

Original Article

Implementation of Interventions Using School-based Posbindu Module and Applications to Prevent the Risk of Non-communicable Diseases to High School Students in Jakarta

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Background : Non-communicable Diseases (NCDs)(PTM) are the main cause of death, accounting for 36 million (63%) of all deaths that occur worldwide. About 29 million (80%) occur in developing countries. The increasing prevalence of Non-communicable Diseases cannot be separated from the risk factors that cannot be avoided by the Indonesian people which begin to occur when they are teenagers. If teenagers never do physical activity and regulate their diet, they will be at risk of developing NCDs such as obesity and diabetes mellitus. In the present study, we aimed to identify behavioral risk factors for preventing NCDs for high school students in DKI Jakarta.

Materials and Methods : In this a quasi-experimental method with a non-equivalent control group pretest and posttest design study. The total sample is 220 students in four DKI Jakarta schools were included. The test used univariate data analysis with distribution frequency, bivariate with chi square test and multivariate with multiple logistic regression.

Results : The intervention carried out by providing modules and School-based PTM Posbindu Applications can improve Students' PTM Risk Prevention Behavior. Students' dietary attitudes have the greatest influence on Non-Communicable Disease Risk Prevention Behavior in Students, namely 1.683.

Conclusion : The results of the present study indicated the School-based Posbindu PTM Modules and Applications improve Students' Non-communicable Disease Risk Prevention Behavior. Attitudes Eating patterns, physical activity attitudes and student self-efficacy affect the risk prevention behavior of non-communicable diseases. The most dominant variable influencing the risk prevention behavior of non-communicable diseases is the attitude of students' eating patterns. The need to further develop the Posbindu that already exists in the school setting as a guide for implementing the School Posbindu to improve PTM Risk Prevention Behavior for Students.

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Key words : Interventions School-Based, Posbindu Module, Prevent Risk, Non-communicable Diseases.

Non-Communicable Diseases (NCDs) are the main cause of death for 36 million (63%) of all cases of death that occur worldwide. Around 29 million (80%) actually occur in developing countries. The increase in NCD deaths in the future is projected to continue to occur at 15% (44 million deaths)¹.

The increasing prevalence of NCDs is due to : risks that are not avoided by Indonesian society that begin to occur during adolescence. The prevalence of smoking at the age of 10-18 years is increasing every year, according to the 2013 Basic Health Research, the prevalence of smoking at the age of 10-18 years is

Editor's Comment :

- Non-communicable diseases are the major causes of morbidity & mortality in the modern world.
- Preventive strategy beginning at school level are desirable to curb the growing incidence of NCD.
- This study gives positive outcome with the school based Posbindu Module.

7.2%, and based on the report on the results of the Basic Health Research in 2018 it has increased to 9.1%. If teenagers never do physical activity they will be obese, in this condition the closest non-communicable disease can be affected is diabetes mellitus^{2,3}.

According to the results of the Global School-based Student Health Survey (GSHS) survey in 2015. It is known that the current lifestyle of adolescents is at risk for NCDs in the future. The unhealthy eating pattern is where in one day teenagers do, including eating Fast Food (53%), less consumption of Vegetables and Fruit (78.4%), Soft Drinks (28%), lack of Physical

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Activity (67.9%), Ever Smoked (22.5%) and Consumed Alcohol (4.4%)⁴.

Various efforts from the Government through the Ministry of Health have been carried out to improve Student Health Behavior by issuing policies on guidelines for fostering Clean and Healthy Living Behavior, one of which is implemented in schools. Efforts to change student behavior are a shared responsibility so cooperation from various parties is needed, therefore based on a joint decree of four ministries a school health business development team was formed with the hope that the four ministries would synergize with each other to improve the health of students^{5,6}.

As time goes by, the educational needs of students and monitoring of student health are not enough just to do conventionally so far what has been done is only to provide direct health education face-to-face, but along with high mobility, a breakthrough is needed by utilizing technological advances. The rapid development of technology can be used to assist education, increase knowledge, and disseminate information to become an alternative in the use of health promotion media. The use of smartphones is currently very widespread used by teenagers as a medium of communication and information. The survey results stated that 8.7% of adolescents were smartphone users equipped with an android system⁷.

In the process, android-based applications via smartphones can be used as a media for health promotion to assist adolescents in increasing knowledge and implementing a healthy lifestyle. So that it is expected to be a medium to prevent the occurrence of pre-diabetes among adolescents⁸. Smartphone devices can help collect, organize, store and present information. That way the smartphone is not only for communication, it can be used for cameras, games (games), social media, learning media for students⁹.

Utilization of current technological developments is very possible to develop a system that replaces the role of a health worker, seeing the growing development of Android smartphones currently allows it to be used as a health education medium, a tool for screening symptoms of NCDs and monitoring health checks for students. Smartphones besides being used as a communication tool, have also become a necessity for modern society, so they are very well known among the general public. android based is very simple and easy to carry¹⁰.

The purpose of this study was to identify behavioral risk factors for preventing NCDs for high school students in DKI Jakarta.

MATERIALS AND METHODS

This type of quantitative research uses a quasi-experimental method (quasi-experimental) with a non-equivalent control group pretest and posttest design.

Samples Selection :

The research was conducted in four schools in the DKI Jakarta area and the determination of the sample size in this study was determined by random sampling. The number of samples is 220 students in four schools in DKI Jakarta. Sampling was done by means of purposive sampling. Inclusion and exclusion criteria: The students included in the inclusion criteria in this study were : (1) students who were willing to participate in the study by signing the consent form, (2) male and female students aged 15-18 years, (3) students having android-based smartphones. (Special treatment group). The students who met one of the following exclusion criteria could not participate in this study : (1) students who did not follow all the intervention procedures, (2) students who withdrew from the study. Written consent was obtained from each student before sampling and the study was approved by the Health Research Ethics Committee of Diponegoro University of Public Health No. 556/EA/KEPK-FKM/2019.

Interventions used :

The interventions carried out were providing School Posbindu Modules to Students and Teachers in implementing Posbindu in Schools and providing Health Education with the Web-based School Posbindu Application which contains Information on School Posbindu, Information on NCDs, Education on Healthy Diets, Physical Activities, Videos on Dietary Patterns & Physical Activity, Diabetes Mellitus Risk factor test.

Statistical Analysis :

SPSS 22 version were used for statistical analysis. Chi square test was used for analysis of the mutation data and P value <0.05 and Multivariate with multiple logistic regression.

RESULTS

Analysis of Trends in Research variables based on Time and Groups :

Based on the Table 1, students' knowledge of eating patterns increased in the intervention group. The results showed that the knowledge of students' eating patterns significantly increased after being given treatment. Although at the beginning of the pretest the knowledge of the students in the control group was in a higher position, but after being given higher treatment

the intervention group experienced an increase compared to the control group.

Attitudes Students' eating patterns increased in the intervention group. The results showed that the attitude to eating patterns significantly increased after being given treatment. Although at the beginning of the pretest, the students' eating habits in the control group were in a higher position than the intervention group at the time of the pretest, but after being given treatment the intervention group experienced an increase compared to the control group.

Knowledge of students' physical activity experienced an increase in the intervention group. The results showed that the knowledge of students' physical activity significantly increased after being given treatment. At the beginning of the pretest, the knowledge of students' physical activity in the intervention group had seen an increase and it continued consistently, even in the second pretest, the increase was high.

Attitudes Students' physical activity increased in the intervention group. The results showed that the attitude of students' physical activity significantly increased after being given treatment.

At the beginning of the pretest the attitude of physical activity of students in the intervention and control groups has seen an increase, but the increase in the intervention group is higher than the control group.

Knowledge of Periodic Health Check-up increased in the intervention group. The results showed that the knowledge of Periodic Health Examination significantly increased after being given treatment. At the beginning of the pretest the knowledge of Periodic Health Examination in the control group was very high, but consistently the intervention group showed an increase in knowledge after being given treatment.

The attitude of the Periodic Health Check-up increased in the intervention group. The results showed that the attitude of the Periodic Health Examination significantly increased after being given treatment at the start of the pretest. The attitude of the Periodic Health Check-up in the control group was very high but then decreased. Different things were shown by

variable	Time	Group			
		Intervention		Control	
		mean	SD	mean	SD
Knowledge of Diet	Pretest	9.24	1,496	9.50	1,537
	Posttest 1	9.58	1,474	9.56	1,223
	Posttest 2	9.75	1,235	9.56	1,623
Attitude of Eating	Pretest	40.10	4,294	40.63	4,368
	Posttest 1	40.41	4,071	39.62	40.63
	Posttest 2	40.74	4,353	40.88	3,338
Knowledge of Physical Activity	Pretest	9.32	1,249	9.27	1,292
	Posttest 1	9.39	0,987	9.35	0,990
	Posttest 2	9.59	0,782	9.44	0,991
Physical Activity Attitude	Pretest	9.59	0,782	9.44	0,991
	Posttest 1	40.35	3,991	39.75	4,424
	Posttest 2	41.74	4,947	41.33	4,495
Knowledge Health Check	Pretest	4.40	0,859	4.65	0,724
	Posttest 1	4.45	0,944	4.38	0,938
	Posttest 2	4.55	0,774	4.47	0,875
Health check Attitude	Pretest	15.84	1,970	15.82	2,121
	Posttest 1	15.95	1,827	16.22	2,002
	Posttest 2	16.12	1,851	16.17	1,837
Student Self-efficacy	Pretest	20.64	4,194	20.89	4,301
	Posttest 1	21.18	4,454	20.72	3,989
	Posttest 2	21.37	3,790	20.06	4,248
Teacher Assistance	Pretest	1.66	1,498	1.64	1,501
	Posttest 1	1.85	1,464	1.80	1,476
	Posttest 2	2.05	1,404	1.96	1,433
Teacher Monitoring	Pretest	1.61	1,504	1.50	1,507
	Posttest 1	1.83	1,471	1.61	1,503
	Posttest 2	1.91	1,450	1.66	1,498
The Role of Youth Cadres	Pretest	1.94	1,442	1.85	1,464
	Posttest 1	2.10	1,381	1.94	1,442
	Posttest 2	2.18	1,342	2.10	1,381
PTM Prevention Behavior	Pretest	93.25	10,100	93.03	99.18
	Posttest 1	94.13	9,967	95.19	10,606
	Posttest 2	95.88	10,244	95.09	9,483

the intervention group that consistently showed improvement after being given treatment.

Students' self-efficacy increased in the intervention group. The results showed that students' self-efficacy significantly increased after being given treatment. At the beginning of the pretest the self-efficacy of students in the control group was higher but then decreased. Different things were shown by the intervention group that consistently showed improvement after being given treatment.

Teacher mentoring has increased in the intervention group. The results of the study show that mentoring Teacher significantly increased after being given treatment. Although the initial measurement of the intervention group and control group experienced an increase, but after the teacher mentoring treatment the intervention group had a higher increase than the control group.

Monitoring Teachers experienced an increase in the intervention group. The results showed that

monitoring Teacher significantly increased after being given treatment. Although the initial measurement of the intervention group and control group experienced an increase, after the monitoring intervention was carried out, Teacher the intervention group had higher improvement than the control group .

The role of adolescent cadres has increased in the intervention group. The results showed that the role of adolescent cadres significantly increased after being given treatment . Although the initial measurement of the intervention group and control group experienced an increase, after being given treatment the role of adolescent cadres in the intervention group was higher than the control group.

Behavior Risk prevention NCDs have increased . The results showed that the non-communicable disease risk prevention behavior in the intervention group significantly increased after being given treatment. Although at the initial measurement the intervention group and control group experienced an increase, after the intervention the intervention group experienced an increase in contrast to the control group it decreased.

Analysis of the relationship of independent variables on non-communicable disease risk prevention behavior

Based on the following Table 2, it can be seen that the variables that influence the Non-Communicable Disease Risk Prevention Behavior are eating patterns P value 0,001, physical activity 0,000, attitudes and students' self-efficacy 0,000.

Multivariate Analysis of the Effect of Independent Variables on Non-Communicable Disease Risk Prevention Behavior :

The results of the multivariate analysis of the influence of independent variables related to the Non-Communicable Disease Risk Prevention Behavior of Students can be seen in Table 3 . Variables of eating pattern attitude, physical activity attitude and students' self-efficacy affect the Non-Communicable Disease Risk Prevention

Table 2 — Results of Cross Tabulation Analysis and Chi Square Test of Relationship between Independent Variables and Bound Variables

Variable	PTM Risk Prevention Behavior on Student				P value
	Good		Not Good		
	f	%	f	%	
Dietary Knowledge :					
Tall	101	53.2%	89	48.8%	0.642
Low	14	46.7%	16	53.3%	
Diet Attitude :					
Positive	86	61.4	54	38.6	0.001
Negative	29	36.3	51	63.8	
Physical Activity Knowledge :					
Tall	107	51.7	100	48.3	0.687
Low	8	61.5	5	38.5	
Physical Activity Attitude :					
Positive	69	69.0	31	31.0	0.000
Negative	46	38.3	74	61.7	
Knowledge of Periodic Health Checks :					
Tall	95	52.5	86	47.5	1,000
Low	20	51.3	19	48.7	
Attitude of Periodic Health Checks :					
Positive	96	51.3	91	48.7	0.637
Negative	19	57.6	14	42.2	
Student self-efficacy :					
Good	65	82.3	14	17.7	0.000
Not enough	50	35.5	91	64.5	
Teacher assistance :					
Do	74	50.0	74	50.0	0.410
Do not do	41	56,attitude 9	31	43.1	
Teacher monitoring :					
Do	67	51.1	64	48.9	0.788
Do not do	48	53.9	41	46.1	
The role of youth cadres :					
Play a role	82	53.2	72	46.8	0.768
No role	33	50.0	33	50.0	

Remarks : *Significant at 5% alpha

Behavior in Students.

The magnitude of the influence of each variable on the Non-Communicable Disease Risk Prevention Behavior of Students can be seen in the Exp column (B). The variable that has the greatest influence on Non-Communicable Disease Risk Prevention Behavior in Students is the student's dietary attitude, which is 1,683, meaning that students who have a good eating pattern have the opportunity to have better Risk Prevention Behavior. NCDs is 2 times greater than students whose eating patterns are not good. The R2 value obtained from the regression model is 0.009, so it is known that all research variables affect Risk

Table 3 — Multivariate Analysis of the Effect of Independent Variables on Student Non-Communicable Disease Risk Prevention Behavior

Variable	B	SE	Wald	df	Sig	Exp(B)	95 %Ci for EXP (B)	
							Lower	Upper
Diet Attitude	0.252	0.3 23	0.609	1	0.435	1,683	0.683	2,426
Physical Activity Attitude	0, 255	0.290	0.774	1	0.379	0.775	0.439	1.368
Student self-efficacy	0.090	0.308	0.086	1	0.770	0.914	0.500	1,670

Prevention Behavior non-communicable disease is 0.9% and the remaining 99.1% is influenced by other variables.

DISCUSSION

The results showed that the knowledge of students' eating patterns significantly increased after being given treatment. Although at the beginning of the pretest the knowledge of the students in the control group was in a higher position, but after being given higher treatment the intervention group experienced an increase compared to the control group. Students who lack good knowledge tend to have problems with being overweight which are at risk of becoming NCDs. This is in accordance with the results of a study conducted by Dragana Milosavijevic, *et al* on high school students in Croatia regarding knowledge of eating habits showing that overweight people experience non-communicable diseases at a young age¹¹.

The students' eating habits increased in the intervention group. The results showed that the attitude to eating patterns significantly increased in the measurement after being given treatment. Although at the beginning of the pretest, the students' eating habits in the control group were in a higher position at the time of the pretest, but after being given treatment the intervention group experienced an increase compared to the control group. The attitude of students' good eating patterns can be seen from their regular breakfast habits.

This is in accordance with research conducted by Jannina Viljakainen, *et al* on a number of adolescents in Finland which states that adolescents who eat breakfast irregularly tend to experience higher body weight, as well as the results found that adolescents who eat dinner irregularly and do not often consume fruits will be overweight and at risk of non-communicable diseases such as Diabetes Mellitus¹².

The intervention that has been carried out is expected to be more effective in increasing students' knowledge of eating patterns, the existing and accessible school Posbindu application can improve attitudes and serve as a reminder for students to maintain their diet.

Knowledge of students' physical activity increased in the intervention group. The results showed that the knowledge of students' physical activity significantly increased after being given treatment. At the beginning of the pretest the knowledge of physical activity of the intervention group students had seen an increase and it lasted consistently even in the second pretest the increase was high.

Through the intervention in the form of the Posbindu School Application, it has been proven to increase students' knowledge of physical activity. In this application, students can get information easily, in addition to the above, they also get physical activity education counseling, either directly or indirectly, which was carried out during the intervention period. Even though students have a good diet, if the physical activity carried out is not optimal, it will be a risk factor for non-communicable diseases in students. As research conducted by Furong Xu on adolescents in the United States showed the results that respondents tended to consume healthier foods, but they did not pay attention to the physical activity that was carried out causing obesity in adolescents and at risk of developing NCDs such as Diabetes Mellitus¹³.

Students' physical activity increased in the intervention group. The results showed that students' physical activity attitudes significantly increased in the pretest to posttest 2 measurements. At the beginning of the pretest, students' physical activity attitudes in the intervention and control groups had seen an increase, but the increase in the intervention group was higher than the control group.

The attitude of students' physical activity can be seen from the habits they show in their daily activities, this is in accordance with research conducted by Robert G McMurray on a number of adolescents in England which states that a strong relationship with high-intensity physical activity watching TV, playing video games causes overweight in adolescents in England¹⁴.

Knowledge of Periodic Health Checkup increased in the intervention group. The results showed that the knowledge of Periodic Health Examination significantly increased after being given treatment. At the beginning of the pretest the knowledge of Periodic Health Examination in the control group was very high, but consistently the intervention group showed an increase in knowledge after being given treatment.

Periodic Health Checks on Students need to be improved considering that there are still many students with poor knowledge resulting in students not doing regular health checks. Health checks in schools need to be carried out related to the lifestyle and activities carried out by teachers and students at the school. The current trend tends to be a trend that requires students, both male and female, to have an ideal body¹⁵.

The attitude of the Periodic Health Check-up increased in the intervention group. The results showed that the attitude of the Periodic Health Examination

significantly increased after being given treatment. At the beginning of the pretest, the attitude of the Periodic Health Check-up in the control group was very high but then decreased. Different things were shown by the intervention group that consistently showed improvement after being given treatment.

The attitude of students' periodic health checks is an awareness where they feel the importance of conducting regular health checks. There is a big challenge to increase students' awareness so that they will later avoid non-communicable diseases. This is in accordance with research conducted by Tahira Sadiq, *et al* on a number of students in Rawalpindi and Islamabad which stated that medical and non-medical students are aware of the importance of regular health checks¹⁶.

Students' self-efficacy increased in the intervention group. The results showed that students' self-efficacy significantly increased after being given treatment. At the beginning of the pretest the self-efficacy of students in the control group was higher but then decreased. Different things were shown by the intervention group that consistently showed improvement after being given treatment.

Adolescents with a high level of self-efficacy will tend to have a stronger effort in implementing a healthy lifestyle when compared to adolescents who have lower self-efficacy. With good self-efficacy can support confidence and self-confidence to want to try. This can be an inherent factor and motivates oneself to perform a behavior. research conducted by Arturo Direito with the application of the Improving FITness (AIMFIT) application as a form of media that helps in making lifestyle modifications to increase physical activity in adolescents. In this study there was a significant increase in the level of self-efficacy, satisfaction, enjoyment and fitness towards use and acceptance for adolescents¹⁷.

Interventions carried out on Teacher proven to increase the role Teacher do assistance. The results of the study show that mentoring Teacher significantly increased after being given treatment. Although the initial measurement of the intervention group and control group experienced an increase, but after the teacher mentoring treatment the intervention group had a higher increase than the control group.

The results of this study are in accordance with what was done by Luran H Smith on adolescent students in Appaalchia who stated that the approach to adolescent students is an effective approach to changing the lifestyle of students in their school environment¹⁸.

Teachers have an important role in encouraging students to prevent the risk of NCDs by supervising and monitoring these students. This is in accordance with research conducted by Erin K Eliassen which states that teachers have a role not only limited to being teaching staff for students. Teachers are also responsible for being student role models in carrying out these actions, the teacher can not only admonish students for snacking carelessly, but can also invite students to sit down to eat together and discuss what proper and nutritious food to eat¹⁹.

Interventions carried out on youth cadres are proven to increase their role in helping efforts to improve health in schools. The results showed that the role of adolescent cadres significantly increased after being given treatment. Although the initial measurement of the intervention group and control group experienced an increase, after being given treatment the role of adolescent cadres in the intervention group was higher than the control group.

Based on the results of the research above, cadres must be fostered, guided, and supported by more skilled and experienced supervisors and given better training and knowledge. They should be able to know when and where to seek medical help for conditions they can not manage on their own. The training program does not only affect the knowledge but also the skills of the youth school cadre participants²⁰.

Youth cadres need to get support and motivation to carry out their roles so that efforts need to be made to increase the role of the school youth cadres. Based on Social Cognitive Theory, human behavior is influenced by personal, environmental, and behavioral factors. One of the environmental factors that influence human behavior is motivation²¹.

Behavior of risk prevention NCDs in both groups have increased. The results showed that the non-communicable disease risk prevention behavior in the intervention group significantly increased after being given treatment. Although the initial measurement of the intervention group and control group experienced an increase, after the intervention of teacher mentoring the intervention group had a higher increase than the control group which actually decreased.

Students' understanding of NCDs is obtained through knowledge and this is in line with research conducted by Gamage in Sri Lanka which found that the proportion of students aged 17-19 years who have good knowledge of NCDs is 43%¹⁰. A person's understanding is obtained through knowledge²².

The limitations of this research are that the need assessment activities and the implementation of the

intervention were carried out in schools collecting students and teachers, many experienced problems related to the time of the study during the COVID-19 period in DKI Jakarta, the number of samples determined was not representative of the area of high school in DKI Jakarta because it only involved four areas. School in DKI.

CONCLUSION

Interventions that have been carried out by providing school-based PTM Posbindu modules and Applications and School Posbindu applications can improve Students' Non-Communicable Disease Risk Prevention Behavior. Attitudes Students' eating patterns, physical activity attitudes and students' self-efficacy affect the risk prevention behavior of non-communicable diseases. The most dominant variable influencing non-communicable disease risk prevention behavior is students' eating patterns. The need to further develop the existing Posbindu in the school setting as a guide for the implementation of Posbindu in schools to improve the Non-Communicable Disease Risk Prevention Behavior of Students.

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