Impact of Calorie Intake on Cardiovascular Disease Risk Factors in Young Adults Who Working From Home during The COVID-19 Pandemic

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ABSTRACT

The Covid-19 pandemic has been one of Indonesia's most significant causes of death since the end of 2019. Therefore, the government imposed a Work From Home program to break the chain of the virus spread. However, people find it difficult to get fresh and healthy food ingredients during this program. This condition causes people to consume more fast food. Increased calorie intake is a chronic metabolic disease risk factor such as cardiovascular disease. The type of research used is an experimental group pre-test and post-test design study for two months. This research aims to determine the impact of calorie intake on the value of body mass index, waist circumference, and blood pressure during the Covid-19 pandemic for young adults working from home. Respondents filled out a list of foods consumed for three using the food record method and followed up for two months. Clinically, it shows that respondents with an adequate calorie intake tend to experience a decrease in body mass index, as evidenced by the results of respondents who experience a decrease (53.3%) in men and (57.1%) in women. The percentage increase in waist circumference in respondents with excess calories. The percentage of systolic and diastolic blood pressure in male and female respondents tends to decrease and or stable inadequate caloric intake. There is no significant association between calorie intake and risk factors for cardiovascular diseases such as obesity and high blood pressure. However, clinically it is found that adequate calorie intake prevents cardiovascular diseases risk factors by reducing body mass index, waist circumference, and blood pressure.

Keywords: calorie intake, cardiovascular diseases

I. INTRODUCTION

The Coronavirus Disease pandemic or known as Covid-19 was first detected in Indonesia on March 2, 2020. The conditions at that time increased the number of deaths and harmed various sectors. Human-to-human transmission is the main spread of this disease that occurs very quickly. The Indonesian government has implemented the LSSR (Large-Scale Social Restrictions) program in various regions in Indonesia to prevent the increasingly widespread of the Covid-19 disease [1]. This social restriction has implications for various sectors, especially various companies and educational institutions which then implement a work from a home program known as WFH (Work From Home). This restriction does not escape the temporary closure of businesses, including the food business so that people find it difficult to get fresh food ingredients which will then lead to an increase in consumption of processed foods which tend to be high in fat, sugar, and salt which can trigger an increase in Body Mass Index (BMI), Waist Circumference (WC), and Blood Pressure (BP) values

[2]. Staying at home for long periods can cause additional stress and interfere with people's mental health which can increase appetite which leads to an increase in calorie intake (CI) [3].

Calorie intake is defined as the amount of energy consumed through food and drink [4]. The choice of calorie intake alone or in combination with an unhealthy lifestyle can increase the incidence of cardiovascular disease (CVD) which affects chronic inflammation on health. The prevalence of CVD risk factors in Indonesia in 2018 was very high among men and women aged 10 years and over. The most important risk factors are smoking, physical activity, obesity, and hypertension ranging from 28 to 33% [5-6]. The high incidence of overweight in the young adult age group has been associated with poor eating habits (food rich in fat and carbohydrates) and diet (indulging in heavy dinners) and replacing home-prepared meals with fast food and processed foods [5-6].

Excessive calorie intake can increase postprandial oxidative stress which abnormally increases blood glucose levels, free fatty acids, and triglycerides circulating in the blood, triggering obesity and hyperglycemia [7]. This is supported by the statement of Mathew's study who stated that cardiovascular disease is associated with obesity, elevated serum lipids, and BP which are major problems worldwide that cause high mortality and morbidity [8].

Some literature revealed that CI that is limited or in a balanced category will have a better effect on the body's metabolism. Sebastian's study support this statement based on the results of their study showing that individuals following a calorie restriction regimen resulted in a decrease in total cholesterol, LDL, total cholesterol to HDL ratio, triglycerides, fasting glucose, fasting insulin, CRP, and systolic and diastolic blood pressure [5]. The thickness of the tunica intima to carotid artery media for the atherosclerotic vascular disease was reduced by 40% in the calorie-restricted group compared to the control group [5]. According to American Heart Association data from 2020, it is stated that as many as 3.2 million individuals aged 20-79 years are obese and overweight so that they are at greater risk for CVD which will lead to a higher mortality rate [6]. This study aims to determine the effect of CI on risk factors for CVD, such as obesity and hypertension during the LSSR of the Covid-19 pandemic in young adults who work from home (WFH).

II. METHODS

2.1. Research Design and Respondents

This study took the experimental study method of One group pre-test and post-test design which was carried out for 2 months. The aim was to find out how the CI influences the BMI, WC, and BP values during the LSSR of the Covid-19 pandemic in young adults who work from home (WFH). The determination of respondents in this study was based on the purposive sampling method. The total respondents in this study were 50 young adult respondents who were currently working from home (WFH) due to LSSR during the Covid-19 pandemic. They live in Greater Jakarta (Jakarta, Bogor, Depok, Tangerang and Bekasi). Based on WHO information, the age included in the adult category is 20 to 60 years. The age of young adults according to WHO is the age of 15 to 25 years. This is what underlies the researchers to determine the age of 23 to 25 years as the age of the respondents in this study. Respondents were selected based on inclusion criteria through an online questionnaire using a google form. This research has passed the ethical review of the Research Ethics Com-

mittee of the YARSI University Research Institute with letter number No: 055/KEP-UY/BIA/II/2021.

Procedure

Measurements were made in 2 measurements (pre and post-test) in the morning. Measurement was conducted at each respondent's home considering the limitations due to the LSS due to the Covid-19 pandemic. The researcher in this case visited the respondent's residence one by one with protocols and health standards as recommended by the government due to the Covid-19 Pandemic. After that, BMI, WC, and BP pre-test values were measured in the first week. Respondents in this stage were asked to fill out a list of foods consumed for 3 days where follow-up would be carried out for 2 months. Measurement of BMI, WC, and BP post-test values is the next step to be carried out. The aim is to see whether the CI at the time of WFH for 2 months, from Maret 2021 to the end of April 2021, affects the values of BMI, WC, and BP.

Measurement of CI using the food record method for 3 days in 24 hours (2 weekdays and 1 weekend) was followed up for 2 months to see the total CI online using the fat secret application. If the results have been obtained, it will be seen whether the results are included in the CI that is deficient, balanced, and excessive. The measurement results are divided into deficient CI, namely if the amount of energy consumed is <70% of the total body requirement. Meanwhile, Balanced or Good CI is the amount of energy consumed as much as 70-80% of the total body requirement and what is included in the excess CI is if the calories consumed are >80% of the total body requirement [9]. BMI measurement is carried out using the weight formula body weight (BW) in Kilograms (Kg) divided by body height (BH) in meters squared (m2). Bodyweight measurement uses a digital weight measurement tool, while TB is measured using a stadiometer. From this measurement, healthy BMI in women is between 18 - 22.9 Kg/m2, while in men it is 18 - 24.9 Kg/m2. WC measurement was performed using a tape measure, which was to measure the midpoint of the distance between the top of the iliac crest and the bottom of the last rib (costae 12) in a horizontal plane parallel to the umbilicus. WC in ASIA women is said to be normal if <80 cm, while in men <95 cm [10]. BP measurement is done by placing a cuff on the right upper arm with an arrow pointing to the brachial artery using a digital sphygmomanometer where the measurement results which are considered normal are < 120/80 mm Hg.

III. RESULTS AND DISCUSSION

Primary data was obtained from the measurement of BMI, WC, and BP variables which were carried out twice (pre and post-test). The frequency distribution of respondent characteristics as presented in Table I shows that most of the respondents, amounting to 28 respondents (56%) are women. The age of 22 years is the age of most respondents, namely 19 respondents (38%). There were 10 respondents (45.5%) male aged 22 years. Most of the female respondents aged 22 years and 23 years amounted to 9 respondents (32.1%) as shown in Table II.

Table 1. Frequency distribution of respondent characteristic

No	Respondent Characteristics	Amount (n)	Percentage (%)
1	Sex		
	Male	22	44
	Female	28	56
	Total	50	100
2	Age		
	21 years old	7	14
	22 years old	19	38
	23 years old	16	32
	24 years old	7	14
	25 years old	1	2
	Total	50	100

Table 2. Frequency distribution of respondent's age by gender

No	Respondent Characteristics	Amount (n)	Percentage (%)
1	Male		
	21 years old	1	4,5
	22 years old	10	45,5
	23 years old	7	31,8
	24 years old	4	18,2
	Total	22	100
2	Female		
	21 years old	6	21,4
	22 years old	9	32,1
	23 years old	9	32,1
	24 years old	3	10,7
	25 years old	1	3,6
	Total	28	100

The calorie intake during the large-scale social restriction (LSSR) for young adults who working from home is shown in Table III. It was found that most of the respondents had sufficient calorie intake, as many as 15 male respondents (68.2%) and 14 female respondents (50%).

Table 3. Description of calorie intake during the large-scale social restriction (LSSR) for young adults working from home

No	Calorie Intake	Men		Women	
		Amount (n)	*Percentage (%)*	*Amount (n)*	*Percentage (%)*
1	Adequate	15	68,2	14	50
2	Excess	7	31,8	14	50
Total		22	100	28	100

Table 4. The correlation between calorie intake and changes in body mass index during the large-scale social restriction (LSSR) in young adults (men) working from home

Calorie Intake	Changes in Body Mass Index (BMI)						Amount		p-value
	Drop		*No Changes*		*Increase*				
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Adequate	8	53,3	3	20	4	26,7	15	100	1,000
Excess	3	42,9	3	42,9	1	14,3	7	100	
Total	11	50	6	27,3	5	22,7	22	100	

It was found that 8 male respondents (53.3%) had a balanced calorie intake and experienced a decrease in body mass index (BMI) as presented in Table IV. One respondent (14.3%) had excess calorie intake and experienced an increase in Body Mass Index (BMI). The number of respondents who did not experience changes in Body Mass Index (BMI) were 3 respondents (20%) where they had a balanced calorie intake. In contrast, 3 respondents (42.9%) had excessive calorie intake. After the results of statistical tests using chi-square, obtained a p-value of 1,000 ($p > 0.05$) which indicates there is no significant meaning between the level of CI in BMI in young adult males who work from home. However, clinically, Table IV shows that respondents with balanced CI tend to experience a decrease in BMI. This is evidenced by the respondents who experienced a decrease (53.3%) more than those who experienced an increase.

Table 5. The correlation between calorie intake and changes in body mass index during the large-scale social restriction (lssr) in young adults (women) working from home

Calorie Intake	Changes in Body Mass Index (BMI)						Amount		p-value
	Drop		*No Changes*		*Increase*				
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Adequate	8	57,1	5	35,7	1	7,1	14	100	0,334
Excess	4	28,6	4	28,6	6	42,9	14	100	
Total	12	42,9	9	32,1	7	25	28	100	

Table 5 shows that 8 female respondents (57.1%) had sufficient calorie intake with a decrease in body mass index (BMI). A total of 6 respondents (42.9%) women were also

found to have excessive calorie intake and experienced an increase in body mass index (BMI). The number of respondents who did not experience changes in body mass index (BMI) were 5 respondents (35.7%) where they had sufficient calorie intake and 4 respondents (28.6%) had excess calorie intake. The results of statistical tests using chi-square obtained a p-value of 0.334 ($p > 0.05$). This value indicates that there is no significant relationship between CI levels in BMI in young adult women who work from home. However, Table V shows that respondents with CI are quite likely to experience a decrease in BMI as indicated by respondents who experienced a decrease (57.1%) more than those who experienced an increase. This is supported by respondents with excess CI who tend to experience an increase in BMI (42.9%).

Table 6. The correlation between calorie intake and changes in waist size during the large-scale social restriction (lssr) in young adults (men) working from home

Calorie Intake	Changes in Waist Size						Amount		*p-value*
	Drop		*No Changes*		*Increase*				
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Adequate	10	66,7	2	13,3	3	20	15	100	0,493
Excess	2	28,6	1	14,3	4	57,1	7	100	
Total	12	54,5	3	13,6	7	31,8	22	100	

The results obtained and presented in Table VI show that as many as 10 male respondents (66.7%) had sufficient calorie intake and experienced a decrease in waist circumference. A total of 4 respondents (57.1%) were also known to have excessive calorie intake with an increase in waist circumference. The number of respondents who did not experience changes in waist circumference were 2 respondents (13.3%) where they had sufficient calorie intake and 1 respondent (14.3%) had excess calorie intake. The results of statistical tests using chi-square obtained a p-value of 0.493 ($p > 0.05$). These values indicate that the relationship between CI and WC rates for young adult males who work from home is not significant. In Table VI, it is presented that respondents with CI tend to experience a decrease in their WC as evidenced by the number of respondents who experienced a decrease (66.7%) of their WC than those who experienced an increase. This is supported by respondents with excess CI who tend to experience an increase in WC (57.1%).

Table 7. The correlation between calorie intake and changes in waist size during the large-scale social restriction (lssr) in young adults (women) working from home

Calorie Intake	Changes in Waist Size						Amount		*p-value*
	Drop		*No Changes*		*Increase*				
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Adequate	6	42,9	6	42,9	2	14,3	14	100	0,905
Excess	5	35,7	4	28,6	5	35,7	14	100	
Total	11	39,3	10	35,7	7	25	28	100	

Based on the results obtained and presented in Table VII, there were 6 respondents (42.9%) women who had sufficient calorie intake and experienced a decrease in waist circumference. There were also 5 respondents (35.7%) with excess calorie intake and an increase in waist circumference. A total of 6 respondents (42.9%) reported no change in waist circumference and had sufficient calorie intake. In contrast, 4 respondents (28.6%) were found to have excessive calorie intake. After the results of statistical tests using chi-square, obtained a p-value of 0.905 ($p > 0.05$). This value shows that there is no significant meaning between the CI level in young adults of women who work from home. Table VII, however, shows that respondents with CI who are included in the moderate category tend to experience a decrease in WC as evidenced by more respondents experiencing a decrease (42.9%) than those experiencing an increase in WC.

This is supported by excess CI respondents who tend to experience an increase in WC (35.7%).

Table 8. The correlation between calorie intake and changes in systolic blood pressure during large-scale social restriction (lssr) in young adults (men) working from home

Calorie Intake	Systolic Blood Pressure Changes						Amount		p-value
	Drop		No Changes		Increase				
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Adequate	3	42,9	10	66,7	2	13,3	15	100	0,964
Excess	3	20	2	28,6	2	28,6	7	100	
Total	6	27,3	12	54,5	4	18,2	22	100	

Based on the results obtained and presented in Table VIII, it was found that 3 male respondents (42.9%) had adequate calorie intake and experienced a decrease in systolic blood pressure. A total of 2 respondents (28.6%) with excessive calorie intake were found to have increased systolic blood pressure. The number of respondents who did not experience changes in systolic blood pressure was 10 respondents (66.7%) where they also had sufficient calorie intake, while 2 respondents (54.5%) were known to have excessive calorie intake. After statistical testing with Kolmogorov–Smirnov test, the p-value was 0.964 ($p > 0.05$). This value shows that there is no significant meaning between the level of CI in the systolic BP of young adult males who work from home. However, clinically, Table VIII shows that respondents with CI are quite likely to experience a decrease in systolic BP as evidenced by more respondents experiencing a decrease (42.9%) than those experiencing an increase. This is supported by the excess CI respondents tend to experience an increase in systolic BP (28.6%).

Table 9. The correlation between calorie intake and changes in systolic blood pressure during large-scale social restriction (lssr) in young adults (women) working from home

Calorie Intake	Systolic Blood Pressure Changes						Amount		p-value
	Drop		No changes		Increase				
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Adequate	4	28,6	8	57,1	2	14,3	14	100	0,999
Excess	2	14,3	10	71,4	2	14,3	14	100	
Total	6	21,4	18	64,3	4	14,3	28	100	

Based on the results obtained in Table IX, it was found that there were 4 female respondents (28.6%) who had sufficient calorie intake and experienced a decrease in systolic blood pressure. There were also 2 respondents (14.3%) with excess calorie intake and an increase in systolic blood pressure. In respondents who did not experience changes in systolic blood pressure, 8 respondents (57.1%) had adequate calorie intake and 10 respondents (71.4%) had excessive calorie intake. The statistical testing with Kolmogorov–Smirnov test obtained 0.999 ($p > 0.05$) as the p-value. This value shows that there is no significant correlation between the level of CI in systolic BP for young women who work from home, but clinically in Table IX shows that respondents with CI are quite likely to experience a decrease in systolic BP as evidenced by the results of respondents who have decreased (28.6 %) more than the increase.

Table 10. The correlation between calorie intake and changes in diastolic blood pressure during large-scale social restriction (lssr) in young adults (men) working from home

Calorie Intake	Changes in Diastolic Blood Pressure						Amount		p-value
	Drop		No Changes		Increase				
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Adequate	1	14,3	8	53,3	6	40	15	100	1,000
Excess	1	6,7	3	42,9	3	42,9	7	100	
Total	2	9,1	11	50	9	40,9	22	100	

Based on the results obtained in Table X, it was found that there was 1 male respondent (14.3%) who had sufficient calorie intake with a decrease in diastolic blood pressure. There were also 3 respondents (42.9%) with

excess calorie intake and an increase in diastolic blood pressure. The number of respondents who did not experience changes in diastolic blood pressure was 8 respondents (53.3%) where they had sufficient calorie intake, while 3 respondents (42.9%) in this study were known to have excess calorie intake. The p-value obtained from the statistical test with Kolmogorov–Smirnov is 1,000 ($p > 0.05$). This value indicates that there is no significant relationship between the CI level and the diastolic BP of young adult males who work from home. However, Table X clinically shows that respondents with moderate CI tend to experience a decrease in diastolic BP as evidenced by more respondents experiencing a decrease (14.3%) than those with excess CI. This is corroborated by evidence that respondents with excess CI tend to have an increase in diastolic BP (42.9%).

Table 11. The correlation between calorie intake and changes in diastolic blood pressure during large-scale social restriction (lssr) in young adults (women) working from home

Calorie Intake	Changes in Diastolic Blood Pressure						Amount		p-value
	Drop		No changes		Increase				
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Adequate	6	42,9	6	42,9	2	14,3	14	100	0,999
Excess	4	28,6	6	42,9	4	28,6	14	100	
Total	10	35,7	12	42,9	6	21,4	28	100	

Table XI shows that as many as 6 respondents (42.9%) of women with sufficient calorie intake experienced a decrease in diastolic blood pressure. In addition, it was found that 4 respondents (28.6%) with excess calorie intake experienced an increase in diastolic blood pressure. Meanwhile, the number of respondents who did not experience changes in diastolic blood pressure was 6 respondents (42.9%) with sufficient and excess calorie intake. From the statistical tests with Kolmogorov–Smirnov test carried out, the p-value was 0.999 ($p > 0.05$). This value indicates a non-significant significance of the correlation between CI level and diastolic BP in young adult women who work from home. However, clinically, Table XI shows that respondents with CI are quite likely to experience a decrease in diastolic BP as evidenced by more respondents experiencing a decrease (42.9%) than those experiencing an increase. This is supported by excess CI respondents who tend to experience an increase in diastolic BP (28.6%).

IV. DISCUSSION AND LIMITATION

During WFH, a person tends to be more passive in all activities at home, causing laziness and increasing the risk of increasing CI or overfeeding. These factors can affect the risk of chronic metabolic diseases such as heart disease. Several things make researchers quite surprised by the results of this study. In the BMI examination conducted on female respondents, it was found that there was a sufficient trend of CI according to the recommendations that could reduce and/or stabilize BMI in 57.1% of respondents. These results are in line with the literature which explains that good eating habits are obtained as long as the total calories consumed every day are limited according to the target so that weight gain that affects BMI can be prevented while avoiding obesity [11-12]. This result is not the same as a study that says that excessive CI can increase postprandial oxidative stress, which abnormally increases blood glucose, free fatty acid, and triglyceride levels circulating in the blood which can ultimately lead to obesity and hyperglycemia [11].

Interviews conducted by researchers on respondents found that respondents with excess CI but experienced a decrease in BMI occurred in those who balanced their lifestyle by doing enough Physical Activity (PA), even

some who did excessive PA, such as doing heavy intensity PA every day. This physical activity is believed to play an important role in the results obtained related to BMI. In addition, this is following Rashidi's statement in his journal explaining that an increase in energy expenditure such as PA can affect a person's body weight [13]. Besides, adequate CI with eating healthy food has a lot of benefits. This support based on studies in adults has indicated that increased consumption of fruits and vegetables may be an effective strategy for decreasing energy consumption and for increasing and maintaining weight loss. In addition to potential beneficial effects on body weight, there is considerable evidence in other age groups that adequate CI with high consumption of fruits and vegetables may offer protective effects against and/or reduce the relative risk of cardiovascular disease, hypertension, diabetes, and certain cancers [14].

Based on the result of the WC examination conducted on female respondents, it was found that there was an adequate CI that could reduce and/or stabilize WC in 49.2 % of respondents. These results are supported by Ahmed which showed that not only consuming an adequate diet but also a diversified diet was linked to the reduction of abdominal obesity measured by the waist-hip ratio. However, higher dietary diversity does not necessarily mean a healthy eating pattern. Some dietary diversity which consumed high cereals or legumes staples, moderate intake of animal-sourced foods, and very little fruits, This implies a poor diet quality, which leads to higher calories consumption, low in protein, minerals, and vitamins, which increase body weight and finally lead to obesity [15]. On the other hand, from the results of Karl's study, it was found that a low-calorie and high-fiber diet intervention by a group of individuals with a BMI > 30 kg/m2 who was followed up for 5 years could reduce the incidence of coronary heart disease by 30% [20]. The results of this study indicate that adequate CI and following the recommendations tend to reduce WC, both in male and female respondents. In contrast, based on several works of literature which explain that excess CI can increase Body Weight (BW) which will affect BMI and also WC [14]. This is also in line with Larky's study which proved that the slow decrease in BW was caused either by improper diet patterns or excess calorie intake can increase WC [16].

This study found insignificant results regarding the effect of CI level on systolic and diastolic BP in young adult women and men who work from home. However, clinically, there was a higher percentage decrease in systolic and diastolic BP in respondents with an adequate CI and an increase in systolic and diastolic BP in respondents with excess CI. This is supported by Rhoda's study that mentioned although investigating the effect of single nutrients on BP may be informative, these nutrients are delivered in food, and food is usually consumed as whole diets. In addition, multiple interactions may occur between components of whole diets, so there is value in assessing the effects of the entire dietary pattern. Furthermore, dietary patterns may vary between different cultural environments because of the differences in the types of foods consumed [17]. However, modification of calorie intake is one effective way to control BP which is in line with the results of a study that all calorie restriction interventions have an impact positive, there was a decrease in systolic BP of 3.07 mmHg and diastolic of 1.81 mmHg [18-19]. The literature explains a correlation between calorie intake and an increase in BP caused by high salt levels and high-calorie foods. This can trigger hypertension accompanied by obesity where these two factors

are the most common causes of CVD [21].

The researcher realizes the shortcomings in this study, given the limitations of the researcher as the main actor regarding the insignificant results. The number of respondents tends to be small due to time and cost constraints. In addition, several things that the researcher cannot control in this study are individual variations, different modes, and durations of physical activity of each individual, and the respondent's calorie intake which is only based on dietary recall as well as the duration and hours of sleep of respondents which may affect the results of the study variable. The pandemic situation that limits social activities has resulted in researchers not being able to follow up with respondents directly.

V. CONCLUSION

In conclusion, in this experimental study in young adults who work from home, we showed no significant relationship between CI and risk factors for CVD such as obesity and hypertension which were evaluated based on statistically increasing or decreasing BMI, WC, and BP values. However, it was found that clinically CI was quite able to prevent the occurrence of CVD risk factors by reducing BMI, WC, and BP. This suggests the importance of recording calorie intake data based on the food type and composition which they consumed and individual variation to prevent bias. Further research is needed taking into account dietary misreporting so that any firm conclusions can be drawn about the effect of CI on BMI, WC, and BP values.

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