Article

The efficacy of Raspberry Pi-based automatic voice message education on knowledge level and prevention behavior of high-risk population

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Abstract

Introduction: The number of confirmed COVID-19 cases has increased in Indonesia. Preventive measures are believed to break the chain of transmission of COVID-19. Therefore, increasing knowledge through health education is essential to improve preventive behavior in the community. The study aims to determine the efficacy of implementing health education using Raspberry Pi based automatic voice massages in increasing high risk populations' knowledge and prevention behavior.

Design and Methods: This study was a quasi-interventional method with a pre-posttest research design and a non-equivalent control group, consisting of 30 respondents in each group. Control group received health education through leaflet sharing, while intervention group received health education through Raspberry-pi based automatic voice massages.

Results: This study showed that there were no significant different in knowledge between control and intervention group after obtaining health education. Meanwhile, the intervention group showed higher score in knowledge regarding COVID-19. Moreover, the prevention behavior was significantly improved in both groups after acquiring health education through leaflets and automatic voice messages.

Conclusions: Health education using Raspberry Pi based automatic voice messages improved both knowledge and preventive behavior regarding COVID 19 in high risk population.

Introduction

The incidents of COVID-19 cases is rapidly increasing as it spreads to several nations in a short period. Furthermore, on September 30, 2020, the WHO reported up to 33.5 billion confirmed cases with 1.01 billion deaths worldwide.[1] The Ministry of Health of the Republic of Indonesia reported 287,002 confirmed cases, with 10,729 deaths.[1] Based on data from the COVID-19 Task Force in Malang Regency, 899 confirmed cases were reported as of September 29, 2020, with a death toll of 59. Karangploso is the fourth-ranked sub-district based on reports on confirmed cases with 52 points and 4 deaths.[2] The majority of deaths were caused by the deterioration of health in high-risk population groups with comorbidities. Furthermore, the survey result showed that the death rate was 10%, 7.3%, 6.3%, 6%, 5.6% in patients with cardiovascular, diabetes, chronic respiratory, hypertension, cancer disease, respectively.[3]

Even though the government has attempted various efforts, such as limiting outdoor activities to prevent the virus trnasmission, the number of confirmed cases continues to increase. This is due to the lack of awareness of the Indonesian citizens towards the dangers of COVID-19 transmission[4] and the non-compliance with government recommendations.[5]

The knowledge and behavior of the community is a measure of the awareness level towards the dangers of virus transmission.[6] Consequently, it is essential to increase people's knowledge and change their non-compliance behavior towards COVID-19 prevention. In addition, knowledge plays an essential role in behavioral reflection. This fosters a sense of trust, which is then presented as the basis for the realization of decision making.[7] Promotive and preventive activities through health education improve people's understanding of COVID-19 behavior in Kepuharjo Village. Health education is a process of improving one's health status. As a result, a suitable method is needed for the proper dissemination of health information.[8]

Computers and communication technologies, with technical advancements, are powerful channels for providing public information and education. According to Dogba (2019), information and communication technology has great potential to improve education in rural areas.[9] Automatic voice message is one of the areas of information and communication technology applied in various healthcare education. The application of information technology in health education minimizes physical contact, thereby enabling educators to conduct their services without meeting face-to-face.[10] Therefore, this study aimed to investigate the efficacy of implementing health education using Raspberry Pi based automatic voice massages in increasing high risk populations' knowledge and prevention behavior.

Design and Methods

This study was a quasi-interventional design with a pre-post test and a non-equivalent control group. Furthermore, a design was used to determine the effect of health education using automatic voicemail media based on Rasberry Pi in Kepuharjo Village,

Significance for public health

This study revealed that the usage of raspberry-pi based automatic voice message improved the high-risk population's knowledge and preventive behavior in COVID-19. This study provided a new perspective in educating the community during COVID 19 pandemic era while they have to stay at home.

Malang Regency. Furthermore, the intervention and control groups were given different treatments. The control group was educated through leaflets and automatic voice messages. The population is a high-risk community in Kepuharjo Village, Karangploso District, Malang Regency. A purposive sampling technique obtained 60 respondents with details of 30 and 60 respondents in the intervention and control group, respectively.

The data collected using the COVID-19 Knowledge questionnaire instrument consists of 18 questions on the etiology, symptoms, risk groups, transmission, and prevention of the virus[11]. Furthermore, the second questionnaire is the PCIBS (Preventive COVID-19 Infection Behavior Scale), consisting of 6 question items on washing hands, avoiding touching eyes, nose, and mouth, coughing and sneezing etiquette, and keeping distance by staying at home.[12] After the translation, the questionnaires were adapted to the study conditions and tested for validity and reliability, where r > 0.338. Therefore, it was reliable, as seen from the Cronbach's Alpha score > 0.6. Furthermore, it is valid and reliable when the value of r > 0.443 and Cronbach's Alpha > 0.6 in the PCIS questionnaire.

The data were analyzed by paired t-test and Mann Whitney test with p value <0,05 considered as significant result.

Results and Discussions

Table 1 shows respondents' characteristics based on gender, age, last education, and sickness history of the intervention and control groups. Furthermore, most respondents were female, with 23 (76.6%) and 25 (83.3%) respondents in the control and intervention groups, respectively. Most respondents are adults based on age, with 19 (63.3%) and 40 (70.0%) respondents in the control and intervention group, respectively. In addition, most of the respondents were graduated from elementary school, with 18 (69.0%) and 20 (66.7%) respondents in the control and intervention group, respectively. Based on the medical history, hypertension was the most common health problem in the control and intervention group, with 19 (63.3%) in each group.

Table 2 showed that the average pre-test score of knowledge level is 13.83 lower than the average post-test score of 13.90 with a standard deviation of 1.704 knowledge level pre-test and 2.023 post-tests. Meanwhile, the average pre-test score for preventative behavior was 16.13, higher than the average post-test score of 15.37, with a standard deviation of 1525 and 2,008 for behavioral pre-test and post-test. Table 3 also showed the average pre-test score of knowledge level is 13.77 lower than the average post-test score of 14.20 with a standard deviation of 2.528 and 2.265 for pre-test and post-test, respectively. Likewise, the average pre-test score of preventive behavior was 15.63, lower than the average post-test score of 16.10 with a standard deviation of 1.829 and 2.040 for pre-test and post-test, respectively.

No difference in the level of knowledge of COVID-19 between the pre-test and post-test in the control group (p = 0.826; = 0.05) was observed in this study. In contrast, the pre-test and post-test data analysis show a difference in preventive behavior between the pre-test and post-test (p = 0.001; = 0.05). Moreover, no difference in the level of knowledge of COVID-19 between the pre-test and post-test in the intervention group (p = 0.091; = 0.05) was observed. In contrast, the analysis of the pre-test and post-test data on preventive behavior shows a difference between the pre-test and post-test (p = 0.001; = 0.05)

Table 3 showed the result of the unpaired t-test on the improvement of COVID-19 knowledge level between control and intervention groups. There was no significant difference in the level of

Table 1. Baseline characteristics.

Characteristics	Control Groups (n=30)		Interventional group (n=30)		Total	
	n	%	n	%	N	%
Sex						
Man	7	23.3%	5	16.7%	12	20.0%
Woman	23	76.6%	25	83.3%	48	80.0%
Age						
Adulthood	19	63.3%	21	70.0%	40	66.7%
Elderly	11	36.7%	9	30.0%	20	33.3%
Education						
Elementary	18	60.0%	20	66.7%	38	63.3%
Junior High School	4	13.3%	5	16.7%	9	15.0%
Senior High School	6	20.0%	4	13.3%	10	16.7%
Bachelor Degree	2	6.7%	1	3.3%	3	5.0%
Medical History						
Hypertension	19	63.3%	19	63.3%	38	63.4%
Diabetes Melitus	6	20.0%	8	26.7%	14	23.3%
Hypertension and Diabetes Melitus	3	10.0%	2	6.7%	5	8.3%
Asthma	2	6.7%	1	3.3%	3	5.0%
Total	30	100%	30	100%	60	100%

Table 2. Pre-test and posttest results in the control group.

Variable	Control Group			Intervention Group		
	Pre test	Post test	p value	Pre test	Post test	p value
Knowledge	13.83 ± 1.704	13.90 ± 2.023	0.862	13.77 ± 2.528	14.20 ± 2.265	0.091
Attitude	16.13 ± 1.525	15.37 ± 2.008	0.001	15.63 ± 1.829	16.10 ± 2.040	0.001

COVID-19 knowledge improvements between leaflets and automatic voice messages through Rasberry Pi groups ($p< 0.423$). Moreover, improvement of prevention behavior in both control and intervention groups showed significant between the groups. The intervention group had a higher preventive behavior improvement compared to that of control group ($p < 0.001$).

The result shows no significant difference in the level of knowledge about COVID-19 between the pre-test and post-test after acquiring health education using leaflet media and automatic voicemail media. Furthermore, most control and intervention group respondents were already informed on the etiology, symptoms, and transmission of COVID-19. However, most respondents still do not understand the comorbidities issue as well as virus transmission. They believe the infection could not be worsen, except for the elderly population. Previous study suggested that respondents do not know that the virus can penetrate the clothes and mask.[13] Meanwhile, 99% of Indonesian people already have good knowledge about social distancing. However, these results are not in line with that of previous study that suggested 83% of the respondents in DKI Jakarta had a good knowledge regarding the prevention of COVID-19.[14] Previous study explained that most of the acceptance of the cognitive component in the knowledge aspect is obtained from sensing the eyes and ears. In this research, the control group received health education through leaflet media, characterized by viewing.[8] Health education using leaflet media triggers respondents to view and repeat activities while imparting information.[15]

The decrease in knowledge is based on the respondent's lack of interest in reading the educational material due to rewards and punishments. Furthermore, the limitations in conducting observations also affect the increase in respondents' level of knowledge because there is no control over the activities performed.

Health education was acquired in the intervention group through an automatic voice message based on Raspberry Pi, which is an outdoor audio educational medium. The information is conveyed systematically and repeatedly to the targeted respondents to change the intervention targets' views. Furthermore, individual stimulation is increased by using audio to promote learning, listening, and remembering of health education material.[16]

The lack of knowledge after health education was due to the majority of respondents' previous high expertise and the large amount of information conveyed by the government through many educational media. Additionally, the absence of activity restrictions from respondents also breaks concentration and affects the understanding of the proposed educational material.

Knowledge of COVID-19 is also influenced by several factors, including the respondent's age and education level, since most respondents were adults. Also, age affects a respondent's mindset and grasping power, which means that age is directly proportional to development and understanding. The study results show that most of the education level is elementary school or equivalent. Previous study suggested that the level of education acquired is directly proportional to the knowledge of the receiver.[8] However, there are many sources of information other than formal education, including television, newspapers, radio, and the internet.[21-23] Consequently, low education targets do not necessarily have common knowledge. Environmental conditions such as noise and weather affect the transmission of information since health education media is performed outdoors.[25-25]

Most respondents in the control and the intervention group were good at health protocols such as washing hands, avoiding touching eyes, nose, and mouth, staying at home when not feeling well, and using masks. However, some did not comply with the cough and sneeze etiquette protocol and the rules of social distancing. This study was supported by previous study that suggested 93% of respondents show good behavior in social distancing.[13] The results are also in line with another study that showed 50.46% of respondents obeyed the rules of washing hands using soap, and 72.2% complied with the use of masks.[17] Preventive behavior is reviewed based on several components, including perceptions of vulnerability to disease, benefits for change, barriers and ability to change, motivation, environment, and knowledge.[18]

Conclusions

Health education using Raspberry Pi based automatic voice messages improved both knowledge and preventive behavior regarding COVID 19 in high-risk population.

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