

# The Impact of COVID-19 Pandemic on Childhood Obesity in “Ananda Bunda” Clinic, Bali

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**Abstract:** ***Introduction:** World Health Organization declared the Novel Coronavirus-19 (COVID-19) outbreak a global pandemic. School closure is one of the measures chosen by many governments include Indonesia. The risk factors for obesity are more prevalent during school holidays; in fact, the risk of weight gain due to school closures in children during COVID-19 has been recognized. **Methods:** This study is a prospective observational cohort study. The population is children and adolescents who follow regular growth and development assessments at the Ananda Bunda Clinic, Bali. The total sampling are 110 and were observe pre and during COVID-19 pandemic period. **Results:** The proportion of children who were overweight or obese increased by 20 from the initial 51 overweight/obese to 71 (36%). Fortunately there were only 4 (5%) experienced a decrease weight to ideal BMI. Furthermore, through bivariate analysis, this study found  $p$ -value = 0.000 ( $<0.05$ ) which indicates a real and significant difference between BMI in children before the pandemic and during the pandemic. **Conclusion:** Obesity is still a problem in children when pandemic. The incidence of obesity during the pandemic was proven to show a significant increase in this study there was a significant difference between BMI before and during the pandemic. Closure of schools, consumption of foods high in sugar and fat, and lack of physical activity can be factors.*

**Keywords:** Childhood, Obesity, Pandemic, COVID-19

## 1. Background

On March 11, 2020, the World Health Organization declared the Novel Coronavirus-19 (COVID-19) outbreak a global pandemic. School closure is one of the measures chosen by many governments include Indonesia. However, in addition of barriers to learning, educational disparities, and stunted development of social and emotional skills, children's physical activity was reduced. The risk factors for obesity are more prevalent during school holidays, in fact, the risk of weight gain due to school closures in children during COVID-19 has been recognized as delayed in school reopening.<sup>2,3</sup> To find out the indirect effect of implementing social distancing and school closures due to the Covid-9 pandemic that affects children's growth by investigating changes in children's anthropometric parameters before and during the COVID-19 pandemic.

## 2. Methods

This study is a prospective observational cohort study. The population is children and adolescents who follow regular growth and development assessments at the Ananda Bunda Clinic. The inclusion criteria: Age between 5-17 years old; Have regularly attended learning institutions during the pre-COVID-19 period; Have at least one growth assessment at Ananda Bunda Clinic during the pre-COVID-19 and COVID-19 pandemic period; Stating that they are willing to become a respondent by signing the informed consent. Besides that, the exclusion criteria: Diagnosed with a psychiatric disorder; Underlying endocrine disorders requiring therapeutic intervention; Any underlying disease that would prevent them from attending the regular school.

This study used consecutive sampling. The minimum sample calculation uses the *Lameshow* formula (1997), so the numbers of samples are 55 respondents for each group (total

110 respondents). The time of this research was carried out according to the date the school closure took effect on April 3<sup>rd</sup>, 2020, so; the 6 month period after April 3<sup>rd</sup>2020 is defined as the 'COVID-19 period'; The pre-Covid-19 period is defined as 1 year before April 3<sup>rd</sup>, 2020 when children carry out their normal daily activities with no restrictions in their physical activity.

Parameters	$\beta$	95% CI		SE	P-Value
		Lower	Upper		
Pre-During Pandemic	-0.514	-0.685	-0.342	0.086	0.000

The variables studied were: Age with measuring results 5-14 years and >14-17 years, weight and height measured by scales then plotted onto the CDC 2000 weight or height/age curve and the measurement results were according appropriate to age and not appropriate to age, and BMI using the formula  $\text{weight (kg)} / \text{height (m)}^2$  with the results measure not obese (normoweight/underweight)  $<24.9$  and obesity (overweight/obesity)  $>25$ .

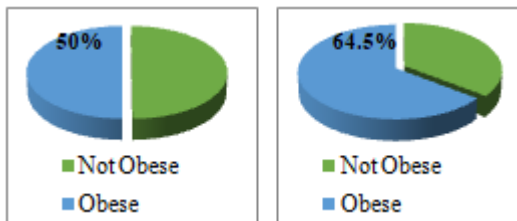
## 3. Results

First, the univariate analysis for the distribution of respondents based on age found 57 (51.8%) aged 5-14 years, 53 (48.2%) aged >14-17 years. Furthermore, based on weight/age, there were 53 (48.2%) according to age, 57 (51.8%) not according to age. If based on height/age, there were 83 (75.5%) according to age, 27 (24.5%) not according to age. The purpose of this study was to compare before and during the pandemic, then the distribution of BMI before the pandemic was in accordance with the number of samples above, namely 55 for non-obese and 55 obese. After being followed-up according to the study period, the results of the BMI distribution during the pandemic were 39 (35.5%) who were not obese while 71 (64.5%) were obese (**Fig.1**).

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**Figure 1:** Pie chart shows the proportion of respondents' BMI before and during the pandemic.

Followed by bivariate analysis using the *Paired Sample T-test* which had previously been tested for normality. The results obtained  $p\text{-value} = 0.000$ . The P value is less than 0.05, so it can be interpreted that there is a significant difference between the child's body mass index before the pandemic and during the COVID-19 pandemic. (Tab.1)

**Table 1:** Comparison of BMI before the pandemic and during the COVID-19 pandemic with  $p\text{-value} 0.000 (<0.05)$ .

#### 4. Discussion

The COVID-19 pandemic is still ongoing; there are still many confirmed positive cases. There are many positive and negative aspects that can be the impact of a pandemic. Like the school closure at the beginning of the determination of COVID-19 as a national disaster by the Indonesian government on April 3<sup>rd</sup>, 2020. Many students were forced to study at home online. Social distancing policies as well as physical distancing are considered to be able to reduce the spread of COVID-19. Along with this policy, the government encourages all elements of education to be able to activate online classes even though schools have temporarily closed physically. School closures then became one of the most effective mitigation measures to reduce the spread of the virus in children.<sup>4</sup>

In the study of Me Kang, *et al* in Korea found the average BMI z-score of children during the COVID-19 period (March-August 2020), the 6-month period immediately after school closure in Korea showed an increase of 0.219 (95%CI, 0.167-0.271) compared to the micro-simulation model that has been carried out (April-December 2020) will find 0.198 (95% CI, 0.197-0.199).<sup>1</sup> This Korean study also revealed that the proportion of children who were overweight or obese increased from 23.9% to 31.4%. Also children who were in the normal weight category experienced a significant increase, and almost 10% of children with normal weight increased in the overweight or obese category.<sup>1</sup> That study is in line with this study, from the characteristics of 110 respondents each of them amounted to 55 respondents with obesity and 55 respondents not with obesity. Determination of BMI parameters using the formula for weight / (height)<sup>2</sup> and the results are

overweight/obese if BMI > 25.0 and not obese if BMI < 24.9. So after monitoring of this research period during the COVID-19 pandemic, it was found that the proportion of children who were overweight or obese increased by 20 people from the initial 51 overweight/obese people to 71 people (36%). Fortunately there were only 4 people (5%) experienced a decrease weight to ideal BMI (Fig.2).

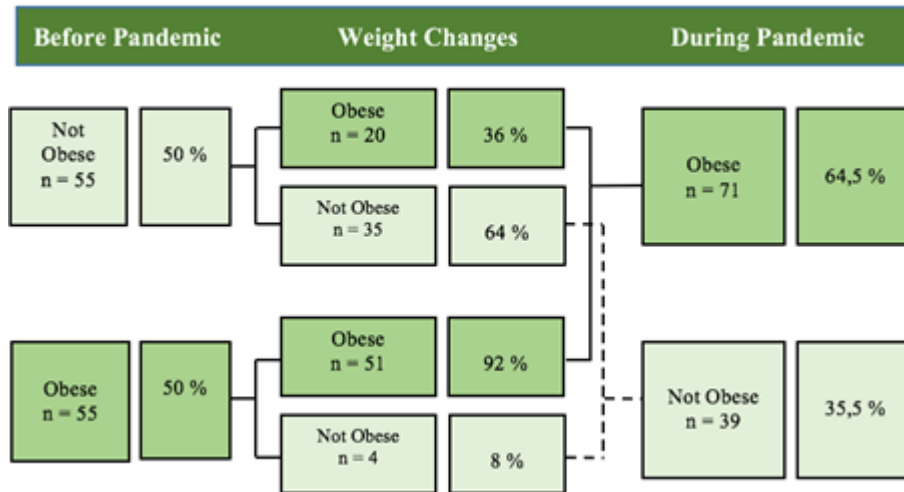
Furthermore, through bivariate analysis, this study found  $p\text{-value} = 0.000 (<0.05)$  which indicates a real and significant difference between BMI in children before the pandemic and during the pandemic. Almost all children experienced weight gain in this study, but based on previous research, normoweight was a significant risk factor ( $p=0.017$ )<sup>1</sup> for increasing BMI during school closure, which means that body weight was a significant risk factor for weight gain. Weight gain may be due to a lack of awareness with overweight and obese children about weight gain.

What is being discussed is what are the possibilities that cause weight gain which has an impact on increasing BMI in these children. When at home children also have more freedom in consuming foods high in sugar and high in fat. Furthermore, children from low socioeconomic families do not have access to healthy food. Lack of physical activity by children can also increase the risk of obesity during the pandemic. As was the case in a study in Germany which showed as many as 2-15% of children experienced a decrease in physical activity during the pandemic and in children in Spain experienced a decrease in physical activity of approximately 55 minutes / day ( $p < 0.001$ ).<sup>1,5,6</sup>

Duration of school closure was found to be a significant risk factor for increased BMI. The study found that after 6 weeks of school closure, reduced physical activity could significantly affect the BMI of children and adolescents, and the relationship between increased BMI and duration of school closure was found linear.<sup>1</sup>

Obesity in children is a risk factor for several diseases such as cardiovascular disease, type 2 diabetes mellitus, hypertension, hyperlipidaemia, non-alcoholic fatty liver disease (NAFLD), premature puberty, irregular menstruation and polycystic ovary syndrome, steatohepatitis, sleep apnoea, asthma, musculoskeletal disorders, and psychological problems such as depression.<sup>7</sup>

UNICEF said that in an effort to support families to meet the nutritional needs of children during the COVID-19 pandemic, various efforts can be made. Such as increasing awareness of parenting for children and still encouraging all children to consume a balanced nutritious diet.



**Figure 2:** Changes in BMI before and during the pandemic. Not obese (normoweight/underweight) BMI < 24.9. Obese (overweight/obese) BMI > 25.0

In addition to increasing physical activity during school closures, increase learning options at home (a solution that does not require and requires only a little technology).<sup>8</sup>

There are some limitations in this study due to the prospective cohort design. To reduce selection bias, all children who were respondents had to match the inclusion and exclusion criteria of the researcher. This study also only includes two weight criteria as a reference, namely obesity and not obesity and only a small number of children who come to clinics that are not on a large scale, but it is enough to show significant results on changes in children's BMI during the COVID-19 pandemic period.

A colorectal carcinoma in situ includes an intraepithelial and an intramucosal carcinoma. They are defined as malignant cells that are confined to the basement membrane (intraepithelial carcinoma) and that have invaded into the mucosal lamina propria and have extended into, but not through, the muscularis mucosae (intramucosal carcinoma)

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## 5. Conclusion

The COVID-19 pandemic is a concern of all, parents, the community and the government must work together. Obesity still a problem in children. The incidence of obesity during the pandemic was proven to show a significant increase in this study and the *p-value* of 0.000 (<0.05) showed that there was a significant difference between BMI in children before and during the pandemic. Closure of schools, consumption of foods high in sugar and fat, and lack of physical activity can be factors that contribute to obesity in children.

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