

# Changes in body weight and healthy lifestyle perception of Indonesian adults during COVID-19 pandemic

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#### ABSTRACT

**BACKGROUND** Social restrictions during the COVID-19 pandemic have impacted eating patterns and psychological status, leading to changes in body weight and perceptions of a healthy lifestyle in society. This study aimed to investigate the effect of social restrictions on weight changes and perceptions of a healthy lifestyle in adults during the COVID-19 pandemic in Indonesia.

**METHODS** This cross-sectional study was conducted using convenience sampling on 287 Indonesian adults from June to August 2020. The data were collected using a self-administered online questionnaire using Google Forms. Data were analyzed using the chi-square test and logistic regression analysis.

**RESULTS** There was no effect of social restrictions on weight changes and perceptions of lifestyle in adults ( $p = 0.900$  and  $0.748$ , respectively). However, 112 respondents (78.3%) had positive perceptions or supported adopting a healthy lifestyle under large-scale social restrictions. Multivariable logistic regression demonstrated that adults aged 36–45 years had a 3.6 times higher risk of weight changes than young adults aged 25–35 years ( $p = 0.004$ , OR = 3.65, 95% CI = 1.51–8.85).

**CONCLUSIONS** Social restrictions did not affect weight changes and perceptions of a healthy lifestyle in adults during the COVID-19 pandemic in Indonesia. However, older adults might have a higher risk of body weight changes. Controlling body weight is important to prevent further weight gain and the risk of noncommunicable diseases that can aggravate COVID-19.

**KEYWORDS** body weight changes, COVID-19, healthy lifestyle, Indonesia

During the coronavirus disease 2019 (COVID-19) pandemic, the Indonesian government attempted to reduce the COVID-19 transmission rate by limiting community mobility and creating social restrictions in red zone cities via large-scale social restrictions (LSSR) in April 2020 and the community activity restrictions enforcement in 2021.<sup>1</sup> LSSR have affected daily life, including study, work, and home activities, as well as the psychological aspects of individuals, leading to increased stress, anxiety, and high consumption of fat,

sugar, and salt, ultimately resulting in unintentional weight gain.<sup>2</sup> The risk of malnutrition also increased due to difficulty obtaining safe, nutritious, and affordable food during the COVID-19 pandemic.<sup>3</sup>

Challenges during the COVID-19 pandemic forced the population to quickly adapt to new habits and lifestyles, especially clean and healthy living behaviors, such as performing regular physical activity, consuming vegetables and fruits, washing hands regularly, sunbathing, processing/cooking

home meals, consuming multivitamins, and adhering to the recommended balanced nutritional diet to improve the immune system.<sup>4,5</sup> However, changes in behavior and attitudes are also influenced by social, experiential, and cultural factors, affecting individual perceptions and self-motivation to implement disease prevention behaviors.<sup>6</sup>

Implementing social restrictions during the COVID-19 pandemic has affected individuals' quality of life physically, socially, and psychologically. However, the effects of social restrictions during the COVID-19 pandemic on weight changes and perceptions of healthy lifestyles among adults in Indonesia remain unclear. This study aimed to investigate the effects of social restrictions during the COVID-19 pandemic on weight changes and perceptions of healthy lifestyles in Indonesian adults.

## METHODS

### Research design

This cross-sectional study used data from the IndoNutriLifeCOVID-19 survey, including 287 participant responses collected from June to August 2020 and gathered through convenience sampling. A self-administered questionnaire was distributed through Google Forms via social media platforms across Indonesia. Indonesians aged 26–45 years who provided informed consent and lived in either LSSR or non-LSSR areas were included in the study.

### Data collection

Google Form links were distributed via Facebook, Twitter, Instagram, WhatsApp, personal contacts, and university networks in Indonesia. The form provided a brief description of the background and objectives of the study. All participants provided informed consent to participate in this study.

### IndoNutriLifeCOVID-19 survey questionnaire

The items included on the IndoNutriLifeCOVID-19 online questionnaire were divided into four categories: (1) sociodemographic questionnaire including age, sex (female or male), living arrangements (alone or with family), ethnicity, employment status (working or not working), work conditions during the COVID-19 pandemic (working from home, going to work as usual, split employee schedule [working from home and working from the office], unable to work, or not

working), province of residence, and income level, (2) the participants' nutritional status questionnaire (body weight and height), (3) health status questionnaire (healthy or history of chronic disease), and (4) questionnaire about perceptions of a healthy lifestyle. For income level, the Central Bureau of Statistics categorizes as low (<1,500,000 IDR per month), moderate (1,500,000–2,500,000 IDR per month), high (>2,500,000–5,000,000 IDR per month), and very high (>5,000,000 IDR per month).<sup>7</sup> The participants were grouped into LSSR or non-LSSR categories based on their area of residence.

### Changes in body weight

Nutritional status data included the participants' current weight, weight before the COVID-19 pandemic, weight changes experienced during the COVID-19 pandemic, self-reported height, satisfaction with weight, weight control during the COVID-19 pandemic, and strategies for weight control during the COVID-19 pandemic.

### Perceptions of a healthy lifestyle

Healthy lifestyle perception data were collected using questionnaire items regarding the importance of improving the immune system. The questionnaire included six statements regarding the importance of having healthy dietary habits, active lifestyle, stress and anxiety reduction, good sleep quality, healthy weight status (normal body mass index [BMI]), and good social relation to which the participants responded with 'agree,' 'neutral,' or 'disagree'.

### Data analysis

Categorical variables are presented as numbers and percentages, and continuous variables are presented as mean and standard deviation (SD). Perceptions of a healthy lifestyle were calculated using a Likert-type scale. The score was transformed by summing each participant's answers and further analyzed using the T-score formula (Equation 1):

$$\frac{50 + 10(\text{participant's score} - \text{group average value})}{\text{Group SD}} \quad (1)$$

A T-score equal to or higher than the mean was considered a positive perception, whereas a T-score lower than the mean was considered a negative perception. The chi-square test was used to determine the bivariate relationship between the LSSR and

non-LSSR areas during the COVID-19 pandemic, weight change, and healthy lifestyle perceptions. A multivariate analysis was used to determine the factors related to weight change and perceptions of a healthy lifestyle during the LSSR period. Logistic regression analysis was used to control for confounding factors, including sex, age, cohabitation status, and income level. Statistical significance was set at  $p < 0.05$ . All analyses were conducted using SPSS software version 20 (IBM Corp., USA).

### Ethical clearance

This study was approved by the Ethics Committee of Universitas Alma Ata Yogyakarta (approval number: KE/AA/XI/10959/EC/2022).

## RESULTS

A total of 287 participants were included in this study (Table 1). Most participants who resided in the LSSR areas during the COVID-19 pandemic reported being in good health and employed with very high incomes. Most of these participants reported working from home during the COVID-19 pandemic. In contrast, most respondents who resided in the non-LSSR areas reported working as usual, aged 26–35 years old, female, and living on Java Island along with their families. The LSSR policy was implemented in large cities in Indonesia, which were in the red zone for COVID-19 cases.

Most of the participants reported changes in body weight during the COVID-19 pandemic. However, there was no significant relationship between LSSR and weight change ( $p = 0.900$ ) (Table 2). Most participants reported positive perceptions of a healthy lifestyle or that adopting a healthy lifestyle was important for a healthy immune system during the COVID-19 pandemic (Table 2).

Most participants reported that they rarely controlled their weight, made healthier dietary changes, exercised less, and had no difference in sleep quality while the LSSR was implemented during the COVID-19 pandemic compared to before the implementation of the LSSR (Table 3). The percentage of participants who reported losing weight was highest in the group who reported always controlling their weight (61.5%). The percentage of participants who gained weight while the LSSR was implemented was highest in the group with an unhealthy diet (57.1%).

**Table 1.** Sociodemographic characteristics of the respondents (N = 287)

Characteristics	LSSR, n (%) (N = 143)	Non-LSSR, n (%) (N = 144)
Age (years), mean (SD)	31.2 (4.9)	33.2 (5.6)
26–35	112 (78.3)	97 (67.4)
36–45	31 (21.7)	47 (32.6)
Sex		
Female	105 (73.4)	114 (79.2)
Male	38 (26.6)	30 (20.8)
Living arrangement		
Alone	15 (10.5)	6 (4.2)
With family	128 (89.5)	138 (95.8)
Ethnicity		
Javanese	75 (52.4)	96 (66.7)
Bugis	10 (7.0)	5 (3.5)
Sundanese	22 (15.4)	3 (2.1)
Dayak	2 (1.4)	1 (0.7)
Others*	34 (23.8)	39 (27.1)
Working status		
Employed	130 (90.9)	135 (93.8)
Unemployed	13 (9.1)	9 (6.2)
Work conditions during the COVID-19 pandemic		
Work from home	82 (57.3)	60 (41.7)
Work from office	41 (28.7)	67 (46.5)
Combination (work from home and office)	7 (4.9)	8 (5.6)
Not working	13 (9.1)	9 (6.3)
Income level		
Low	14 (9.8)	10 (6.9)
Moderate	15 (10.5)	22 (15.3)
High	40 (28.0)	63 (43.8)
Very high	74 (51.7)	49 (34.0)
Residency		
Java	111 (77.6)	89 (61.8)
Outside Java	32 (22.4)	55 (38.2)
Health status		
Healthy	128 (89.5)	129 (89.6)
Had chronic disease	15 (10.5)	15 (10.4)

COVID-19=coronavirus disease 2019; LSSR=large-scale social restrictions; SD=standard deviation

\*Others were Aceh, Batak, Banjar, Betawi, Buton, Kaili, Kutai, Lampung, Madura, Melayu, Minangkabau, Muna, Padang, Sumbawa, Tetun, Tionghoa, Tolaki, and Toraja

**Table 2.** Relationship between LSSR and body weight change perceptions of healthy lifestyles

Variables	LSSR, n (%) (N = 143)	Non-LSSR, n (%) (N = 144)	<i>p</i> *
Body weight change			0.900
Weight gain	37 (48.1)	40 (51.9)	
No changes	54 (49.5)	55 (50.5)	
Weight loss	52 (51.5)	49 (48.5)	
Perception of healthy lifestyles			0.748
Positive	112 (78.3)	115 (79.9)	
Negative	31 (21.7)	29 (20.1)	

LSSR=large-scale social restrictions  
\*Chi-square test

Participants in late adulthood (36–45 years) had a higher risk of weight change and of having a positive perception of a healthy lifestyle than those in early adulthood (26–35 years), as shown in Table 4. Men were less likely to experience changes in body weight than women, while women were less likely to have a positive perception of a healthy lifestyle. Participants

who lived with their families were less likely to experience body weight changes and have a positive perception of a healthy lifestyle than those who lived alone. Participants in the high-income group were less likely to experience weight change and more likely to have a positive perception of a healthy lifestyle than those in the low-income group.

## DISCUSSION

The IndoNutriLifeCOVID-19 online questionnaire aimed to identify the effect of the COVID-19 pandemic on the nutrition and lifestyle of individuals who lived in areas with social restriction policies. Social restrictions did not affect weight changes in adults during the COVID-19 pandemic in Indonesia. These findings are similar to those of Putra et al,<sup>8</sup> who reported no significant changes in body weight or nutritional status during the COVID-19 pandemic. Curtis et al<sup>9</sup> also reported that the overall impact of social restrictions on lifestyle during the COVID-19 pandemic was minimal, with no significant body weight changes in Australian adults. In the current study, the participants

**Table 3.** Changes in healthy lifestyle behavior and weight change status during LSSR

Variables	Body weight status			<i>p</i> *
	Weight gain, n (%) (N = 37)	No changes, n (%) (N = 54)	Weight loss, n (%) (N = 52)	
Weight control during LSSR				<b>0.002</b>
Never	11 (24.4)	21 (46.7)	13 (28.9)	
Sometimes	21 (35.6)	23 (39.0)	15 (25.4)	
Always	5 (12.8)	10 (25.6)	24 (61.5)	
Current diet compared to before LSSR				<b>0.010</b>
Less healthy	8 (57.1)	2 (14.3)	4 (28.6)	
No different	12 (19.4)	31 (50.0)	19 (30.6)	
Healthier	17 (25.4)	21 (31.3)	29 (43.3)	
Current physical activity compared to before LSSR				0.221
No difference, never exercise	4 (18.2)	12 (54.5)	6 (27.3)	
No difference, exercise as usual	10 (28.6)	15 (42.9)	10 (28.6)	
More frequently do exercise	9 (21.4)	17 (40.5)	16 (38.1)	
Less frequently do exercise	14 (31.8)	10 (22.7)	20 (45.5)	
Current sleep quality compared to before LSSR				0.300
Worse	12 (28.6)	11 (26.2)	19 (45.2)	
No different	23 (26.1)	38 (43.2)	27 (30.7)	
Better	2 (15.4)	5 (38.5)	6 (46.2)	

LSSR=large-scale social restrictions  
\*Chi-square test

**Table 4.** Factors associated with body weight changes and perceptions of healthy lifestyle during LSSR

Variables	Body weight changes				Perceptions of healthy lifestyle			
	Unadjusted, OR (95% CI)	<i>p</i> *	Adjusted, OR (95% CI)	<i>p</i> *	Unadjusted, OR (95% CI)	<i>p</i> *	Adjusted, OR (95% CI)	<i>p</i> *
Age (years)								
26–35	1.00	<b>0.005</b>	1.00	<b>0.004</b>	1.00	0.188	1.00	0.192
36–45	3.26 (1.41–7.50)		3.65 (1.51–8.85)		0.46 (1.15–1.45)		2.16 (0.67–6.92)	
Sex								
Female	1.00	0.131	1.00	0.122	1.00	0.208	1.00	0.199
Male	0.49 (0.19–1.23)		0.45 (0.17–1.23)		1.73 (0.73–4.06)		0.55 (0.29–1.36)	
Living arrangement								
Alone	1.00	0.137	1.00	0.137	1.00	0.168	1.00	0.118
With family	0.54 (0.18–1.63)		0.40 (0.12–1.33)		4.28 (0.54–33.94)		0.18 (0.02–1.53)	
Income level								
Low	1.00		1.00		1.00		1.00	
Moderate	0.38 (0.05–2.53)	0.321	0.27 (0.04–1.96)	0.201	0.38 (0.05–2.53)	0.200	3.67 (0.56–23.88)	0.173
High	1.20 (0.31–4.57)	0.785	0.83 (0.21–3.36)	0.804	1.20 (0.31–4.57)	0.800	2.73 (0.50–14.83)	0.243
Very high	0.99 (0.28–3.50)	0.988	0.52 (0.13–2.05)	0.355	0.99 (0.28–3.50)	0.350	2.07 (0.40–10.70)	0.385

CI=confidence interval; OR=odds ratio; LSSR=large-scale social restrictions

\*Logistic regression test

did not experience weight changes or aim to control their weight and had no changes in eating patterns, physical activity levels, or sleep quality due to the implementation of the LSSR.

Although there was no significant effect on weight change, participants in late adulthood had a higher risk of weight change than those in early adulthood. A previous study<sup>10</sup> reported that metabolism decreases with age, increasing body fat levels. However, Zachary et al<sup>11</sup> and Robinson et al<sup>12</sup> reported that body weight and average BMI increased due to reduced outside activity during social restrictions and regional quarantine, which encouraged individuals to have a sedentary lifestyle, increased stress, affected eating behaviors, and increased the tendency to eat a diet high in calories, carbohydrates, and fat. Age and other factors may increase body weight, particularly if social restrictions continue to be enforced.

In the current study, most participants lived with their families. Abe et al<sup>13</sup> reported that patients who live alone have a 3-times higher chance of gaining weight than those who live with family or are married. Individuals who lived alone had a higher risk of psychological stress than those who lived with their families during the COVID-19 pandemic. In addition, individuals who lived alone tended to have reduced

physical activity and increased consumption of high-calorie foods to reduce psychological stress.<sup>14</sup>

Moreover, most participants reported very high incomes in this study. Individuals with high incomes were less likely to experience weight changes than those with low incomes. Goitia et al<sup>15</sup> found that adults with a low income gained 8.9% more weight than those with a high income. Septiyana et al<sup>16</sup> reported that individuals with high income levels had healthier eating patterns during the COVID-19 pandemic than those with low income levels. Low-income individuals cannot access the resources necessary to maintain healthy behaviors, thus increasing their body weight.<sup>17</sup>

In the current study, social restrictions did not affect adults' perceptions of healthy lifestyles during the COVID-19 pandemic in Indonesia. Public perception refers to community understanding or response, particularly their healthy lifestyle implementation to improve the immune system during the COVID-19 pandemic. This finding is similar to that of Prastyawati et al<sup>18</sup> who reported no significant relationship between COVID-19 risk perception, perceived susceptibility, perceived barriers, perceived self-efficacy, perceived severity, cues to action, and prevention behaviors.

Most participants in the current study reported a positive perception of implementing a healthy

lifestyle to improve their immunity during the COVID-19 pandemic. A healthy lifestyle includes healthy eating habits, active lifestyle or regular exercise, stress and anxiety management, good sleep quality, and good social relationships.<sup>19</sup>

Demographics, psychological factors, age, sex, socioeconomic status, personality, pressure from significant people, habits, and personal motivation influence individual perceptions.<sup>20</sup> Most participants in this study were women, and women were less likely to have a positive perception of a healthy lifestyle than men. The differences in perceptions between women and men may be attributed to differences in attitudes and knowledge. Stephen et al<sup>21</sup> reported that men had better COVID-19 knowledge and higher self-risk perceptions than women, which may be due to the lack of access to information, lower literacy, limited Internet access, and lower cell phone ownership of women.

Internal and external factors influence public perceptions during a pandemic. During the COVID-19 pandemic, the most powerful external factors included mass media, educational status, and social problems. Internal factors, such as personality traits, abilities, desires, and feelings, did not affect perceptions about the pandemic.<sup>22</sup> In addition, misinformation, hoaxes, and social restrictions increased, influencing self-efficacy and public knowledge in efforts to prevent COVID-19. Educational efforts, including lectures and webinars or audiovisuals, must be implemented to increase the positive perceptions among the population during pandemics.<sup>23–25</sup>

This study had limitations. First, most of the participants were from Java, resulting in a lack of relevancy to the Indonesian population as the sample was too small. Second, the convenience sampling method may have resulted in a selection bias, and the participants in this study were adults with higher education and income levels than the general population. Third, data were self-reported and no direct measurements were obtained; therefore, anthropometric data related to changes in body weight cannot be used as reference values. Finally, this study was limited to examining the perceptions of a healthy lifestyle without measuring changes in the participants' dietary behaviors.

In conclusion, social restrictions did not affect weight changes or the healthy lifestyle perceptions of adults during the COVID-19 pandemic in Indonesia.

However, further social restrictions may affect public health and result in negative perceptions of the COVID-19 emergency period. During the COVID-19 pandemic, older adults had a higher risk of body weight changes than younger adults. A healthy lifestyle must be promoted to control body weight and prevent further weight gain and health risks, including noncommunicable diseases that aggravate COVID-19. The government must intensify guidelines for healthy living during the COVID-19 pandemic to expand the scope of education for communities and households, provide positive knowledge, and immediately anticipate misinformation, allowing for public health to be established at the individual level in the broader community.

#### Conflict of Interest

The authors affirm no conflict of interest in this study.

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