ORIGINAL ARTICLE

# The Effect of a Workplace Wellness Program for Primary School Teachers in Controlling Blood Pressure: A Before and After Study

Sugma Agung Purbowo,[1] Muchtaruddin Mansyur,[2] Indah Suci Widyahening,[3] Retno Asti Werdhani,[3] Parlindungan Siregar,[4] Ina Susianti Timan[5] and Muhammad Faza Soelaeman[6]

[1]*Doctoral Program in Medical Science, Faculty of Medicine, Universitas Indonesia*
[2]*Department of Community Medicine, Division of Occupational Medicine, Faculty of Medicine, Universitas Indonesia*
[3]*Department of Community Medicine, Division of Family Medicine, Faculty of Medicine, Universitas Indonesia*
[4]*Department of Internal Medicine, Division of Nephrology and Hypertension, Faculty of Medicine, Universitas Indonesia*
[5]*Department of Clinical Pathology, Faculty of Medicine and Health Sciences, Universitas Kristen Krida Wacana*
[6]*Faculty of Medicine, Universitas Indonesia*

## ABSTRACT

**Background and Objective.** Hypertension is a major health issue worldwide, with primary schoolteachers possessing several lifestyle risks of the disease. There have not been any health promotion programs yet for primary schoolteachers in Indonesia, especially for blood pressure control. A school-based model of workplace wellness program for teachers was developed. It focused on using screening as feedback in controlling blood pressure by eating a healthy diet, doing physical activity, and having regular checks. This study aimed to assess its clinical and behavioral effects.

**Methods.** This trial was a one group pre- and post-test study design without control. It was implemented purposively in three public primary school locations in Jakarta to 44 eligible teachers for approximately three months from January to March 2022. The workplace wellness program included on-site screening (blood pressure, body mass index/BMI, spot urine sodium-creatinine ratio), knowledge, motivation, and ongoing health behavior (physical activity and the dietary approach to stop hypertension/DASH), online education/training, consultation/counseling sessions with a family doctor, and self-monitoring. All screening measurements were repeated at the end of the program. A paired t-test or Wilcoxon analysis was performed using SPSS 20.0.

**Results.** Both systolic and diastolic blood pressure decreased by 5.05 mmHg ($p = 0.018$) and 6.41 mmHg ($p < 0.001$), respectively. The spot urine sodium-creatinine ratio and BMI decreased slightly but not significant ($p = 0.707$; $p = 0.761$). Knowledge and motivation increased slightly but not significant ($p = 0.529$; $p = 0.175$). The DASH behavior significantly increased by 25% ($p < 0.001$). Though the overall physical activity did not change, the walking activity increased twofold significantly ($p = 0.006$). This study also showed that the outcome would be achieved when the participant followed the recommendations obediently.

**Conclusion.** This school-based workplace wellness program was found to have a potential effect on controlling blood pressure by changing health behaviors. A randomized controlled trial is recommended to provide stronger evidence on its effectiveness before doing a large-scale implementation in primary schools in Indonesia.

*Keywords: primary schoolteacher, health promotion, hypertension, exercise, DASH diet*



eISSN 2094-9278 (Online)
Published: November 29, 2024
https://doi.org/10.47895/amp.vi0.7147


Corresponding author: Sugma Agung Purbowo, MARS, SpKKLP
Faculty of Medicine
Universitas Indonesia, DKI Jakarta, Indonesia
Email: sugma.agung@ui.ac.id
ORCiD: https://orcid.org/0000-0001-8707-777X

## INTRODUCTION

Among the productive age group, one of the most affected by hypertension is teachers, especially those in primary school. Previous studies reported that hypertension among schoolteachers was even higher than the national prevalence.[1,2] It was worsened by the prevalence of prehypertension that was 2-3 times greater.[3,4] Several probable causes might underlie this number. The two studies reported that primary schoolteachers, compared to high schoolteachers, experienced higher workloads that could potentially increase their blood pressure (BP) due to teaching and caring for students at the same time.[5,6] The schoolteachers also had low levels of physical activity (PA) in the workplace.[7] Sedentary behavior was related to metabolic and cardiovascular system adverse effects.[8] Obesity, work stress, and a salty meal were other risk factors.[2,4,9] Modifications in this behavior are important to improve their health and performance at school. Moreover, primary schoolteachers are also role models for their pupils. Thus, if they improved their health behavior, it would be emulated by the students as our next generation.[10]

Workplace-based health promotion to improve a healthy lifestyle might be one of the solutions to control hypertension. A workplace-based intervention model is considered more efficient and effective as the subjects come every day for work, thus making them easily observed and assessed of their progress.[11] It would be beneficial to the companies or institutions as well as managing the health of their workers, minimizing expenditure for medical treatments and loss of work hours, and increasing productivity among workers.[8,12] Worksite wellness program, commonly known as WWP, had proven effective and efficient in controlling BP.[13] The health promotion activities in school had actually been conducted since many years ago. The program named Health Promoting School (HPS) had been developed and implemented by WHO, UNESCO, and UNICEF in many institutions since 1992.[14] Studies about the effectiveness of HPS were still rare, but it was reported that the program could help prevent communicable and non-communicable diseases.[15] Unfortunately, HPS which was also the form of WWP for teachers, still focused mainly on students.

In Indonesia, health promotion program for primary schoolteachers, especially for BP control, is not yet available. Therefore, we developed a school-based health behavior intervention model for primary schoolteachers to control their BP designed in a training module. We used the first three steps of the Medical Research Council (MRC) framework for complex interventions.[16] Firstly, we conducted a systematic review as the initial step to finding evidence of the effectiveness of WWP in controlling BP and its characteristics. We mapped and identified the elements of the model and multicomponent activities provided to employee behavior change. The supplier-input-process-outcomes-customer (SIPOC) model was used in this process.[17] The phenomenology study through focus group discussion was conducted to obtain the health promotion program experience and the expert judgment of our draft model. We sent the refined model back to obtain the expert's validation. The details of the process have not been published yet. After one year, it was finished and was then called SUGMA model. It focused on using screening as feedback for school-teachers in controlling their high BP by doing the dietary approach to stop hypertension (DASH), increasing PA, and improving patient routine visits to healthcare providers. Finally, as the third step of the MRC, this model was then tested to investigate its effect. This report mainly focuses on the effect of BP control and behavior change on trial results.

## METHODS

### Study Design

This research was a one group pre- and post-test study design without control. The sampling method was conducted purposively. The total sampling would be conducted if it met the inclusion criteria. The minimum sample size was determined according to the one-sample mean comparison test.[18] This calculation used the standard deviation and the mean difference in systolic and diastolic BP from the previous study[13] at a significance level of 0.05 and 80% power. Based on statistical counting, the sample size should be 17-32 subjects at minimum. Considering that there were 10-15 teachers per school, and prehypertension and hypertension incidence in previous studies ranged from 70-80%, it estimated that it would need 7-9 teachers as research subjects in one school. This study would need at least five primary schools.

Regarding the model, primary school's location should be close to each other in one subdistrict as a scup of work area of primary health care (PHC). We then conveniently selected three locations of ten public primary schools in the central of Jakarta which had been involved before with university's health promotion program. These were public schools, where each location generally consists of two schools. But in this study, there was one location consisting of seven schools, which were all used as research sites. Despite a total of 11 schools, only 10 were used as research sites because the number of samples was sufficient.

This program experienced many challenges considering the COVID-19 pandemic situation. Several times, the schedule of activities in the program was adjusted to accompany changes in teaching and learning activities in schools. Even though there was previously a school that refused, most other schools were open and enthusiastic about joining the program. We contacted and visited every site several times to coordinate and explain the details of the research. After getting permission, preparation was conducted prior to intervention. The research was conducted for approximately five months, with three months of intervention (January to March 2022).

A guide in the form of modules containing the competency of the intervention implementer, characteristics

of participants, methods, and materials was made to ensure they were implemented in a standardized manner. There were three modules for screening, education, and counseling activities. We then trained three teams based on these modules. They consisted of physiotherapists, nutritionists, family doctors, and sports experts. Some of them were practitioners in the health service and lecturers at medical school with more than ten years of experience. The same team, tools, and methods were implemented at the beginning and end of the study to avoid measurement bias. The instruments used had also been well-validated.

## Study Participants

This study had been approved by The Ethical Committee for Research in Humans from The Faculty of Medicine, Universitas Indonesia (KET-366/UN2.F1/ETIK/PPM.00.02/2021). All participants were informed two weeks prior to the research and were sent an informed consent form. If they agreed, they would sign and send it back to the researcher. All participants included in this study had signed the written informed consent form. Eligible participants were teachers who had not retired during the study period (less than 60 years old), had hypertension or prehypertension known through interviews or measurements at the time of screening, did not have secondary hypertension or severe illness such as heart disease, kidney failure, or stroke, and were not pregnant.

The procedure for selecting participants was carried out after the school principal and the research team provided information and an explanation of the program. Teachers were welcomed to attend the screening activity in the first week of the program. The screening officer prepared the equipment in a designated place, such as the school hall or corridor. Blood pressure and nutritional status were checked as part of the initial screening. Participants who met the criteria for prehypertension and hypertension were then interviewed to find out their willingness and commitment to join the program. Participants who agreed were further interviewed to collect health behavior data and conduct self-assessments to measure knowledge and motivation. Participants were asked to micturate to collect a urine sample. After completion, the participants were given a logbook containing activity information and a self-monitoring sheet for follow-up. Participants were also included in social media groups. The final examination as a follow-up was also carried out with the same method without screening.

## Intervention

A school-based health promotion program was developed for primary school teachers which was named SUGMA model in Indonesian language. It stood for *Penggunaan **S**krining sebagai **U**mpan balik bagi **G**uru untuk **M**onitoring meng**A**tasi tekanan darah tinggi* or the usage of screening result as feedback for primary schoolteachers to monitor their healthy behavior change to control high blood pressure. Generally, SUGMA model is a school-based health promotion program for primary schoolteachers to control their high BP by doing three behavior changes, such as do DASH diet, increase PA with exercise, and check the BP regularly. The study team which consisted of a family medicine specialist, a nutrition specialist, and a sports medicine specialist conducted the intervention, in coordination with the primary health care in the public primary schools working area. It lasted for three months which started at the beginning of the academic year period. Introducing hypertension and its risk factors, how PA, low-impact exercise, and the DASH diet could lower BP, how to lose weight safely, a healthy school environment for normal BP, and behavior change techniques were topics delivered weekly for two hours after teaching time. A counseling session was given to every participant once a month for half an hour. Participant's compliance with suggestions was monitored through filling out logbooks and reporting in the form of photos, videos, or text in social media groups, accompanied by daily reminders by counselors. It was also monitored and enhanced during individual counseling sessions.

## Outcome Measures

As part of the effect assessment, the main outcomes were systolic blood pressure (SBP) and diastolic blood pressure (DBP). The secondary outcomes included spot urine sodium-creatinine ratio, body mass index (BMI), PA (MET-min/wk), DASH score, knowledge about hypertension, and intention/motivation to engage in health behavior. We used a mercury sphygmomanometer to measure three repetitions of sitting BP. The BP was classified based on JNC7.[19] Collected spot urine sample was sent to the laboratory of national referral hospital (Cipto Mangunkusumo). Standard portable microtoises and digital weight scales (SECA 876) were used to measure BMI. The participants would be grouped by their nutrition status based on WHO standard for Asian people.[20] The participant's recent health behaviors were evaluated from the guided interview using The International Physical Activity Questionnaire (IPAQ)[21] for PA and Food Frequency Questionnaire (FFQ)[22] for DASH scoring. Knowledge and intention/motivation were identified respectively by filling yes/no and Likert scale (1 to 5) self-assessment questionnaire that was developed and adapted from previous studies (Cronbach alpha 0.51 and 0.82).[11,23] We did all measurement through screening activity in the first week of program for one week and repeated it in the 12$^{th}$ week for evaluation. During the activity, enumerators used personal protective equipment according to the classification of COVID-19 risk zones in the school area. This 3-month intervention was selected as previous studies showed blood pressure improvement after the short-term intervention.[8,24] It was also approved by experts at our previous FGD.

## Statistical Analysis

The data were analyzed using the Wilcoxon or the paired t-test to assess pre- and post-test value of blood pressure,

IMT, spot urine creatinine-sodium ratio, PA, DASH, knowledge, and intention. Additional analysis was performed by using linear regression and path-analysis to enhance the result. All data was analyzed by using SPSS 20.0. In June 2022, we analyzed all data after encoding and cleaning.

## RESULTS

### Participant's Characteristics

A total of 63 out of 93 teachers attended the screening day, and 48 met the inclusion criteria (Figure 1). However, four participants canceled due to their tight schedules. They missed further interviews to teach students. All eligible participants signed the commitment letter.

As shown in Table 1, most of the subjects were female teachers (75%), with an average age of 48.5 years. The majority of teaching scope type was classroom teacher (79.5%). Many of them were permanent employees (70.5%) with working time for 18.5 years.

The average values of SBP and DBP were slightly above normal but no hypertension yet or classified as pre-hypertension. However, when the data differed by BP status, more than 50% were in the hypertension group, including 18.2% of teachers which were on medication. The prevalence of hypertension itself was 36.5% of a total of 63 subjects measured. The majority had no treatment or even realized they suffered from hypertension.

Almost one-third of the subjects reported a family history of hypertension. The average value of BMI was slightly higher compared to the normal one. Most (61.4%)

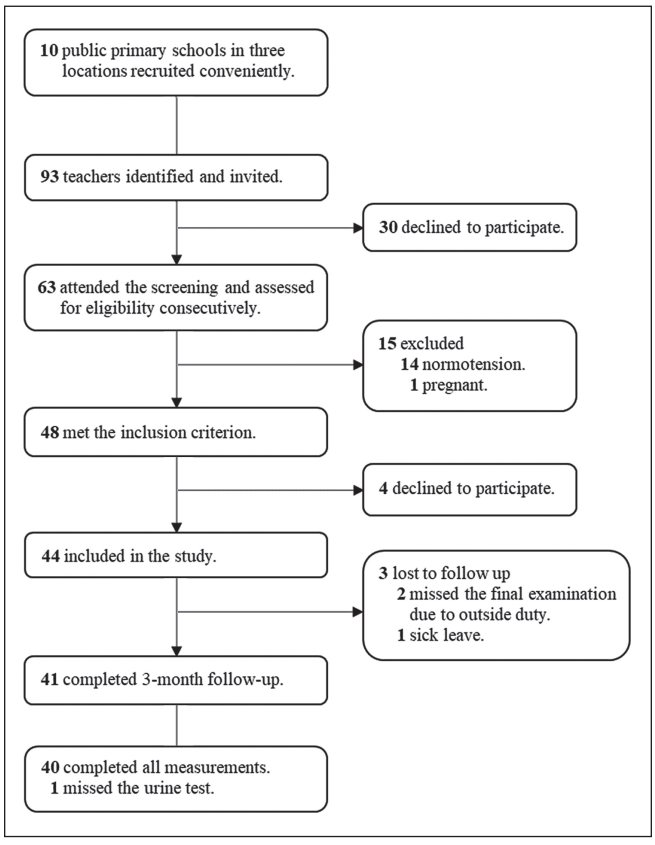


**Figure 1.** Flow diagram of participants in the WWP for primary school teacher study.

**Table 1.** Baseline Characteristics of Primary School Teachers (n = 44)

| Variable | Total (%) |
|---|---|
| ***Gender*** | |
| Male | 11 (25%) |
| Female | 33 (75%) |
| ***Age in years*** *(median, min-max)* | 48.5 (23-59) |
| ***Working years*** *(median, min-max)* | 18.5 (0.8-40) |
| ***Type of teacher based on scope*** | |
| Classroom teacher | 35 (79.5%) |
| Subject teacher | 6 (13.6%) |
| Management | 3 (6.8%) |
| ***Type of teacher based on employment status*** | |
| Permanent teacher | 31 (70.5%) |
| Contract teacher | 9 (20.5%) |
| Honorary teacher | 4 (9.1%) |
| **Blood Pressure Status** | |
| ***Mean Blood Pressure*** *(mean, SD)* | |
| Systolic (mmHg) | 124.3 (±12.5) |
| Diastolic (mmHg) | 82.4 (±10.2) |
| ***Hypertension Treatment Status,*** *n (%)* | |
| Yes | 8 (18.2%) |
| No | 36 (81.8%) |
| ***Blood Pressure Status*** | |
| Prehypertension | 21 (47.7%) |
| Hypertension | 23 (52.3%) |
| **Risk Factor** | |
| ***Hypertension history in the family*** | |
| Yes | 13 (29.5%) |
| No | 31 (70.5%) |
| ***BMI*** *(kg/m²) (mean, SD)* | 27.8 (±5.4) |
| ***Weight*** | |
| Normal | 10 (22.7%) |
| Overweight | 7 (15.9%) |
| Obese 1 | 14 (31.8%) |
| Obese 2 | 13 (29.5%) |
| ***Urine Sodium/Creatinine Ratio*** *(mean, SD)* | 12.5 (2.7-37.9) |
| ***Estimated 24-hour urinary sodium excretion*** *(mg/day) (median, min-max)* | 3,248.8 (1,712.4-5,105.7) |
| ***Average Level of Knowledge*** *(%) (mean, SD)* | 76.6 (±13.4) |
| ***Average Level of Intention/Motivation*** *(median, min-max)* | 4 (2-5) |
| ***Mean level of health behavior*** *(median, min-max)* | |
| DASH (score) | 2 (0.5-3.5) |
| Physical activity (MET-min/wk) | 1,043.7 (160-6,396) |
| Walking PA (MET-min/wk) | 198 (0-2,492) |

*BMI, body mass index; DASH, dietary approach to stop hypertension; PA, physical activity*

**Table 2.** Comparisons of Variables before and after Intervention

| Variable | Before Intervention (n = 44) | After Intervention (n = 41) | *p* value |
|---|---|---|---|
| ***Blood Pressure*** | | | |
| Systolic (mmHg) | 124.3 (±12.4) | 119.3 (±11.9) | 0.018[a]* |
| Diastolic (mmHg) | 82.4 (±10.2) | 75.9 (±9.4) | <0.001[a]* |
| ***BMI*** *(kg/m²)* | 27.4 (20.5-42.4) | 27.3 (20.7-42.7) | 0.761[b] |
| ***Spot Urine Sodium-Creatinine Ratio*** | 12.5 (2.7-37.9) | 11.5 (2.8-32.2)[c] | 0.707[b] |
| ***Knowledge*** *(%)* | 76.6 (±13.4) | 78.4 (±12.8) | 0.529[a] |
| ***Intention/Motivation*** | 4.0 (±0.8) | 4.2 (±0.8) | 0.175[a] |
| ***Health Behavior*** | | | |
| DASH (score) | 2.0 (0.5-3.5) | 2.5 (0.5-4.5) | <0.001[b]* |
| Physical Activity (MET-min/wk) | 1,043.75 (160-6,396) | 1,038.5 (33-10,878) | 0.751[b] |
| Walking PA (MET-min/wk) | 198 (0-2,492) | 429 (0-2,475) | 0.006[b]* |

*BMI, body mass index; DASH, dietary approach to stop hypertension; PA, physical activity*

*[a] paired t-test; [b] Wilcoxon; [c] n=40; * significant*

of the subjects were in the obese group (1 or 2). During urine examination, the value of the sodium/creatinine ratio was still within normal limits. However, the estimated 24-hour sodium excretion calculated according to the Tanaka[25] method yielded a high result. Teachers consumed 3,248.82 mg sodium or 8.12 g salt more than the daily Indonesia Ministry of Health (MoH) or DASH recommendation of 5 g.[18,26] It aligned with a low result of the DASH diet score. However, the average value of PA was categorized as moderate.[27] It was good but not excellent yet. Nevertheless, the knowledge before the intervention obtained quite good results with a high intention/motivation to behave in health.

## Intervention Model Effect

At the end of the third month, 41 participants attended the final examination. Having outside duty or sick leave were the reasons for the absence. Because one teacher was not able to urinate during that day, 40 participants were reported to have completed the examination (Figure 1). This number represented the amount of data to be analyzed. In this case, there was no missing data. Given that this study was one group, there was no subgroup or interaction analysis.

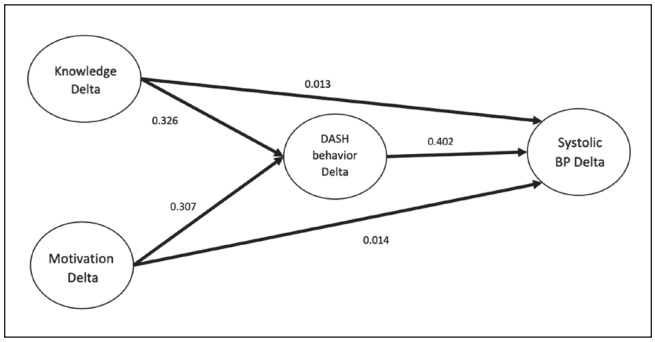


**Figure 2.** Pathway analysis of factor relationships influencing blood pressure.

*DASH, dietary approach to stop hypertension; BP, blood pressure*

*Delta is the difference between the values after and before the intervention program.*

Table 2 showed the statistically significant decrease in SBP and DBP after three months of intervention (p value < 0.05). When compared between the initial and final BP, there was a decrease of ± 5 mmHg each. In terms of nutritional status (BMI), there was a slight decrease, although not significant. Some teachers (n=23) experienced a loss of weight from 0.2 – 3.2 kg in three months. The spot urine sodium-creatinine ratio decreased slightly (8%) but not significantly. The knowledge and intention slightly increased but were also not statistically significant. In the behavior of the DASH, there was a statistically significant increase of 25%. The increase mainly occurred in the fruit and vegetable diet. While in PA behavior, there was almost no change. However, when broken down by type, there was a significant increase in walking PA ±46.56% (p<0.05). There was also a decrease in sitting time ±13.58% but not significant (p = 0.237).

In the partial analysis using linear regression, we found that in teachers who experienced a decrease in systolic BP (n = 23), the greater the decrease in it, the greater the decrease in sodium urine level (p = 0.042). It also happened in teachers who experienced a decline in DBP and the spot urine sodium-creatinine ratio (n = 15). The higher the decrease in diastolic BP, the higher the decrease in the spot urine sodium-creatinine ratio (p = 0.032). The path analysis (Figure 2) also showed that the decrease, such as systolic BP, was higher when knowledge or intention influenced DASH behavior first compared to directly. It was confirmed that when participants implemented health behavior changes as recommended, their BP improved.

# DISCUSSION

Baseline data showed that female teachers were greater than male ones. It is suited to most primary schoolteachers' characteristic in Indonesia, particularly in the Province of Jakarta.[28] They were middle-aged or pre-elderly with the

scope of work as classroom teachers. It showed that they had a higher risk of hypertension in the future. Even though sex and age were not consistent variables of hypertension risk factors but with high workload made them more vulnerable than others.[29,30] These findings were corroborated by a high prevalence of hypertension, as shown in the result part. It was even higher than the national prevalence (34.1%).[31] This risk became worse with the existence of a prehypertension group, high salt meal consumption behavior, obesity, and ignorance of regular checks or medication. However, good knowledge and intention among teachers could make this program run well optimistically. Therefore, this study was very important to carry out. The government should consider the implementation of the intervention model immediately in a greater scope.

This study showed a significant decrease in BP after the intervention. Physiologically, it might happen because of the general vasodilation mechanism during PA. The other possibility was the sodium waste increase due to a higher intake of potassium, magnesium, and calcium ingredients in fruits and vegetables.[32] These results proved the hypothesis that the intervention model can control BP in primary schoolteachers. In addition, the magnitude of the BP decrease, especially diastolic, met the expected effect size. This was similar to the previous study, which had the same design and components but a longer period and more participants.[33] It was also similar to the study with the same components and period, but a higher level of evidence designed and a larger sample.[24] The other similar study in a small workplace setting and the use of teleconference for education reported worse results.[34] Therefore, we could claim this study as an improvement on the previous one.

BMI values did not change in this study as in some previous studies.[35] Increasing the DASH diet and walking activity might not have been enough to reduce the participants' overall BMI in the intervention period. However, in the data analysis of participants who experienced weight loss, the reduction rates ranged from 0.2 – 3.23 kg. This range indicates a decrease within safe limits.[36]

Even though it was less than 10% and not significant, the intervention still had a potency to reduce the spot urine sodium-creatinine ratio. It was proven by partial analysis among participants who experienced SBP or DBP declines. Health promotion activities in the workplace have the potential to reduce salt consumption, which can be measured through urine at any time. Eating more fruits and vegetables contained high potassium, magnesium, and calcium could also decrease BP by increasing the sodium waste in urine.[32] The small change value might be due to a small sample, insufficient preparation, and unidentified participants' micturition frequency on that day. Based on a previous study, WWP would be more successful in reducing salt intake among workers if the food is provided by the company.[37] Unfortunately, at those three sites, there was no catering provided.

The estimated value of participants' salt consumption had advantages and disadvantages. The formula was not 100% accurate. It did not differ between males and females which might have different water metabolism in the body. However, the salt consumption estimation by the Tanaka method was considered more practical because the formula was the same for both genders and closer to Asians.[25] Estimates of the average salt consumption in the sample group could be known and compared with the DASH diet salt recommendation. It also could be used to count the DASH diet score instead of the 24-hour dietary food recall questionnaire. Furthermore, it could make it easier for a family doctor to explain it to a participant during a counseling session.

In this study and previous studies, knowledge increased slightly, but not significantly.[34] It might be due to the length of measurement lag between baseline and end, which could have affected participants' memory. This could be overcome by measuring before and after each educational session. However, in this study, there were several educational sessions, so it was felt that this method was less practical because it required preparation with sufficient time. This method has also been tried by providing links to pre- and post-test questions via online social media, but only a few participants accessed it. Another thing that could influence was a measurement tool developed by researchers with a low validity level. Even though the calculated r value was still greater than the r-table, the figure was still less than 0.70. In addition, in our previous systematic review, there was only one study that evaluated the knowledge with the same pattern as ours. It assumed that knowledge was not a priority to investigate.

In the intention assessment, the subject showed a high enough intention to make health changes. Intentions shaped attitudes and behaviors. The slight and insignificant increase before and after the intervention could be explained because the score was already high. Thus, the incline would not be captured in contrast. Besides that, this kind of measurement was subjective. It could change according to time and individual conditions.[11]

The intervention model in the study increased DASH dietary behavior. This was in line with previous studies which showed WWP's success in changing eating behavior.[12,33] Although the score obtained was still relatively low, there appeared to be a significant increase in potential (25%). The increase occurred mainly in fruit and vegetable consumption. Several program participants also consumed red rice which was easy to access from the markets around the school. Motivation increased with feedback to implement a healthy diet pattern. This was seen in the increasing number of teachers who sent photos of their food to online social media in the second month.

The PA showed no change. However, when viewed from the type of activity, there was a significant increase in walking PA and a decrease in sitting time (not significant). This was like previous studies which also showed that WWP could motivate participants to increase PA.[8,29] Education and

counseling encouraged participants to walk more. Apart from that, the joint gymnastic activities later held in this activity, as informant's input when we developed this model, also further increased the participants' motivation. The teachers said that they were more enthusiastic when doing sports or gymnastics together than alone. In fact, group exercise activities had been routinely performed but stopped due to the pandemic. The existence of a role model from the teacher himself/herself who demonstrated gymnastic movements further increased other participants' motivation to exercise.

### Study Limitations

The pre- and post-study design without a control group was one of this study's limitations. The design was chosen because it was the first implementation of the model. Besides that, carrying out on a smaller scope first could identify the magnitude of its effect rapidly and practically. Indirectly, the pandemic condition, especially during the middle of the program when several schools were closed due to the Omicron infection surge, affected the study results. Because most activities were online, they could continue completely. The effects obtained from this study needed further investigation to ensure that they were not caused by chance. Based on the characteristics of Indonesian teachers and the pattern of teaching schedules, we are confident that this study would yield the same results if expanded to other public primary schools in Indonesia. The issue presents a challenge, nevertheless, in private schools or other types of schools. Maybe there are different teacher characteristics and teaching patterns, so it is necessary to adjust to get the same results. It may also be important to improve the delivery method since individual characteristics such as gender and age influence health behavior.[38] The other limitation was that the PHC as its main provider had not yet taken charge of this trial. Therefore, the model should be re-tested when conducted by an after-trial-trained PHC.

## CONCLUSION

The SUGMA model showed significant effects on reducing BP both systolic and diastolic while increasing DASH and walking PA behavior. It also showed the broader impact of how health education could influence health behavior and ultimately improve health status. However, it had no significant effects on reducing BMI, spot urine sodium-creatinine ratio, and estimated 24-hour sodium excretion or improving total PA, knowledge, and intention. Further studies with a control group and more participants should be conducted to increase the evidence, precise the result, assess the real effectiveness, and monitor the consistency. Motivation can be increased by combining offline and online activities and increasing participant involvement in the program. Schedule adjustments are also needed to increase participation. This way, it will yield the same results across different school settings.

Despite the limitations, the Program has proven to be able to continue to run even during a pandemic. Therefore, we also suggest the Indonesian MoH with its PHC network in collaboration with the Ministry of Education (MoE) as the highest authority of the public primary schools to implement this program broadly and support future studies. Intensive training of trainers for PHC by utilizing their limited resources must be carried out to ensure the program is well delivered and provides the same results.

### Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

### Author Disclosure

There is no conflict of interest in this study. Universitas Indonesia only provides the funding needed and does not intervene in the results of this study, including the reporting and publication. Three researchers, MM, ISW, and RAW are lecturers of Faculty of Medicine UI.

### Funding Source

The study was funded by Universitas Indonesia.

## REFERENCES

1. Fikadu G, Lemma S. Socioeconomic status and hypertension among teachers and bankers in Addis Ababa, Ethiopia. Int J Hypertens. 2016;2016:4143962. doi: 10.1155/2016/4143962.
2. Korneliani K, Meida D. Obesity and stress related with hypertension. Public Health Journal (Bahasa). 2012;7(2):117-121.
3. Kumar SV, Laxmi ANR, Pasula S, Adepu K, Ali M. Prevalence, awareness, and control of hypertension in schoolteachers in Warangal, Andhra Pradesh, India. Int J Biol Med Res. 2013;4(2):3247-9.
4. Purbowo SA, Arya IFD, Hilfi L. Factors related to hypertension among primary and secondary schoolteachers. Indonesian Family Doctor Journal (Bahasa). 2017;3(2).
5. Yang X, Ge C, Hu B, Chi T, Wang L. Relationship between quality of life and occupational stress among teachers. Public Health. 2009 Nov;123(11):750-5. doi: 10.1016/j.puhe.2009.09.018.
6. Griffith J, Steptoe A, Cropley M. An investigation of coping strategies associated with job stress in teachers. Br J Educ Psychol. 1999 Dec; 69 (Pt 4):517-31. doi: 10.1348/000709999157879.
7. Steeves JA, Tudor-Locke C, Murphy RA, King GA, Fitzhugh EC, Harris TB. Classification of occupational activity categories using accelerometry: Nhanes 2003–2004. Int J Behav Nutr Phys Act. 2015 Jun;12:89. doi: 10.1186/s12966-015-0235-z.
8. Lin Y-P, Lin C-C, Chen M-M, Lee K-C. Short-term efficacy of a "sit less, walk more" workplace intervention on improving cardiometabolic health and work productivity in office workers. J Occup Environ Med. 2017 Mar;59(3):327-34. doi: 10.1097/JOM.0000000000000955.
9. Putri NA, Utari DM. The proportion differences of hypertension risk factors among primary schoolteachers in subdistrict Cilandak, South Jakarta, in 2013 [Script]. Jakarta: UI; 2013.
10. Nubani Husseini M, Zwas DR, Donchin M. Teacher training and engagement in health promotion mediates health behavior outcomes. Int J Environ Res Public Health. 2022 Mar 7;19(5):3128. doi: 10.3390/ijerph19053128.
11. Prestwich A, Kenworthy J, Conner M. Chapter 1 Introduction. In: Health Behavior Change Theories, Methods and Interventions. New York: Routledge; 2018. pp. 1-7.

12. Unmuessig V, Fishman PA, Vrijhoef HJM, Elissen AMJ, Grossman DC. Association of controlled and uncontrolled hypertension with workplace productivity. J Clin Hypertens. 2016 Mar;18(3):217-22. doi: 10.1111/jch.12648.
13. Khosravi AR, Rowzati M, Gharipour M, Fesharaki MG, Shirani S, Shahrokhi S, et al. Hypertension control in industrial employees: findings from SHIMSCO study. ARYA Atheroscler. 2012;7(4):191-6.
14. WHO. Making every school a health promoting school [Internet]: WHO; 2019 [cited 2020 Nov]. Available from: https://www.who.int/initiatives/making-every-school-a-health-promoting-school.
15. WHO. Health promoting schools. An effective approach to early action on non communicable disease risk factors [Internet]. In: WHO, editor. 2017. p. 1-2. [cited 2019 Oct]. Available from: https://www.who.int/publications/i/item/health-promoting-school-an-effective-approach-for-early-action-on-ncd-risk-factors
16. Campbell M, Fitzpatrick R, Haines A, Kinmonth AL, Sandercock P, Spiegelhalter D, et al. Framework for design and evaluation of complex interventions to improve health. BMJ. 2000 Sep;321(7262):694-6. doi: 10.1136/bmj.321.7262.694.
17. McCarty T, Bremer M, Daniels L, Gupta P. The six sigma black belt handbook. The McGraw-Hill Companies; 2004.
18. Chow S-C, Shao J, Wang H. Sample size calculations in clinical research. 2nd ed. Boca Raton: Chapman & Hall/CRC; 2008. pp. 50-56.
19. National Heart L and Blood Institute. JNC 7 express. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Bethesda, MD: U.S. Department of Health and Human Services; 2003. Contract No.: 03-5233.
20. Inoue S, Zimmet P, Caterson I. The asia-pacific perspective: Redefining obesity and its treatment. Australia: WHO; 2000.
21. Dharmansyah D, Budiana D. Indonesian adaptation of the International Physical Activity Questionnaire (IPAQ): Psychometric Properties. JPKI. 2021;7(2):159–63.
22. Syauqy A, Afifah DN, Purwanti R, Nissa C, Fitranti DY, Chao JC. Reproducibility and validity of a food frequency questionnaire (FFQ) developed for middle-aged and older adults in Semarang, Indonesia. Nutrients. 2021 Nov;13(11):4163. doi: 10.3390/nu13114163.
23. Murcia JAM, Gimeno EC, Camacho AM. Measuring self-determination motivation in a physical fitness setting: validation of the Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) in a Spanish sample. J Sports Med Phys Fitness. 2007 Sep;47(3):366-74.
24. Cheon O, Naufal G, Kash BA. When workplace wellness programs work: Lessons learned from a large employer in Texas. Am J Health Educ. 2020;51(1):31-9.
25. Ma W, Yin X, Zhang R, Liu F, Yang D, Fan Y, et al. Validation and assessment of three methods to estimate 24-h urinary sodium excretion from spot urine samples in high-risk elder patients of stroke from the rural areas of Shaanxi Province. Int J Environ Res Public Health. 2017 Oct;14(10):1211. doi: 10.3390/ijerph14101211.
26. Indonesia MoH. What kind of food to avoid preventing and control hypertension [Internet]. Jakarta: MoH; 2019 [cited 2019 Oct]. Available from: http://p2ptm.kemkes.go.id/infographic-p2ptm/hipertensi-penyakit-jantung-dan-pembuluh-darah/page/4/apa-sajakah-bahan-makanan-yang-harus-dihindari-untuk-mencegah-dan-mengendalikan-hipertensi
27. Pedersen MT, Blangsted AK, Andersen LL, Jørgensen MB, Hansen EA, Sjøgaard G. The effect of worksite physical activity intervention on physical capacity, health, and productivity: a 1-year randomized controlled trial. J Occup Environ Med. 2009 Jul;51(7):759-70. doi: 10.1097/JOM.0b013e3181a8663a.
28. Indonesia MoE. Data Statistics Jakarta [Internet]. Jakarta: MoE; 2018 [cited 2019 Oct]. Available from: http://statistik.data.kemdikbud.go.id/index.php/page/sd.
29. Freis ED. Age, race, sex and other indices of risk in hypertension. Am J Med. 1973 Sep;55(3):275-80. doi: 10.1016/0002-9343(73)90129-0.
30. Choudhary SB, Rao V, Suneetha S. Cardiovascular reactivity during teaching: An emerging occupational stress in schoolteachers. IJOEM. 2004 Jan-Apr;8(1):22-4.
31. Indonesia MoH Balitbangkes. National Report Basic Health Research 2018. Jakarta: Balitbangkes RI; 2018:158.
32. Kotchen TA. Hypertensive Vascular Disease. In: Harrison's Principle of Internal Medicine. US: McGraw-Hill Companies, Inc.; 2012. pp. 1611-26.
33. Goldberg L, Lockwood C, Garg B, Kuehl KS. Healthy Team Healthy U: a prospective validation of an evidence-based worksite health promotion and wellness platform. Front Public Health. 2015 Aug;3:188. doi: 10.3389/fpubh.2015.00188.
34. Allen JC, Lewis JB, Tagliaferro AR. Cost-effectiveness of health risk reduction after lifestyle education in the small workplace. Prev Chronic Dis. 2012;9:E96. doi: 10.5888/pcd9.110169.
35. Schliemann Dee, McKinley M, Woodside JV. The impact of a policy-based multicomponent nutrition pilot intervention on young adult employee's diet and health outcomes. Am J Health Promot. 2019 Mar;33(3):342-57. doi: 10.1177/0890117118784447.
36. Indonesia MoH. Tips to lose weight safely [Internet]. Jakarta: MoH; 2019 [cited 2019 Oct]. Available from: https://p2ptm.kemkes.go.id/infographic-p2ptm/obesitas/tips-menurunkan-berat-badan
37. Sakaguchi K, Takemi Y, Hayashi F, Koiwai K, Nakamura M. Effect of workplace dietary intervention on salt intake and sodium-to-potassium ratio of Japanese employees: A quasi experimental study. J Occup Health. 2021 Jan;63(1):e12288. doi: 10.1002/1348-9585.12288.
38. Prestwich A, Kenworthy J, Conner M. Chapter 7 Health Promotion Behaviors. In: Health Behavior Change Theories, Methods and Interventions. New York: Routledge; 2018. pp. 144-145.