ORIGINAL ARTICLE

Effectiveness of health education module on work safety culture in improving knowledge, attitudes and practices: a cluster randomized controlled trial among public sector administrative workers in Nigeria

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ABSTRACT

Introduction: Studies have shown that a workplace safety culture (WSC) is lacking among the general workforce in Nigeria. Poor WSC can adversely impact workers' health and high remedial costs for employers. To improve WSC, workers need to improve related knowledge, attitude, and practices (KAP) towards WSC through effective health interventional programs at the workplace. The main objective of this study is to develop, implement and evaluate the effectiveness of the Work Safety Culture Health Education Module (WSCHEM). The specific goals are to improve KAP related to office ergonomics towards WSC among public sector administrative workers in Abeokuta, Nigeria

Materials and Methods: The study was a two-armed, single-blinded cluster randomised controlled trial (CRCT) involving 247 public sector administrative workers from clusters of 20 ministries in Abeokuta, Southwestern Nigeria. The intervention group was given WSCHEM, whereas the waitlist group received a seminar on team building and leadership skills and received the WSCHEM after the intervention program ended. The evaluation was done three times using the first formal validated, self-administered Work Safety Culture Questionnaire (WSCQ) among the administrative workers: first at baseline, second at 1 month, and third at 3 months post-intervention.

Result: The results showed no statistically significant differences between groups regarding the respondents' characteristics (socio-demographic and occupational/office-related ergonomic factors) and the outcome variables KAP towards WSC at baseline. For practices towards WSC, both intervention (β 6.8, 95%CI 4.85, 8.72) and time (β 6.2, 95%CI 4.49, 7.94) significantly improved the respondents' practices towards WSC in the per-protocol analysis. In the secondary outcomes, both knowledge of WSC, intervention (β 3.5, 95%CI 2.8, 4.2) and time (β 3.4, 95%CI 2.7, 5.9); and attitudes towards WSC, intervention (β1.7, 95%CI 1.25, 2.23) and time (β 2.3, 95%CI 1.92, 2.76) significantly improved the respondents' level of knowledge and attitudes respectively towards WSC.

Conclusion: The intervention, WSCHEM, was effective in improving the administrative workers' KAP towards WSC, as demonstrated by the significance between and within-group differences.

KEYWORDS:
Administrative workers, office workers, work safety culture, health education, knowledge, attitude, and practices towards work safety culture

INTRODUCTION

Workplace safety culture (WSC) is crucial in providing a safe working environment. Workers need to be regularly reminded of its importance, and therefore an effective WSC health education program must be identified for this purpose. Based on the global worker health plan of action, the World Health Organisation (WHO) strongly encourages the education of workers, employers, primary care practitioners and professionals for occupational services, and workers' health should be integrated into the basic training for health care.[1]

Training is essential in ensuring and enhancing worker safety, including office workers. However, an effective health interventional program to assess the effectiveness of the Workplace Safety Culture Health Education Module (WSCHEM) on knowledge attitudes and its practices (KAP) among administrative (office workers) is needed to minimise the escalating medical cost of managing occupational health problems (diseases and accidents) related to the poor WSC among them.[2]

"Workplace safety culture can be construed to be manifested in shared values and meanings, and in a particular organizational structure and processes, safety policies, strategies, goals, practices, and leadership styles related to the safety management system."[3] "Workplace safety culture refers to the enduring value, priority, and commitment placed on safety by every individual and every group at every level of the organization."[4] Workplace safety culture is a part of the corporate culture of every organization. "It has been described by the phrase, how we do things around here."[5]

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Health and safety commission[6] defines "Workplace safety culture as the product of individual and group values, attitudes, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management." Workplace-related disasters such as accidents, injury, and disease result from a breakdown in an organization's policies and procedures to deal with safety. The collapse flows from inadequate attention paid to WSC to make the workplace safe for everyone. "For example, a result of the accident investigation in Chernobyl revealed many irregularities in the organizational WSC."[7] Workplace safety culture is precisely planned to minimize the rate of susceptibility to diseases/accidents/injuries or occupational health problems at the workplace

As a result of the high prevalence of occupational health problems and high economic burdens caused by poor WSC in every organisation, primary prevention strategies to address the issues are paramount. Therefore, intervention programs on knowledge, attitude, and practices KAP towards WSC are needed by all the organisations to create a safe working environment and also help to reduce the exposure of workers and the general public to occupational health problems in the workplace.[8-9]

Although WSC is more important in high-risk working environments such as the construction industries,[10] medical and health care centers,[11-12] and aviation industries.[13] Its role among office workers is also essential because of the nature of the office work. Office workers spend extended periods remaining sedentary while working, often sitting for hours in front of computers and under unfavourable ergonomic conditions.[14]

The report from ILO 2019 reported that 36 (%) of workers work excessively long hours, meaning more than 48 hours per week; the report highlighted that office workers are particularly more at risk.[15]

In Malaysia, the Department of Occupational Safety and Health (DOSH) (2016) reported occupational-related diseases among workers in the country. The report showed that the total number of occupational diseases reported increased from 13.8% in 2012 to 19.9% in 2013 and 20.4% in 2014, and finally rose to 45.9% in 2015 in the country.[16]

In Nigeria, the Nigeria Social Insurance Trust Fund (NSITF) also reported that in the first 9 months of 2016, the fatality recorded by NSITF was 38.2% compared to the entire years of 2014 (12.6%) and 2015 (34.5%). The cases were low prior to the year 2016.[17] However, another study showed that the lack of a culture of safety and inconsistency in Nigeria's health and safety laws are the major factors that contributed to increasing cases of occupational diseases and fatalities in the country.[18]

As for office workers, many physical injuries and disorders exist among them. For example, posture problems from sitting or standing too long in a static position, vision difficulties from gazing at a computer screen for prolonged periods, and musculoskeletal disorders.[19-21] To reduce these problems and instill a more positive WSC so that the work conditions and environment are safe and healthy, the workers must have high knowledge, a positive attitude and good practices towards WSC. Therefore, a workplace health education intervention would be a reasonable effort in increasing KAP towards WSC among office workers in Nigeria.

This study's main objective is to develop, implement and evaluate the effectiveness of the WSCHEM. The specific goals are to improve KAP related to office ergonomics towards WSC among public sector administrative workers in Abeokuta, Nigeria.

MATERIALS AND METHODS

The study was a two-armed, single-blinded cluster randomised controlled trial (CRCT) involving 247 public sector administrative workers (office workers) recruited from all the 20 ministries (clusters) in Abeokuta, Nigeria. The clusters in this study refer to the government ministries in the state. The respondents and the clusters were blinded, while the researcher was not. Allocation concealment was achieved by enclosing group allocation in the random sequential numbered with sealed envelopes. Blinding was done by ensuring that the respondents were unaware of the randomisation assignment during the enrolment and follow-up period. Therefore, the programs for both the intervention and waitlist groups took place concurrently during the study periods in different sites (halls).

For the intervention, the researcher delivered the WSCHEM program. As for the waitlist group, one of the senior administrative workers (director) and one of the research assistants from the Ministry of Finance delivered the seminar on team building and leadership skills. The waitlist group also received the WSCHEM after the intervention program ended and was delivered by the researcher. All the respondents were followed for 1 month and 3 months after enrollment in the study.

Participants

The study population is all administrative workers working in 20 government ministries in Abeokuta, Southwestern Nigeria. All the office workers on any leave during the data collection and intervention program period were not included.

Procedure

The CRCT was conducted in which the total number of clusters in this study was 20. A statistician who worked at the Medical Records Department of State Hospital, Abeokuta, Ogun State, Nigeria, randomised the clusters into the intervention and waitlist groups.

The ratio of the intervention group to the waitlist group applied in this study was one-to-one. The 20 clusters were listed in alphabetical order and numbered from 1 to 20, and each of these 20 clusters was given a randomly selected opaque, sealed envelope. Inside each envelope was the note that assigned the cluster to either the intervention or waitlist groups. At the end of the randomisation process, 10 clusters

were randomly allocated to the intervention group, and another 10 were allocated to the waitlist group. Figure 1 displays the flow of participants throughout the study.

The list of office workers was obtained from each cluster from the respective administration office. First, the names in the list were numbered and acted as the sampling frame; respondents were randomly selected from the list of administrative workers for each ministry using the random number generator. A total of 247 informed consent were obtained from a total of 386 eligible office workers. Baseline data collection was then carried out among the 247 respondents.

As shown in Figure 1, 20 government ministries with 460 administrative workers were assessed for eligibility before study. The administrative workers who had neither fulfilled the eligibility criteria (74) nor consented (139) to participation were excluded from the trial. There were 122 respondents in the intervention group and 125 respondents in the waitlist group who had agreed to be recruited into the study. During the follow-up period, seven respondents did not turn up from the intervention group, and eight respondents from the waitlist group were lost to follow-up for various reasons. Thus, the response rate was 94.3% for the intervention group and 93.6% for the waitlist group.

Intervention

In the first step of developing the intervention module, a situational analysis was done in terms of the relevance of WSC among the administrative workers (office workers) and the necessity for intervention. The literature review and

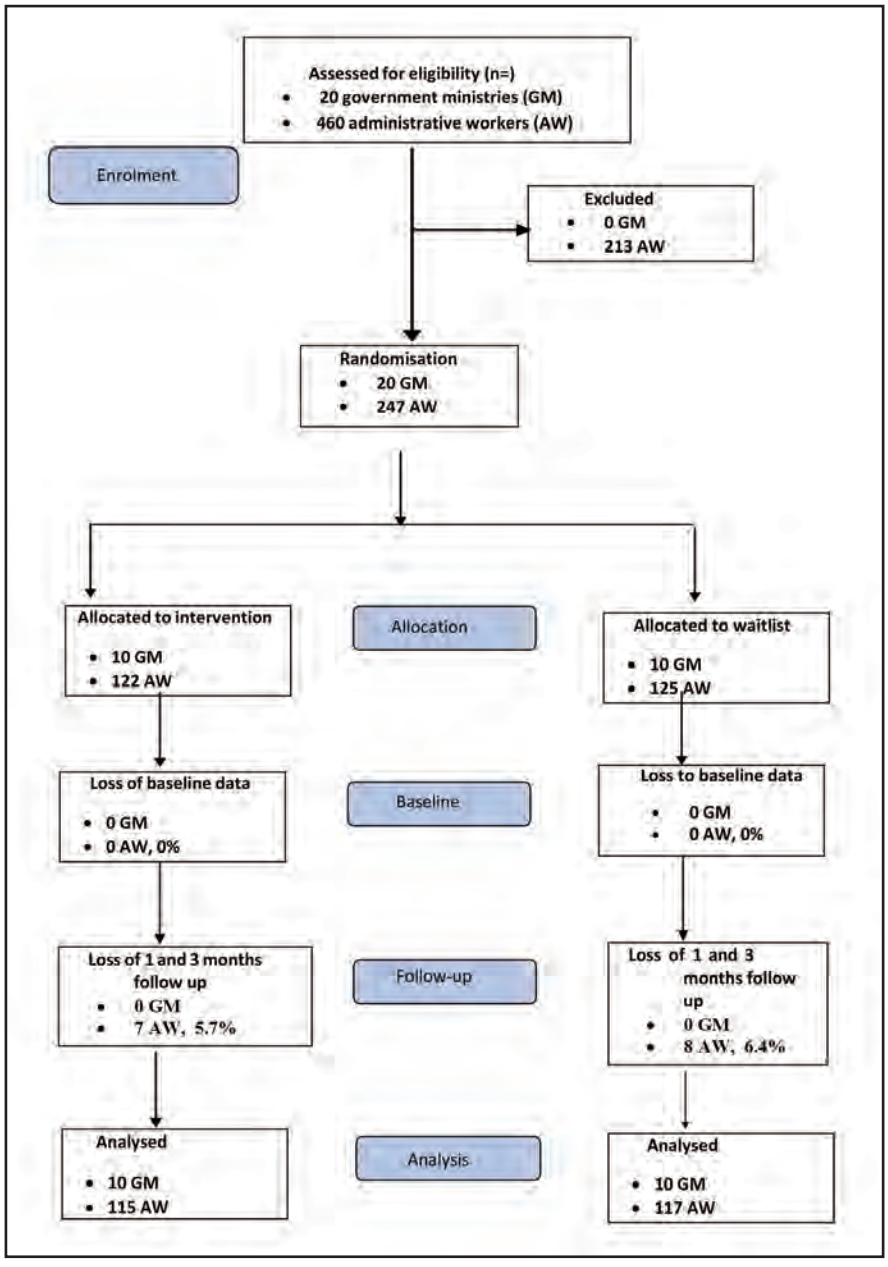

Fig. 1: Cluster randomised controlled trial flow chart.

reports showed that the prevalence of occupational health problems and exposure to occupational health risks were relatively high. Office workers' increased exposure to occupational health problems and risks and other associated adverse health outcomes were attributed to insufficient knowledge of WSC, negative attitude towards WSC, poor practices towards WSC, their work environment and other socio-demographic factors.

The findings thus indicated the need for an intervention to address the high level of exposure to occupational health problems and risks due to poor WSC among administrative workers. Accordingly, five experts from the Faculty of Medicine and Health Sciences, Department of Community Health and Occupational Safety and Health Management Office, Universiti Putra Malaysia, were invited to a meeting to express their views and recommendations on the intervention development.

In the second step, the initial draft of the intervention program module was prepared based on the first meeting with the expert panel. In the third step, the paperwork of the drafted module was presented to the expert panel at the second meeting. In the fourth step, the inputs from the expert panel were again gathered to revise and improve the intervention module. The information motivation and behavior (IMB) model was considered appropriate for the development of program module. The three constructs of the IMB model, namely information, motivation and behaviour, were incorporated into the intervention module.

The intervention program consists of three phases; in phase one, a full-day program was conducted from 9 am until 4 pm, covering a health talk presentation on KAP towards WSC using the IMB model. A health talk presentation on knowledge of WSC was delivered on three topics, definitions and importance of WSC, occupational health risks, and occupational health problems for 3 hours, which addressed the first construct of the IMB model.

The second construct of the IMB model was also discussed by giving a health talk presentation on attitude towards WSC. It covered two topics, the discussion of the attitude towards WSC and the questions and answers of the entire attitude towards WSC questions in the questionnaire for 1 hour. Then, 1 hour was scheduled for lunch break between 1 pm to 2 pm, and the final part of phase one addressed the last construct of the IMB model by giving a health talk presentation on behavioural change approaches in handling occupational health risks and problems towards WSC for 2 hours.

In the second and third phases, after completing the phase one intervention, reminders were sent to the intervention group in phone or WhatsApp messages weekly for three consecutive weeks before the 1 month follow-up data collection and weekly for seven consecutive weeks before the 3 month follow-up data collection for both the phase two and phase three respectively. These reminders served as external cues to promote their practices, reinforce the information and knowledge learned from the intervention program, and encourage them to practice skills learned from the program.

Dependent Variables

This study had three dependent variables: practices towards WSC as the primary outcome, while knowledge and attitudes towards WSC were the secondary outcomes.

Independent Variables

The independent variables were categorised into socio-demography (age, gender, education level and marital status) and occupational/office-related ergonomic factors (work duration per week, working years of experience, knowledge of office ergonomics, using a visual display terminal (VDT) filter or computer screen cover, duration of computer usage, maintaining static position and job title and physical activity).

Study Instrument

The evaluation was done three times using the first formal and locally validated, self-administered WSCQ among the administrative workers. The validation of the WSCQ confirmed high reliability and validity for the evaluation of KAP towards WSC among the study population.22-23 Therefore, the respondents' KAP towards WSC was measured using the WSCQ, first at baseline, second at 1 month, and third at 3 months post-intervention.

Data Analysis

Data obtained were analysed by using the IBM SPSS Statistics 25. Data from the respondents were analysed according to the group to which they were initially randomised. All the numerical data of the dependent and independent variables were not normally distributed, as shown in Tables I and II. Sensitivity analysis which includes per protocol and intention to treat analyses, was adopted to analyse the primary outcome of practice towards WSC in this study, as shown in Table V, and the data loss to follow-up among the respondents at post-intervention was taken into consideration in the analysis.

There were 15 cases reported in this study with a loss of follow-up; a simple imputation method known as the last observation carried forward (LOCF) method was performed in handling the missing data to include all the respondents in the secondary outcomes of knowledge and attitude towards WSC analysis as shown in Table III and IV. In addition, the Chi-square test was used for the bivariate analysis, and Generalized Estimating Equations (GEE) was adopted for the multivariate analysis because GEE is one of the standard statistical techniques used in analysing longitudinal data in clustered trials.

RESULTS

Socio-demographic Characteristics, Occupational/office-related Ergonomic Characteristics, and Outcome Variables Between Research Groups at Baseline

This study showed no significant differences between groups regarding respondents' socio-demographic factors, occupational/office-related ergonomic factors, and the outcomes studied (KAP towards WSC) at baseline. Table I and II show that the distribution and association of socio-demographic factors, occupational/office-related ergonomic factors, and the outcomes studied (KAP towards WSC) in the intervention and waitlist groups were similar at baseline.

Table I: Distribution and association of socio-demographic and occupational/office-related ergonomics characteristics between research groups at baseline

Factors	Research group					
	Intervention (N=122) n (%)	Waitlist (N=125) n (%)	median (IQR)	df	X^2	*p* value
Gender				1	1.006	0.316
Male	46 (37.7)	56 (44.8)				
Female	76 (62.3)	69 (55.2)				
Age group (years)			40.0 (11.0)	1	0.890	0.345
<40	61 (50.0)	71 (56.8)				
>40	61 (50.0)	54 (43.2)				
Educational level				1	0.001	0.977
Degree	90 (73.7)	91 (72.8)				
Others	32 (26.2)	34 (27.2)				
Marital status				1	0.416	0.519
Married	96 (78.7)	93 (74.4)				
Others	26 (21.3)	32 (25.6)				
Duration of work per week			40 (0.0)			
=40	122 (100.0)	125 (100.0)				
Service duration (year)			10 (9.0)	1	0.463	0.496
<10	66 (54.1)	74 (59.2)				
>10	56 (45.9)	51 (40.8)				
Office ergonomic course				1	0.000	1.000
Yes	34 (27.9)	34 (27.2)				
No	88 (72.1)	91 (72.8)				
Job title				1	0.000	1.000
Levels 8, 9, 10 and 12	88 (72.1)	90 (72.0)				
Levels 13, 14, 15, 16 and 17	34 (27.9)	35 (28.0)				
Hours per week work extended			11 (3.0)	1	0.089	0.765
<11	66 (54.1)	71 (56.8)				
>11	56 (45.9)	54 (43.2)				
Maintain a position for a long duration				1	0.003	0.954
Yes	97 (79.5)	98 (78.4)				
No	25 (20.5)	27 (21.6)				
Use computer for long duration				1	0.003	0.954
Yes	97 (79.5)	98 (78.4)				
No	25 (20.5)	27 (21.6)				
Use computer screen cover				1	0.095	0.757
Yes	9 (7.4)	7 (5.6)				
No	113 (92.6)	118 (94.4)				
Take a break for physical activities				1	0.150	0.699
Yes	42 (34.4)	47 (37.6)				
No	80 (65.6)	78 (62.4)				

Notes: Others for single/widow/divorced and master/PhD. Levels 8, 9, 10 and 12 are the following job titles, administrative officer grade II (level 8), administrative officer grade I (level 9), senior administrative officer (level 10) and principal administrative officer (level 12). Levels 13, 14, 15, 16 and 17 are the following job titles, assistant chief administrative officer (level 13), chief administrative officer (level 14), assistant director (level 15), deputy director (level 16) and director (level 17). Statistical test = normality test and Chi-square test, $p<0.05$.

Table II: Distribution and association of KAP towards WSC between research groups at baseline

Factors	Intervention (N=122) n (%)	Waitlist (N=125) n (%)	median (IQR)	df	X^2	*p* value
Knowledge of WSC			207 (9.0)	1	0.745	0.388
<207 (Low)	91 (74.6)	100(80.0)				
>207 (High)	31 (25.4)	25(20.0)				
Attitudes towards WSC			361 (14.0)	1	0.000	1.000
<361 (Negative)	90 (73.8)	93 (74.4)				
>361 (Positive)	32 (26.2)	32 (25.6)				
Practices towards WSC			41 (3.0)	1	0.031	0.860
<41 (Bad)	113 (92.6)	114 (91.2)				
>41 (Good)	9 (7.4)	11 (8.8)				

Statistical test = Normality test and Chi-square test, significant at $p<0.05$

Table III: Effectiveness of intervention on knowledge towards WSC, after adjusting for other factors

Variables	B	SE	Wald	Adjusted OR	95%CI	*p* value
Group						
Intervention	3.462	0.3569	94.110	1.931	2.763, 4.162	0.001*
Control[a]	-	-	-	1	-	-
Time						
3 months post intervention	3.358	0.3223	108.555	1.835	2.726, 3.989	0.001*
1 month post intervention	0.440	0.1201	13.432	1.644	0.509, 0.815	0.001*
Baseline[a]	-	-	-	1	-	-
Gender	0.074	0.2938	0.000	1.005	0.565, 1.787	0.807
Age	0.044	0.4961	0.038	0.908	0.343, 2.400	0.298
Educational level	0.061	0.5584	0.042	0.892	0.299, 2.666	0.913
Marital status	0.454	0.3681	0.550	0.761	0.370, 1.566	0.309
Service duration (year)	-0.036	0.4972	0.186	1.239	0.468, 3.284	0.523
Knowledge of office ergonomic						
No	2.136	0.5145	17.235	1.118	1.127, 3.144	0.001*
Yes[a]	-	-	-	1	-	-
Job title	-1.076	0.6424	2.021	2.492	0.708, 8.777	0.110
Hours per week work extended	0.054	0.3717	0.360	0.800	0.386, 1.658	0.545
Maintain a position for long duration	-0.076	0.3401	0.077	1.099	0.564, 2.141	0.825
Use computer for long duration	-0.076	0.3401	0.077	1.099	0.564,2.141	0.825
Take a break for physical activities						
No	1.678	0.3387	24.526	1.187	1.014, 2.341	0.001*
Yes[a]	-	-	-	1	-	-

Statistical test = GEE, S.E = standard error, CI = confidence interval, [a] reference group, * significant at p<0.05, adjusted for age, gender, educational level, marital status, service duration, attending office ergonomic course, job title, hours per week you work for an extended hour, maintaining a position for a long duration, using the computer for a prolonged duration and taking a break for physical activities.

Table IV: Effectiveness of intervention on attitude towards WSC, after adjusting for other factors

Variables	B	SE	Wald	Adjusted OR	95%CI	*p* value
Group						
Intervention	1.742	0.2503	46.446	1.175	1.251, 1.232	0.001*
Control[a]	-	-	-	1	-	-
Time						
3 months post intervention	2.343	0.2143	119.563	1.096	1.923, 2.763	0.001*
1 month post intervention	1.051	0.1366	59.173	1.350	0.783, 1.319	0.001*
Baselinea	-	-	-	1	-	-
Knowledge of office ergonomic						
No	0.827	0.3399	5.915	1.428	0.160, 1.493	0.015*
Yes[a]	-	-	-	1	-	-
Job title	0.058	0.3070	0.003	0.959	0.539, 1.797	0.858
Hours per week work extended	-0.068	0.2870	1.028	1.338	0.762, 2.348	0.293
Use computer screen cover	0.635	0.4882	1.535	0.546	0.210, 1.422	0.192
Taking a break for physical activities	0.299	0.2706	1.225	0.741	0.436,1.260	0.276

Statistical test = GEE, S.E = standard error, CI = confidence interval, [a] reference group, * significant at *p*<0.05, adjusted for attending office ergonomic course, job title, hours per week you work for an extended hour, using computer screen cover and taking a break for physical activities.

Effectiveness of Intervention on Respondents' Knowledge of WSC

GEE analysis was used to determine the intervention's effectiveness in improving the knowledge of WSC within and between groups from baseline, 1 month, and 3 months post-intervention. Four statistically significant predictors of knowledge were the intervention (*p*<0.001), the time during the intervention (1 month and 3 months post-intervention [p<0.001]), attending an office ergonomic course (*p*<0.001), and taking a break for physical activities (*p*<0.001).

Respondents who received the WSCHEM were more likely to improve their knowledge of WSC than those in the waitlist group after adjusting for the clustering effect and other factors (AOR=1.93, 95%CI 2.76 4.16), as shown in Table III.

Effectiveness of Intervention on Respondents' Attitudes of WSC

GEE analysis was used to determine the effectiveness of the intervention in improving attitudes towards WSC within and between groups from baseline, 1 month, and 3 months post-intervention. There were three statistically significant predictors of knowledge, first, the intervention (p<0.001), the time during the intervention (1 month and 3 months post-intervention (*p*<0.001)), and attending an office ergonomic course (*p*<0.001).

Respondents who received the WSCHEM were more likely to improve their attitude towards work safety culture than those in the waitlist group after adjusting for the clustering effect and other factors (AOR=1.18, 95%CI 1.25 2.23), as shown in Table IV.

Effectiveness of Intervention on Respondents' Practices of WSC

Sensitivity analysis was conducted for the primary outcome of practices towards WSC to examine the robustness of the findings through the per-protocol analysis and intention-to-treat analysis. As shown in Table V, the GEE results showed

Table V: Per-protocol/intention to treat analysis on the effectiveness of the intervention on practices towards WSC, after adjusting for other factors

Variables	B	SE	Wald	Adjusted OR	95%CI	*p* value
Group						
Intervention	6.788	0.9875	47.253	1.821	4.852, 8.723	0.001*
Control[a]	-	-	-	1	-	-
Time						
3 months post intervention	6.218	0.8798	49.924	1.702	4.493, 7.942	0.001*
1 month post intervention	-0.098	0.0798	1.501	1.103	0.943, 1.289	0.221
Baseline[a]	-	-	-	1	-	-
Interaction						
Intervention x 3 months	7.020	1.0531	44.445	1.971	4.956, 9.084	0.001*
Intervention x 1 month	7.202	1.0537	46.722	1.971	5.137, 9.268	0.001*
Intervention x baseline[a]	-	-	-	-	-	-
Waitlist x 3 months[a]	-	-	-	-	-	-
Waitlist x 1 month[a]	-	-	-	-	-	-
Waitlist x baseline[a]	-	-	-	-	-	-
Maintain a position for long duration						
No	-2.526	0.6008	17.683	12.507	3.853, 40.603	0.001*
Yes[a]	-	-	-	1	-	-
Use computer for long Duration						
No	-2.526	0.6008	17.683	12.507	3.853, 40.603	0.001*
Yes[a]	-	-	-	1	-	-
Use computer screen cover						
No	3.452	0.9125	14.309	0.832	1.663, 5.240	0.001*
Yes[a]	-	-	-	1	-	-
Take a break for physical activities						
No	2.674	0.5739	21.704	1.069	1.549, 3.798	0.001*
Yes[a]	-	-	-	1	-	-

Statistical test = GEE, S.E = standard error, CI = confidence interval, [a] reference group, * significant at $p<0.05$, adjusted for maintaining a position for a long duration, using the computer for a prolonged duration, using computer screen cover, and taking a break for physical activities.

that there were six significant predictors for practices towards WSC: the intervention ($p<0.001$), time at 3 months post-intervention ($p<0.001$), maintaining a position for a long duration ($p<0.001$), using the computer for a prolonged duration ($p<0.001$), using computer screen cover ($p<0.001$) and taking a break for physical activities ($p<0.001$).

The per-protocol analysis findings were comparable to the intention-to-treat analysis in which the respondents from the intervention group were 1.821 times more likely to improve their practices towards the work safety culture ($p<0.001$) than those in the waitlist group after adjusting for other factors.

The intention-to-treat analysis included the interaction term between the group and the time point. The results in Table V showed that the time point ($p<0.001$) at 3 months post-intervention and the interaction term of group and time point ($p<0.001$) were the significant predictors of practices towards WSC. Furthermore, the interaction showed a significant association (B = 7.020, 95%CI = 4.956, 9.084) with practices towards WSC.

DISCUSSION

Research Groups' Differences in the Respondents at Baseline

There were no significant differences between intervention and waitlist groups regarding respondents' socio-demographic characteristics and occupational/office-related ergonomics characteristics at baseline. Also, there was no significant difference between the intervention and waitlist groups in terms of the outcomes studied KAP towards WSC. The comparable findings at baseline showed that the simple randomisation process was appropriately conducted to minimise the possible covariates between groups.

Changes in Knowledge of WSC Among the Respondents

The results show that the intervention effectively increased the knowledge of WSC. Respondents in the intervention group showed a significant increase in knowledge of WSC compared to the waitlist group. This finding was similar to another study in Denmark.[24] In that study, the intervention effectively reduced short-term sickness absence due to high knowledge of WSC among respondents in the intervention group after the program (ARR 0.84 95% Cl 0.69 1.01) compared to the control group. In addition, another study in Turkey on burnout levels and job satisfaction of hospital office workers showed that intervention in the form of training effectively decreased burnout levels due to high knowledge of WSC among the respondents after the training ($p<0.05$).[25]

Another factor that had a statistically significant association with knowledge of WSC was office ergonomics knowledge. The intervention was effective to increased knowledge of office ergonomics among the respondents. This finding is similar to the study conducted in China on knowledge of WSC to assess the effect of ergonomic training on awareness of work-related musculoskeletal disorders among teachers in China.[26] After the intervention, the awareness rate improved. The study showed a significant ($p<0.05$) decrease in the

prevalence of work-related musculoskeletal disorders due to high knowledge of WSC among the respondents after the intervention. The similar study showed a decrease in the prevalence of metabolic syndrome (MetS) among those respondents who attended an office ergonomic course due to their high knowledge of WSC.[27] Attending office ergonomic courses (ORD 1.26, 95% CI: 1.02–1.56) was significantly associated with a decrease in the prevalence of MetS.

Taking a break for physical activities had a significant association with knowledge of workplace safety culture. The intervention effectively increased knowledge of physical activities to reduce occupational health risks among administrative workers. This finding is studied in similar study on knowledge of WSC regarding factors associated with physiological stress among office workers in the United States.[28] Higher physical activity at the office was significantly related to lower levels of physiological stress (B=−26.12 ms/mG; 95% CI−40.48 to −4.16) among the office workers.

Changes in Attitudes Towards WSC Among the Respondents
The intervention effectively increased the attitude towards WSC. Respondents in the intervention group showed a significant increase in attitude towards WSC compared to the waitlist group. Similar to this finding was another study by Sanaeinasab et al[29] on attitudes towards work safety intervention to determine the effectiveness of a model-based health education intervention to improve ergonomic posture, in-office computer workers. There were significant differences in the Rapid Office Strain Assessment (ROSA) between the intervention group and control group at follow-up ($p<0.05$). The mean ROSA score decreased from 5.65 (SD 1.03) to 3.95 (SD 0.83) in the intervention group, while no significant change was found in the control group.

Another factor that had a statistically significant association with a positive attitude towards WSC was knowledge of office ergonomics. Therefore, the intervention effectively increased knowledge of office ergonomics among the respondents. Another study showed similar findings; the study was on attitudes towards WSC regarding the prevalence of low back pain (LBP) among office workers in a public university in Malaysia.[30] The study showed a decrease in the prevalence of LBP due to their positive attitude towards WSC among those respondents who attended office ergonomics courses. On the other hand, LBP was high among those respondents who did not participate in the office ergonomics course (91.2%).

Changes in Practices Towards WSC Among the Respondents
In terms of the effectiveness of the intervention on practices towards WSC for the per-protocol/intention to treat analysis, respondents from the intervention group showed statistically significant improvement in the practices of good WSC compared to the waitlist group. This finding was similar to another study in Germany, Denmark, and Austria.[31] In that study, the intervention effectively improved work stress management among the intervention group (Man GO) due to their good practices towards WSC compared to the control group. In addition, the study showed a significant ($p<0.001$) improvement in work stress after the intervention. In another study conducted in Malaysia, the USA, and Iran, it was observed that the intervention effectively decreased neck, shoulders and LBP among the intervention group due to their good practices towards WSC with a significant ($p<0.05$) reduction in the neck, shoulders and LBP among the exercise group (intervention group) compared to the control group.[32]

Maintaining a position for a long duration or using the computer for a prolonged period had a significant association with practices towards WSC. The intervention effectively improved the respondents' practice towards work safety regarding the occupational risk of prolonged sitting or prolonged duration of computer usage at work that is more than 6 hours per day and without taking a break every 2 working hours. This finding is similar to the study conducted by Bawa et al[33] on practices towards WSC regarding the prevalence of LBP among middle-aged office workers in the Lebanese population. The study showed a decrease in LBP due to good practices towards WSC among the respondents who do not maintain a prolonged static position at work. The logistic regression showed that LBP was positively associated with maintaining the same posture for > 5 hours ($p=0.024$); maintaining the same posture for 5 hours or more is three times riskier of LBP (OR= 3.648, 95%CI:1.183; 11.253. Also, the study conducted by Kaliniene et al34 on practices towards WSC regarding the prevalence rates of shoulder, elbow, wrist/hand, upper and LBP among computer workers of the public sector in Lithuania. The study showed an increase in the prevalence of shoulder pain due to bad practices towards WSC among the respondents who maintain a prolonged static position when using a computer at the workplace. The duration of working with a computer was found as a significant factor for shoulder pain. The majority of the respondents estimated that they worked with a computer for more than 6 hours per day and did not have a break every 2 working hours.

This study also showed that using computer screen covers had a significant association with practices towards WSC. The intervention effectively improved the respondents' practices towards work safety culture regarding the use of computer screen covers or visual display terminals (VDT) when working with computers at work. This finding is similar to the study on practices towards WSC to assess the prevalence of computer vision syndrome (CVS) among computer office workers in Sri Lanka.[35] The study showed an increase in the prevalence of CVS due to bad practices towards WSC among the respondents who do not use computer screen covers at the workplace. Binary logistic analysis showed that not using a VDT filter (OR: 1.02; 95%CI: 1.01, 1.03) was significantly ($p<0.01$) associated with the presence of CVS. Also, a study on practices towards WSC to assess the prevalence and associated risk factors of CVS among the computer science students of an engineering college of Bengaluru in India.[36] The study showed an increase in the prevalence of CVS due to the bad practices towards WSC among the respondents who do not use computer screen covers at the workplace. Chi-square analysis showed the association between CVS and screen having glare filter was found to be statistically significant ($p<0.001$), with 91.8% of the students who do not use computer screen cover having CVS.

Taking a break for physical activities had a significant association with practices towards WSC. The intervention effectively increased the respondents' good practices in the

use of physical activities to reduce occupational health risks among the administrative workers. This finding is similar to the study done by [37] in Australia on practices towards WSC to evaluate the effects of 12 weeks of combined ergonomics and neck/shoulder strengthening exercise intervention (EET) and 12 weeks of combined ergonomics and health promotion intervention (EHP) on work ability among office workers. The intervention effectively increased the work ability among the intervention group respondents (EET) due to their good practices towards WSC. In addition, a significant group by time interaction effect at 12 weeks (p=0.03) and a near significant at 12 months (p=0.06) favoured the EET group (intervention group) in the per-protocol analysis of the neck cases with ≥70% adherence to the intervention compared to the EHP group (control group). Also, another study conducted on practices towards WSC among office workers in Canada to assess whether completing practical exercises is associated with improved well-being compared with reading information modules.[38] This study showed that office workers who preferred practical exercises over information modules had 2.22 times greater odds of reporting improved well-being from the web-based health intervention (P=.01; 95% CI 1.20-4.11).

The single blinding technique was planned but it was challenging to apply as the respondents could differentiate the module used for either intervention or waitlist group based on the respondent's information sheet received before the randomisation process. In addition, this study also limited the findings' generalisability to the administrative workers (AW) as a whole in Nigeria, as it was conducted only in one district among administrative workers from 20 ministries (clusters) at the civil service office complex in Abeokuta.

CONCLUSION

The intervention, WSCHEM, was effective in improving the administrative workers' KAP towards WSC, as demonstrated by the significance between and within-group differences. However, more time points for evaluation are recommended to check the sustainability of the desired behaviour health outcomes (KAP towards WSC).

ETHICS STATEMENT

Ethical clearance was first obtained from the Universiti Putra Malaysia Ethics Committee for Research Involving Human Subjects (JKEUPM) with reference number JKEUPM-2020-051. Then, permission to conduct the study at the study location was obtained from the head of the service, Abeokuta, Ogun State, in Nigeria.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

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