

# Community-based intervention of chronic disease management program in rural areas of Indonesia<sup>†</sup>



Original Article

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**Abstract:** **Objective:** This study evaluates the community-based intervention of chronic disease management (CDM) through the Integrated Non-Communicable Diseases Health Post (Posbindu-NCD) conducted by a community of health workers (CHWs) in Indonesia's rural areas.

**Methods:** A cohort retrospective study evaluated 577 participants from Posbindu-NCD in 7 public health centers (PHCs) in 2019. Activities of intervention of CDM for Posbindu-NCD was included, identified risk factors to NCDs, and provided counselling education and other follow-ups based on interviews and measurement results from the five Desk systems that recorded in a medical record as a form of the monthly activity report each the first month, the 6 months, and the 12th month.

**Results:** There were statistically significant differences for alcohol consumed and diabetes mellitus ( $\chi^2 = 10.455$ ;  $P = 0.001$ ). There were significant differences on gender ( $\chi^2 = 3.963$ ;  $P = 0.047$ ), on ethnicity ( $\chi^2 = 19.873$ ;  $P < 0.001$ ), and hypertension. In addition, there were also significant differences on ethnicity ( $\chi^2 = 15.307$ ;  $P < 0.001$ ), vegetable consumption ( $\chi^2 = 4.435$ ;  $P = 0.035$ ), physical exercise ( $\chi^2 = 6.328$ ;  $P = 0.012$ ), and the current diseases of hypercholesterolemia of participants. Furthermore, the survival rate among patients who have overweight, abdominal overweight, hypertension, diabetes mellitus, and hypercholesterolemia increased among participants who regularly visited Posbindu-NCD compared with the non-regularly one.

**Conclusions:** The CDM program's community-based intervention through Posbindu-NCD conducted by CHWs improved survival rates in Indonesia's rural areas. Therefore, this program can be further developed in conducting CDM in the community with the active involvement of CHWs so that the community becomes active regularly in participating in Posbindu-NCD activities in rural areas of Indonesia.

**Keywords:** chronic disease management • community-based intervention • community health worker • non-communicable disease

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## 1. Introduction

Chronic disease (CD) is the leading cause of death and disability in the world. CD cases increased globally from all socio-economic classes and made up 73% of all deaths, 60% of the global disease burden, and 79% of deaths in developing countries.<sup>1</sup> Meanwhile, CDs are increasing in Indonesia, such as 10.9% of people experiencing strokes, 2% diabetes, 1.5% heart diseases, and 8.8% hypertension.<sup>2</sup> Indonesia has been aware that CD is becoming one of the health issues and cause of death, causing major global threats to Indonesia's economic development.<sup>3</sup> Therefore, intervention to prevent CD should focus on controlling key risk factors in a well-integrated manner.<sup>1</sup>

CD is linked by common and preventable biological risk factors, notably high blood pressure, high blood cholesterol and overweight, and related major behavioral risk factors: unhealthy diet, physical inactivity, and tobacco use.<sup>1</sup> Therefore, developing an integrated approach that will control and prevent these factors should be implemented in a particularly community-based intervention program for primary care.<sup>4</sup> Primary care and community care are vital settings for CD's effective management.<sup>5</sup> A self-management support program effectively prevents CD in primary care.<sup>6</sup> Meanwhile, a self-help group as social support was designed to solve CD in Indonesia's rural areas.<sup>7</sup> Furthermore, CD's risk factors in Indonesia are controlled by empowering the community through the Integrated Non-Communicable Diseases Health Post (Posbindu-NCD). The Posbindu-NCD operated by a community of health workers (CHWs) as cadres monitors and controls the CD each month.<sup>8</sup>

A previous study mentioned that effective integration of CHWs within the primary care system is essential for CHW's capacity buildings, necessary supervisory arrangements, supply of logistics and medications, and effective recording and reporting systems for prevention and control of NCDs in Nepal.<sup>9</sup> Meanwhile, Posbindu cadres' performance in the Indonesian setting has a strategic function for delivering CD's management because Posbindu agendas depend on cadres' role in carrying out their duties and obligations.<sup>8</sup> On the other hand, it is possible to implement an intervention integrating CD prevention and management services into primary care settings as a community-based intervention program.<sup>10</sup>

Therefore, this study aims to evaluate community-based intervention of CD management programs conducted by CHWs in Indonesia's rural areas.

## 2. Methods

### 2.1. Design

A cohort retrospective study was used to evaluate the data from the community-based intervention for CD management program in 7 public health centers (PHCs) in 7 of rural sub-districts of Indonesia in 2019.

### 2.2. Participant of this study

Participants in this study were Posbindu-NCD participants who carried out regular monthly checks from January to December 2019 in 7 PHCs in 7 of rural sub-districts of Indonesia. The inclusion criteria in this study were follows: (1) Posbindu-NCD participants aged more than 18 years; (2) participants participating in a community-based intervention of CD management every month, either coming directly to Posbindu-NCD or having an examination at home; (3) participants with complete registration data for risk factor examination and measurement of the Posbindu-NCD card. The study exclusion criteria included participants who were hospitalized and moved to their residence.

A total of 770 medical records registered in Posbindu-NCD during 2019 were selected: 193 medical records were excluded in this study (103 not regularly participated in Posbindu-NCD each month, 40 participants were not at home during home visit, 15 moved to other sub-districts, 20 were sick and being cared for at the hospital, and 15 were dead). Finally, 577 medical records were analyzed in this study.

### 2.3. Description of the program

Community-based intervention for CD management program in Indonesia's rural areas in this study was integrated to Posbindu-NCD. Posbindu is one of the public health efforts oriented toward promotive and preventive efforts in controlling NCD by involving the community, starting from planning, implementing, and monitoring and assessment. The community that is involved in the Posbindu-NCD program is CHWs. The CHWs are an agent of change and a resource that drives Posbindu as a community-based intervention for the CD management program, organized according to the community's capacities and needs.<sup>11</sup>

Posbindu-NCD is a regular monthly health promotion program in the community. This program is held by CHWs to monitor non-communicable diseases in the community. Program activities are implemented through

a five-desk system. Each of the 5 desks are explained as follows: Desk I: carried out data registration and recording. Desk II: performed interviews related to risk factors leading to NCDs. Desk III: carried out measurements of height, weight, body mass index (BMI), and abdominal circumference. Desk: IV measures blood pressure, blood sugar levels, and total cholesterol. Desk: V provided counselling education and other follow-ups based on interviews and measurement results from the previous table. For Posbindu-NCS participants who did not come on the day of the activity, a home visit was carried out to take measurements of each of the indicators above by CHWs.

#### 2.4. Measurement of program and outcome

All measurement results of the five table system activities at Posbindu-NCD are recorded in a medical record as a form of the monthly activity report each at the first month, the sixth month, and the 12th month. The measurement data were recorded in the registration list by the cadre. The measurement data consisted of participant characteristic data, current disease history, lifestyle, and participants' specific health indicator measurements.

The characteristics of participants included were age (18–64 years vs more than 64 years), gender (male vs female), and ethnicity (Jawa or Madura). Current disease history was recorded regarding diabetes mellitus, hypertension, and hypercholesterolemia. The lifestyle-related diseases were interviewed regarding smoking, consuming vegetables, regular physical exercise, and alcohol consumption. Meanwhile, participants' specific health indicator measurements included height, weight, abdominal circumferences, blood pressure, blood sugar levels, and total cholesterol.

The height and weight were measured using a stadiometer and digital weight measurement device to calculate BMI, respectively ( $>25$  kg/m<sup>2</sup>, 23–25 kg/m<sup>2</sup>, and 18.5–22.9 kg/m<sup>2</sup>). Abdominal circumferences were measured using midline (male  $\geq 90$  cm, female  $\geq 80$  cm; male  $< 90$  cm, female  $< 80$  cm). Blood pressure was recorded using a sphygmomanometer (blood pressure  $\geq 140/90$  mmHg; 130–139/80–89 mmHg; 80–144 mg/dL). The blood sugar level was measured using a capillary glucometer ( $>200$  mg/dL, 145–199 mg/dL, and 80–144 mg/dL). Total cholesterol was measured using a portable lipid test ( $\geq 190$  mg/dL, 150–189 mg/dL, and  $<150$  mg/dL). We categorized participants into two groups for regularly visiting Posbindu-NCD during 12 months (regularly visiting for more than 9 months; visiting less than 8 months).

#### 2.5. Statistical analyses

Analysis of the data was performed using SPSS, version 22. The categorical data were presented in numbers and percentages. The statistical significance level was set to  $P < 0.05$ . A Chi-square test was used to measure the difference between participants' characteristics, lifestyle, and current diseases history. It is also used to measure the difference between participants' specific health indicators (BMI, abdominal circumferences, blood pressure, blood sugar levels, and total cholesterol level) among patients who visit and do not visit to guide community health centers during 1-month, 6-month, and 12-month periods.

Furthermore, the Kaplan-Meier test is conducted to predict a patient's survival rate who regularly visits Posbindu-NCD of guiding by CHWs. It also predicts the survival rate for patients who have the characteristics who visit regularly and who do not visit regularly to Posbindu-NCD: overweight, abdominal overweight, hypertension, diabetes mellitus, and hypercholesterolemia.

### 3. Results

Table 1 showed that there were statistically significant differences between participants who consumed alcohol and who had diabetes mellitus ( $\chi^2 = 10.455$ ;  $P = 0.001$ ). There were significant differences based on gender ( $\chi^2 = 3.963$ ;  $P = 0.047$ ), ethnicity ( $\chi^2 = 19.873$ ;  $P < 0.001$ ), and hypertension. In addition, there were also significant differences on ethnicity ( $\chi^2 = 15.307$ ;  $P < 0.001$ ), vegetable consumption ( $\chi^2 = 4.435$ ;  $P = 0.035$ ), physical exercise ( $\chi^2 = 6.328$ ;  $P = 0.012$ ), and the current diseases of hypercholesterolemia of participants.

Table 2 shows the significant difference in blood glucose level and total cholesterol of participants who visit and do not visit Posbindu-NCD of guiding CHWs during 1-month, 6-month, and 12-month periods ( $P < 0.05$ ). There was a decrease in the glucose blood level and total cholesterol level of participants who regularly visited Posbindu-NCD of guiding CHWs during 1-month, 6-month, and 12-month periods.

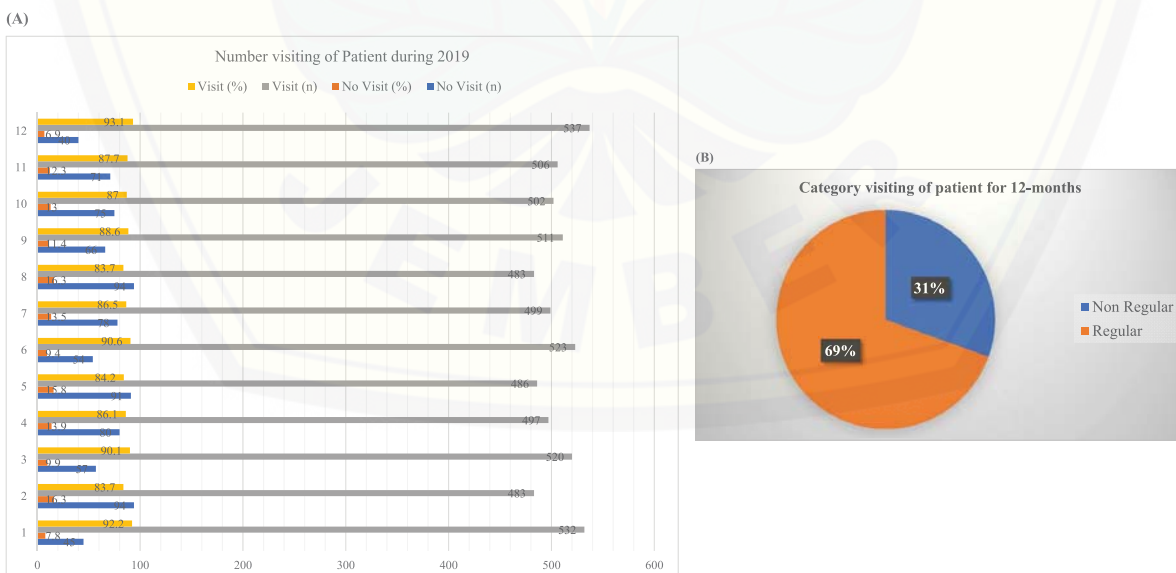
Figure 1A showed the number of participants visiting Posbindu-NCD per month during 2019. Figure 1B showed that 577 patients visited Posbindu-NCD regularly (69%) and the rest of them not regularly (31%).

The survival rate was significantly different among participants who regularly and non-regularly visited Posbindu-NCD (Figure 2) who were overweight, who had abdominal overweight, and who had hypertension, diabetes mellitus, and hypercholesterolemia. The survival rate of participants who are overweight who regularly visited Posbindu-NCD ranged from 0.4 to 1.0 (Figure 2A). The survival rate of participants regularly visited Posbindu-NCD

Variables	Diabetes mellitus			Hypertension			Hypercholesterolemia		
	Yes	No	$\chi^2$ (P)	Yes	No	$\chi^2$ (P)	Yes	No	$\chi^2$ (P)
<i>Gender</i>									
Male	14 (23.4)	131 (25.3)	0.011	33 (19.3)	112 (27.6)	3.963	11 (22.9)	134 (25.3)	0.038
Female	45 (76.3)	387 (22.7)	0.918	138 (80.7)	294 (72.4)	<b>0.047</b>	37 (77.1)	395 (74.7)	0.845
<i>Age (year)</i>									
18-64	35 (59.3)	341 (65.8)	0.722	115 (67.3)	261 (64.3)	0.345	34 (70.8)	342 (64.7)	0.494
>64	24 (40.7)	177 (34.2)	0.395	56 (32.7)	145 (35.7)	0.557	14 (29.2)	187 (35.2)	0.482
<i>Ethnicity</i>									
Jawa	47 (79.7)	299 (57.7)	9.725	127 (74.3)	219 (53.9)	19.873	42 (87.5)	304 (57.5)	15.307
Madura	12 (20.3)	219 (42.3)	0.002	44 (25.7)	187 (46.1)	<b>&lt;0.001</b>	6 (12.5)	225 (42.5)	<b>&lt;0.001</b>
<i>Smoking habit</i>									
Yes	7 (11.9)	34 (6.6)	1.523	11 (6.4)	30 (7.4)	0.053	7 (14.6)	34 (6.4)	4.435
No	52 (88.1)	484 (93.4)	0.217	160 (93.6)	376 (92.6)	0.817	41 (85.4)	495 (93.6)	<b>0.035</b>
<i>Vegetable consumption</i>									
Yes	23 (39.0)	158 (30.5)	1.398	50 (29.2)	131 (32.3)	0.381	16 (33.3)	165 (31.2)	0.021
No	36 (61.0)	360 (69.5)	0.237	121 (70.8)	275 (67.7)	0.537	32 (66.7)	364 (68.8)	0.886
<i>Physical exercise</i>									
Yes	20 (33.9)	127 (24.5)	1.986	41 (24.0)	106 (26.1)	0.187	20 (41.7)	127 (24.0)	6.328
No	39 (66.1)	391 (75.5)	0.159	130 (76.0)	300 (73.9)	0.666	28 (58.3)	402 (76.0)	<b>0.012</b>
<i>Alcohol consumption</i>									
Yes	6 (10.2)	10 (1.9)	10.455	2 (1.2)	14 (3.4)	1.549	1 (2.1)	15 (2.8)	0.000
No	53 (89.8)	508 (98.1)	<b>0.001</b>	169 (98.8)	392 (96.6)	0.213	47 (97.9)	514 (97.2)	1.000

Note: P = significant of P-value. Significant finding in bold. Significant finding determined using Chi-square.

**Table 1.** Characteristics of participants correlatation with diabetes mellitus, hypertension, and hypercholesterolemia among patients who visit Posbindu-NCD (n = 577).



**Figure 1.** (A) Number of participants visiting during 2019 to Posbindu-NCD (n = 577). (B) Category visiting of patient for 12 months to Posbindu-NCD (n = 577).

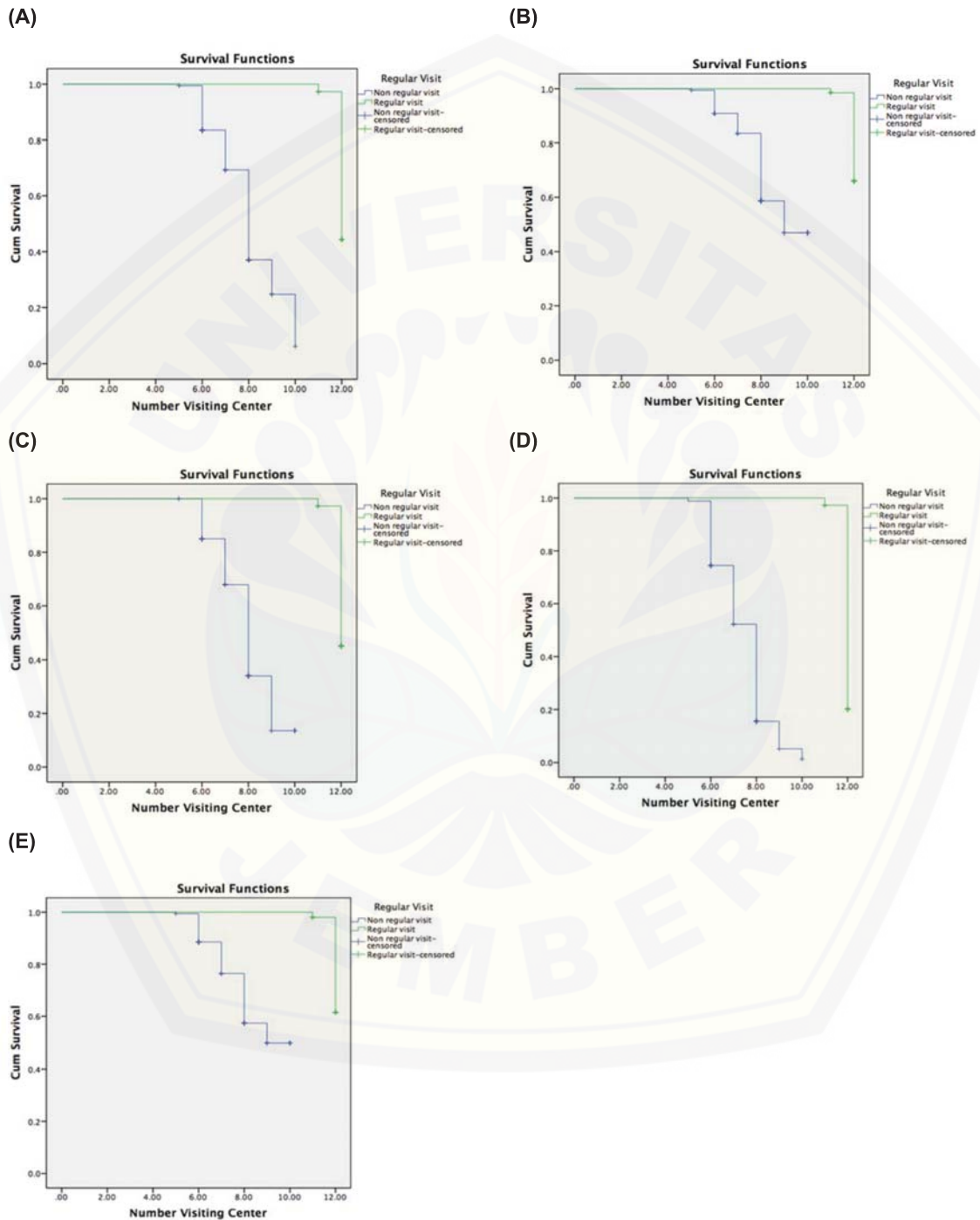
Variables	1-Month			6-Month			12-Month		
	Total, n (%)	No, n (%)	Yes, n (%)	Total, n (%)	No, n (%)	Yes, n (%)	Total, n (%)	No, n (%)	Yes, n (%)
<b>BMI</b>									
>25 kg/m <sup>2</sup>	148 (25.6)	15 (33.3)	133 (25.0)	158 (27.4)	23 (40.4)	135 (26.0)	156 (27.0)	24 (25.5)	132 (27.3)
23–25 kg/m <sup>2</sup>	160 (27.7)	9 (20.0)	151 (28.4)	147 (25.5)	10 (17.5)	137 (26.3)	147 (25.5)	22 (23.4)	125 (25.9)
18.5–22.9 kg/m <sup>2</sup>	269 (46.6)	21 (46.7)	248 (46.6)	272 (47.1)	24 (42.1)	248 (47.7)	274 (47.5)	48 (51.1)	226 (46.8)
<b>Abdominal circumferences</b>									
Male ≥90 cm	185 (32.1)	31 (33.0)	154 (31.9)	205 (35.5)	14 (25.9)	191 (36.5)	181 (31.4)	17 (29.8)	164 (31.5)
Male <90 cm	392 (67.9)	63 (67.0)	329 (68.1)	372 (64.5)	40 (74.1)	332 (63.5)	396 (68.6)	40 (70.2)	356 (68.5)
<b>Blood pressure</b>									
≥140/90 mmHg	215 (37.3)	20 (44.4)	195 (36.7)	211 (36.6)	29 (36.3)	182 (36.6)	221 (38.3)	27 (50.0)	194 (37.1)
130–139/80–89 mmHg	163 (28.2)	13 (28.9)	150 (28.2)	85 (14.7)	7 (8.8)	78 (15.7)	68 (11.8)	5 (9.3)	63 (12.0)
<130/90 mmHg	199 (34.5)	12 (26.7)	187 (35.2)	281 (48.7)	44 (55.0)	237 (47.7)	288 (49.9)	22 (40.7)	266 (50.9)
<b>Blood glucose</b>									
>200 mg/dL	152 (26.3)	19 (23.8)	133 (26.8)	154 (26.7)	15 (16.5)	139 (28.6)	146 (25.3)	28 (42.4)	118 (23.1)
145–199 mg/dL	301 (52.2)	44 (50.0)	257 (51.7)	261 (45.2)	50 (54.9)	211 (43.4)	236 (40.9)	25 (37.9)	211 (41.3)
80–144 mg/dL	124 (21.5)	17 (21.3)	107 (21.5)	162 (28.1)	26 (28.6)	136 (28.0)	195 (33.8)	13 (19.7)	182 (35.6)
<b>Cholesterol</b>									
≥190mg/dL	90 (15.6)	12 (26.7)	78 (14.7)	59 (10.2)	4 (5.1)	55 (11.0)	31 (5.4)	0	31 (5.9)
150–189 mg/dL	258 (44.7)	19 (42.2)	239 (44.9)	195 (33.8)	22 (28.2)	173 (34.7)	214 (37.1)	18 (33.3)	196 (37.5)
<150 mg/dL	229 (39.7)	14 (31.1)	215 (40.4)	323 (56.0)	52 (66.7)	271 (54.3)	332 (57.5)	36 (66.7)	296 (56.6)

Note: P = significant P-value. Significant finding in bold. Significant finding determined using Chi-square. BMI, body mass index; LR, likelihood ratio.

**Table 2.** The differences in BMI, abdominal circumferences, blood pressure, blood glucose, and cholesterol among patients who visited and do not visited Posbindu-NCD of guiding of CHWs during 1-month, 6-month, and 12-month periods (n = 577).

who had abdominal overweight ranged from 0.6 to 1.0 (Figure 2B). The survival rate of participants with hypertension who regularly visited Posbindu-NCD ranged from 0.45 to 1.0 (Figure 2C). The survival rate of participants

with diabetes mellitus who regularly visited Posbindu-NCD ranged from 0.2 to 1.0 (Figure 2D). The survival rate of participants with hypercholesterolemia who regularly visited Posbindu-NCD ranged from 0.65 to 1.0 (Figure 2E).



**Figure 2.** (A) Survival for Overweight. (B) Survival for Abdominal Overweight. (C) Survival for Hypertension. (D) Survival for Diabetes Mellitus. (E) Survival for Hypercholesterolemia.

Variables	Total, <i>n</i>	Events, <i>n</i>	Censored, <i>n</i> (%)	Mean		95% CI		Log rank ( $\chi^2$ )	<i>P</i> -value
				Estimate	Standard error	Min	Max		
<i>BMI</i>									
Non-regular	176	97	79 (44.9)	8.14	0.12	7.91	8.37	3.942.4	<0.001
Regular	401	221	180 (44.9)	11.97	0.01	11.96	11.99		
<i>Abdominal circumferences</i>									
Non-regular	176	60	116 (65.9)	8.71	0.13	8.46	8.97	213.18	<0.001
Regular	401	152	116 (62.1)	11.98	0.01	11.97	11.99		
<i>Blood pressure</i>									
Non-regular	176	102	74 (42.0)	8.01	0.11	7.79	8.21	423.15	<0.001
Regular	401	218	183 (45.6)	11.97	0.01	11.96	11.99		
<i>Blood glucose</i>									
Non-regular	176	154	22 (12.5)	7.46	0.09	7.29	7.64	640.91	<0.001
Regular	401	318	83 (20.7)	11.97	0.01	11.96	11.99		
<i>Cholesterol</i>									
Non-regular	176	54	122 (69.3)	8.79	0.13	8.54	9.05	209.13	<0.001
Regular	401	134	267 (66.6)	11.98	0.01	11.97	11.99		

**Table 3.** Prediction of survival rate of patients who regularly visit Posbindu-NCD of guiding by CHWs (*n* = 577).

Table 3 showed significantly differences in BMI, abdominal circumferences, blood pressure, blood glucose level, and total cholesterol among participants who regularly and non-regularly visited Posbindu-NCD (*P* < 0.001). Participants who visited once during 12 months to Posbindu-NCD maintained their BMI, abdominal circumferences, blood pressure, level of blood glucose, and total cholesterol level.

#### 4. Discussion

The current study identified that the CD management program’s community-based intervention through Posbindu-NCD conducted by CHWs effectively maintained NCD in Indonesia’s rural areas. The BMI, abdominal circumferences, blood pressure, glucose blood level, and total cholesterol were controlled among participants who regularly visited Posbindu-NCD. Furthermore, the survival rates among participants who were overweight, had abdominal overweight, and had hypertension, diabetes mellitus, and hypercholesterolemia were also increasing among participants who regularly visited Posbindu-NCD compared with the ones who did not visit regularly.

The current study showed that community-based intervention of CD management program through Posbindu-NCD conducted by CHWs was effective to control NCD. This result is consistent with previous research that clinical-based interventions in communities could control NCD in rural areas.<sup>12</sup> The implementation of Posbindu-NCD through a five-desk system can facilitate

regular monthly health checks from participants in the community<sup>11</sup> to carry out a self-care program thoroughly and independently.<sup>13</sup> CHWs facilitate scheduled implementation of Posbindu-NCD activities by examining health and providing counselling for participants who have risk factors and health problems. Therefore, the scheduled implementation of Posbindu-NCD needs to be improved in the community to prevent and overcome NCD with local resources in rural areas.

Our finding showed that the BMI, abdominal circumferences, blood pressure, glucose blood level, and total cholesterol were kept at a better level among participants who regularly visited Posbindu-NCD. This result is since CHWs are empowered to provide services to the community.<sup>10,14,15</sup> Participants who came to Posbindu-NCD were checked for height and weight and abdominal circumference at desk III and blood pressure, blood sugar levels, and total cholesterol at desk IV of Posbindu-NCD. Thus, early NCD health problems experienced by participants were observed.<sup>16</sup> Regular checks regarding the risk factors for NCD are essential in reducing health problems.<sup>17</sup> Therefore, there is a need for continuity of community empowerment programs as social workers in Posbindu-NCD to screen activities from, by, and for people in rural areas.

Furthermore, the survival rates among participants who are overweight, who have abdominal overweight, who have hypertension, diabetes mellitus, and hypercholesterolemia increased among participants who regularly visited Posbindu-NCD. Being monitored regularly every

month by CHWs in the community, the participant's health status in Posbindu-NCD was better monitored,<sup>9,18,19</sup> thus improving their health level more than that of participants who did not come regularly every month. Activeness to attendance to Posbindu-NCD regarding the characteristic of community should improve to reduce the risk factors of NCD and improve health status.<sup>20,21</sup> The activeness of visitors' Posbindu-NCD could increase the survival rate at least ten times a year, which can increase the survival rate. Therefore, it requires actively participating in the community to participate in the community's monthly Posbindu-NCD activities.<sup>22</sup>

#### 4.1. Implication for practice

Posbindu-NCD is very effective in controlling CD problems in the community. The five desk system implementation activity by CHWs facilitated participants in carrying out self-management activities for CD problems. Posbindu-NCD participants undergo regular health screening every month so that CD problems can be controlled thoroughly. Home visit activities can also increase participants' active participation in controlling their CD problems. Besides, more efforts are needed to develop the Posbindu-NCD service program in rural Indonesia to increase community participation in health services and empower it through the active role of CHWs with the community.

#### 4.2. Limitations

This study has several limitations. This study uses secondary data from the evaluation of Posbindu-NCD activities during 2019; so, a prospective cohort study is needed to assess the effectiveness of activities with

some additions to education and health promotion at desk V of Posbindu-NCD. Also, this research is done in a small scope in seven PHCs in rural areas of Indonesia. A broader scope is needed for further research by emphasizing the aspects of partnership and community empowerment.

## 5. Conclusions

The CD management program's community-based intervention through Posbindu-NCD conducted by CHWs effectively controlled NCD in rural areas of Indonesia. Therefore, this program can be further developed in conducting NCD management in the community with the active involvement of CHW so that the community becomes active in participating in Posbindu-NCD activities regularly. Community regularity in implementing the five desk system can detect overweight, abdominal overweight, hypertension, diabetes mellitus, and hypercholesterolemia with an active role of CHWs. Thus, community self-management is indispensable in the self-care of NCDs in communities facilitated by CHWs in Indonesia's rural areas.

## Ethics approval

The institutional ethics committee approved the study. This study was approved by the institutional review board of Ethical Committee of Faculty of Dentistry, University of Jember in Indonesia (No.978/UN25.8/KEPK/DL/2020).

## Conflicts of interest

All contributing authors declare no conflicts of interest.

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