%) or

**Table I: Descriptive analysis for demographic factors and tumour characteristics**

| Factors | Group | N (35) | Percentage (%) |
|---|---|---|---|
| Age | 20-24 | 1 | 2.9 |
| | 30-34 | 3 | 8.5 |
| | 35-39 | 1 | 2.9 |
| | 40-49 | 6 | 17.2 |
| | 50-54 | 1 | 2.9 |
| | 55-59 | 8 | 22.9 |
| | 60-64 | 6 | 17.2 |
| | 65-69 | 3 | 8.5 |
| | 70-74 | 3 | 8.5 |
| | 75+ | 3 | 8.5 |
| Ethnicity | Malay | 9 | 25.7 |
| | Chinese | 24 | 68.6 |
| | Indian | 2 | 5.7 |
| ECOG | 0 | 22 | 62.9 |
| | 1 | 11 | 31.5 |
| | 2 | 1 | 2.8 |
| | 3 | 1 | 2.8 |
| Comorbidities* | No | 21 | 60.0 |
| | HPT | 6 | 17.1 |
| | DM | 2 | 5.7 |
| | HCT | 1 | 2.9 |
| | CKD | 1 | 2.9 |
| | HPT+HCT | 2 | 5.7 |
| | HPT+HCT+DM | 2 | 5.7 |
| Tumour characteristics | | | |
| Cancer status at initial diagnosis | Localised disease | 24 | 68.6 |
| | Metastatic disease | 11 | 31.4 |
| Histology subtype | SCC | 24 | 68.6 |
| | Adenocarcinoma | 10 | 28.6 |
| | Neuroendocrine | 1 | 2.8 |
| Number of metastatic/recurrence sites | 1 | 18 | 51.4 |
| | 2 | 16 | 45.7 |
| | 3 | 1 | 2.9 |
| Metastatic/recurrence site | | | |
| Lung | Yes | 9 | 25.7 |
| | No | 26 | 74.3 |
| Liver | Yes | 3 | 8.6 |
| | No | 32 | 91.4 |
| Bone | Yes | 7 | 20.0 |
| | No | 28 | 80.0 |
| Local recurrence | Yes | 13 | 37.1 |
| | No | 22 | 62.9 |
| Nodal | Yes | 16 | 45.7 |
| | No | 19 | 54.3 |
| Others | Yes | 4 | 11.4 |
| | No | 31 | 88.6 |

* HPT-hypertension, DM-diabetes mellitus, HCT - hypercholestrolaemia, CKD-chronic kidney disease

smoked (72.3%). Dyslipidaemia was noted among 67.2% of participants, while 51.8% of participants had diabetes mellitus. Majority of the patients do not have chronic kidney disease (91.1%). Majority of participants had normal body weight (58.5%). The cost of medication is uncertain for a significant portion (87.2%) of participants, and physician preferences are varied, with (54.7%) unsure of their own preference regarding the use of MPC and SPC. Hypertension duration also varies, with the majority of the participants diagnosed with hypertension for >5 to 10 years (67.9%). These socio-demographic characteristics provide a comprehensive understanding of the patient population being studied, allowing for a detailed analysis of factors associated with the use of SPC and MPC therapies among people with hypertension.

Table II shows the association between various sociodemographic factors, lifestyle and clinical characteristics with the intake of single pill combination (SPC) or multiple pill combination (MPC) antihypertensive medications (univariate analysis) among the participants of this study. Chi-square test (or Fischer Exact test) and corresponding p-values were utilised to assess the significance of these associations. Results indicate that gender, ethnicity, marital status, highest level of education, household income, alcohol consumption, smoking habit, dyslipidaemia, and obesity do not exhibit significant associations with medication choice (had a p-value > 0.05). It was noted that the presence or absence of diabetes mellitus, chronic kidney disease and the duration of hypertension showed an association with medication intake, either SPC or MPC therapy ($p<0.05$). Participants with diabetes mellitus were less likely to be on

**Table I: Socio-demographic, lifestyle and clinical characteristic of the participants (N=280)**

| Variable | Frequency (%) |
|---|---|
| Gender | |
| Male | 154 (55.5) |
| Female | 126 (44.5) |
| Occupation | |
| Government workers | 98 (35.0) |
| Private workers | 19 (6.6) |
| Self-employment | 45 (16.1) |
| Unemployed/retirees | 118 (42.3) |
| Ethnicity | |
| Malay | 211 (75.2) |
| Chinese | 29 (10.2) |
| Indian | 40 (14.6) |
| Age (years) | |
| 18 - < 40 years | 8 (2.9) |
| 40 - < 60 years | 37 (13.1) |
| > 60 years | 235 (83.9) |
| Marital status | |
| Single | 21 (7.5) |
| Married | 233 (83.2) |
| Widowed | 26 (9.3) |
| Highest level of education | |
| None | 8 (2.9) |
| Primary | 8 (2.9) |
| Secondary | 63 (22.6) |
| Tertiary | 201 (71.6) |
| Household income | |
| < RM4,850 (B40) | 43 (15.3) |
| RM4,850 - RM10,970 (M40) | 164 (58.4) |
| > RM10,970 (T20) | 73 (26.3) |
| Alcohol consumption | |
| Currently consume | 1 (0.4) |
| Previously consume | 24 (8.0) |
| Never consume | 255 (91.2) |
| Smoking habit | |
| Currently smoking | 10 (3.6) |
| Previously smoking | 68 (24.1) |
| Never smoking | 202 (72.3) |
| Dyslipidaemia | |
| No | 92 (32.8) |
| Yes | 188 (67.2) |
| Body mass index | |
| Underweight | 14 (5.0) |
| Normal weight | 164 (58.5) |
| Overweight | 94 (33.5) |
| Obese | 8 (3.0) |
| Chronic kidney disease | |
| No | 255 (91.1) |
| Yes | 25 (8.9) |
| Diabetes mellitus | |
| Absent | 135 (48.2) |
| Present | 145 (51.8) |
| Cost of SPC/MPC | |
| Yes | 20 (7.1) |
| No | 16 (5.7) |
| Unsure | 217 (87.2) |
| Physician preferences | |
| MPC | 26 (9.5) |
| SPC | 9 (3.0) |
| No preferences mentioned | 92 (32.8) |
| Unsure | 153 (54.7) |
| Duration of hypertension | |
| < 1 year | 6 (2.2) |
| 1 - 5 years | 20 (7.3) |
| >5 - 10 years | 190 (67.9) |
| > 10 years | 64 (22.6) |

**Table II: Association between the sociodemographic factors, lifestyle and clinical characteristics with the intake of single pill combination (SPC) and multiple pill combination (MPC) among the participants (N=280)**

| Variables | MPC n (%) | SPC n (%) | Chi Square, X2 | p-value |
|---|---|---|---|---|
| Gender | | | | |
| Male | 116 (75.0) | 38 (25.0) | 0.257 | 0.612 |
| Female | 99 (78.7) | 27 (21.3) | | |
| Occupation | | | | |
| Government workers | 79 (80.7) | 19 (19.3) | 3.337 | 0.343 |
| Private workers | 11 (57.9) | 8 (42.1) | | |
| Self-employment | 37 (82.2) | 8 (17.8) | | |
| Unemployed | 87 (73.7) | 31 (27.3) | | |
| Ethnicity | | | | |
| Malay | 162 (76.8) | 49 (23.2) | 1.079* | 0.583* |
| Chinese | 24 (82.8) | 5 (17.2) | | |
| Indian | 28 (70.0) | 12 (30.0) | | |
| Age range | | | | |
| 18 - < 40 years | 4 (50.0) | 4 (50.0) | 3.292* | 0.141* |
| 40 - < 60 years | 25 (67.7) | 12 (32.3) | | |
| > 60 years | 186 (79.1) | 49 (20.9) | | |
| Marital status | | | | |
| Single | 17 (81.0) | 4 (19.0) | 0.639* | 0.784* |
| Married | 180 (77.3) | 53 (22.7) | | |
| Widowed | 18 (69.2) | 8 (30.8) | | |
| Highest level of education | | | | |
| None | 8 (100.0) | 0 (0.0) | 1.544* | 0.705* |
| Primary | 8 (100.0) | 0 (0.0) | | |
| Secondary | 47 (74.6) | 16 (25.4) | | |
| Tertiary | 152 (75.6) | 49 (24.4) | | |
| Household income | | | | |
| < RM4,850 | 35 (81.4) | 8 (18.6) | 4.438 | 0.116 |
| RM4,850 - RM10,970 | 134 (81.7) | 30 (18.3) | | |
| > RM10,970 | 47 (64.4) | 26 (35.6) | | |
| Alcohol consumption | | | | |
| Currently consume | 0 (0.0) | 1 (100.0) | 3.081* | 0.266* |
| Previously consume | 18 (75.0) | 6 (25.0) | | |
| Never consume | 198 (77.6) | 57 (22.4) | | |
| Smoking habit | | | | |
| Currently smoking | 6 (60.0) | 4 (40.0) | 1.123* | 0.683* |
| Previously smoking | 54 (79.4) | 14 (20.6) | | |
| Never smoking | 155 (76.7) | 47 (23.2) | | |
| Dyslipidaemia | | | | |
| Absent | 72 (78.3) | 20 (21.7) | 0.048 | 0.835 |
| Present | 143 (76.1) | 45 (23.9) | | |
| Body mass index | | | | |
| Underweight | 10 (71.4) | 4 (28.6) | 1.697* | 0.681* |
| Normal weight | 131 (79.9) | 33 (20.1) | | |
| Overweight | 67 (71.3) | 27 (28.7) | | |
| Obese | 6 (75.0) | 2 (25.0) | | |
| Chronic kidney disease | | | | |
| Absent | 202 (79.2) | 53 (20.8) | - | 0.033* |
| Present | 12 (48.0) | 13 (52.0) | | |
| Diabetes mellitus | | | | |
| Absent | 82 (60.7) | 53 (39.3) | 18.294 | <0.001 |
| Present | 133 (91.7) | 12 (8.3) | | |
| Cost of MPC/SPC | | | | |
| Yes | 12 (60.0) | 8 (40.0) | 2.613 | 0.278 |
| No | 14 (87.5) | 2 (12.5) | | |
| Unsure | 170 (78.3) | 47 (21.7) | | |
| Physician preferences | | | | |
| MPC | 24 (92.3) | 2 (7.7) | 6.517 | 0.072 |
| SPC | 2 (22.2) | 7 (77.8) | | |
| No preferences mentioned | 72 (78.3) | 20 (21.7) | | |
| Unsure | 116 (75.8) | 37 (24.2) | | |
| Duration of hypertension | | | | |
| < 1 year | 2 (33.3) | 4 (66.7) | 12.230* | 0.003* |
| 1 - 5 years | 8 (40.0) | 12 (60.0) | | |
| >5 - 10 years | 159 (83.7) | 31 (16.3) | | |
| > 10 years | 45 (70.3) | 19 (29.7) | | |

(*) = Fisher's Exact Test

**Table III: Factors associated with the use of single pill combination (SPC) of antihypertensives (N=280)**

| Variables | Odds Ratio | 95 % Confidence Interval | p-value |
|---|---|---|---|
| Age range | | | |
| 18 - < 40 years | Reference | Reference | Reference |
| 40 - < 60 years | 4.017 | 0.028 - 568.197 | 0.582 |
| > 60 years | 1.735 | 0.232 - 12.952 | 0.591 |
| Household income | | | |
| < RM4,850 | Reference | Reference | Reference |
| RM4,850 - RM10,970 | 4.563 | 0.541 - 38.457 | 0.163 |
| > RM10,970 | 8.362 | 0.921 - 75.949 | 0.059 |
| Chronic kidney disease | | | |
| No | Reference | Reference | Reference |
| Yes | 6.908 | 1.526 - 31.274 | 0.012 |
| Diabetes mellitus | | | |
| No | Reference | Reference | Reference |
| Yes | 0.145 | 0.043 - 0.493 | 0.002 |
| Physician preferences | | | |
| MPC | Reference | Reference | Reference |
| SPC | 185.883 | 4.499 - 7680.442 | 0.006 |
| No preferences mentioned | 5.837 | 0.377 - 90.322 | 0.207 |
| Not sure | 10.098 | 0.720 - 141.545 | 0.086 |
| Duration of hypertension | | | |
| < 1 year | 6.662 | 0.183 - 242.570 | 0.301 |
| 1 - 5 years | 4.059 | 0.312 - 52.845 | 0.285 |
| 6 - 10 years | 0.538 | 0.168 - 1.724 | 0.297 |
| > 10 years | Reference | Reference | Reference |

SPC therapy compared to MPC therapy ($p < 0.001$), similar with participants with chronic kidney disease ($p = 0.033$). In addition, there was a significant association between the duration of hypertension and the type of therapy. Patients with a longer duration of hypertension (>5-10 years or more) were less likely to be on SPC therapy compared to those with a shorter duration (p=0.003). These findings underscore the complexity of factors influencing medication selection in hypertension management, highlighting the importance of personalised approaches in clinical practice. In univariate analysis, factors that were found to be associated with the use of SPC were presence or absence of Diabetes Mellitus ($p<0.001$), presence or absence of chronic kidney disease (p=0.033) and duration of hypertension (p=0.003).

Variables that had a p-value of <0.25 in Table II were entered into multiple logistic regression analysis to determine the independent factors associated with SPC use. The assumptions underlying multivariable logistic regression were evaluated before model fitting. Model calibration was assessed using the Hosmer–Lemeshow goodness-of-fit test, multicollinearity was examined using variance inflation factors (VIFs), and model discrimination was evaluated using the area under the receiver operating characteristic (ROC) curve (AUC). The logistic regression model is highly reliable, accurate, and ready for use, as every diagnostic test score falls comfortably within the ideal range. The Hosmer-Lemeshow test indicates a good fit (p=0.16), the area under the ROC curve shows excellent discrimination (AUC=0.87), and the highest Variance Inflation Factor (VIF=3.2) confirms no significant multicollinearity.

Table III shows the independent factors associated with SPC use among the participants of this study. The independent factors associated with SPC use were assessed using odds ratios (OR), 95% confidence intervals (CI), and p-values. The presence of chronic kidney disease was significantly associated with the use of SPC therapy. Patients with chronic kidney disease were 6.90 times more likely to use SPC as compared to those without chronic kidney disease (95% CI: 1.526 -31.274, p=0.012). The presence of diabetes mellitus was also significantly associated with a lower likelihood of using SPC therapy. Patients with diabetes were 0.15 times less likely to use SPC therapy compared to those without diabetes (95% CI: 0.043 -0.493, p=0.002). Physician preference for SPC significantly influenced the use of SPC therapy. Participants whose physicians preferred SPC were 186.00 times more likely to use SPC therapy compared to those whose physicians preferred multiple pill combination (MPC) therapy (95% CI: 4.499 - 7680.442, p = 0.006). On checking, the goodness-of-fit assessment was good and there was no missing data.

## DISCUSSION

In this study, the prevalence of participants using SPC was 27.9% (78/280). This is much less than a similar study done among people with hypertension in China a few years earlier.[7] The difference in this finding maybe related to different demographic used and the fact that most SPC therapy used in Malysia mainly involved innovator drugs and may involve additional cost, as compared to widely available and cheaper generic drugs.

Independent factors associated with SPC use was the presence of chronic kidney disease, physician's own preference for SPC and absence of diabetes mellitus ($p<0.05$). Chronic kidney disease (CKD) was found to significantly influence therapy type in both univariate (p=0.033) and multivariate (p=0.012) analyses in this study. This finding is consistent with previous research suggesting that SPC therapy may benefit CKD patients by improving adherence and potentially enhancing blood pressure control.[8] CKD patients often manage complex

medication regimens, and simplifying antihypertensive therapy with SPCs could improve compliance and outcomes. However, other studies have shown mixed results, with some advocating for MPC therapy to better address the specific needs and complications of CKD.[9] Differences in sample size, patient demographics, or healthcare practices across studies may contribute to these varying findings.

The study found that diabetes mellitus was significantly associated with the use of MPC therapy over SPC therapy (p <0.001). This finding is supported by previous research, which suggests that diabetic patients often require more aggressive treatment regimens involving multiple antihypertensive agents due to the complex nature of diabetes.[10] This similarity in findings underscores the practice of tailoring hypertension treatment to meet the specific needs of patients with diabetes, particularly those at higher cardiovascular risk and with stricter blood pressure targets.

Patients with CKD and diabetes are strongly associated with SPC therapy due to the need to hit specific clinical targets, and efforts to reduce pill burden. Certain SPCs are formulated with lower doses of individual medications. By using two drugs at lower doses rather than one drug at a maximum dose, physicians can effectively target disease pathways (e.g., lowering blood pressure) while minimizing the adverse side effects associated with high single-drug doses.[11-12]

Physician's own preference for SPC also influence the use of SPC therapy. Research often noted physician-driven decisions were based on guidelines and patient adherence.[13] Physician preferences played a significant role, with higher recommendations for SPC usage when physicians advocated for it, emphasising their influence in treatment decisions. Despite SPC therapy's potential benefits in improving adherence and reducing pill burden, its adoption is influenced by clinical complexities and physician practices, suggesting a balanced approach to hypertension treatment. Physicians generally show a strong preference for SPC therapy due to its proven benefits in improving patient adherence to medication, reducing pill burden, and achieving better and more rapid blood pressure control.[14-17] Physician preference for SPC also may be affected by guidelines across various specialities such as endocrinology and nephrology, availability, creatine clearance and costs.[4-5] This can further be exacerbated by clinical inertia, i.e. the failure to initiate or intensify therapy when treatment goals are not being met.[18] However, the very large odds ratio for physician preference (OR 185.9; 95% CI 4.5-7680.4) remains difficult to interpret and should be acknowledged as likely reflecting sparse data or model instability rather than just representing a strong association.

## LIMITATIONS

This study had a few limitations. A limitation of this study was that this was a cross-sectional study, thereby limiting the causality relationship. While statistical methods can adjust for confounders, cross-sectional studies are limited in their ability to control for all potential confounding variables, which can influence the observed associations. Another limitation of this study was that it was conducted in a single centre and therefore limiting the external validity, generalizability and introducing possible selection bias to the wider hypertensive population. Additional limitations in this study may also include recall bias, self-report bias, residual confounding and the lack of medication adherence assessment. It is to be noted that several clinically relevant factors were included in the logistic regression model as the p-values were > 0.25. The authors acknowledge that they may be important confounding factors and may affect the conclusion of the study. Therefore, results of this study should be interpreted with caution.

Despite these limitations, this is one of the first few studies to look at data on usage of SPC therapy among people with hypertension in Malaysia and had a quite significant number of participants. Therefore, this study may still hold some value to promote the use of SPC therapy among people with hypertension and stimulate future multi-centre research into this interesting subject matter.

## CONCLUSION

This study demonstrates that the prevalence of patients using single pill therapy was 27.9% (78/280). For future research and clinical practice, this study identifies prescribing patterns and associated factors that may inform future prospective studies and help in selecting patients for SPC therapy. Future research can also recruit more centres to get a more accurate nationwide data on the prevalence of SPC therapy and associated factors. Thus, a message that can be conveyed from this study is healthcare providers should consider these factors when prescribing hypertension treatments.

## CONFLICT OF THE INTERESTS

The authors declare no conflict of interests.

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