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RESEARCH PAPER

## Household food security during Covid-19 pandemic in Daerah Istimewa Yogyakarta, Indonesia

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**Abstract.** Household food security in Indonesia depends on many factors. This study aims to describe household food security during the Covid-19 pandemic in Daerah Istimewa Yogyakarta (DIY). This research was conducted using a questionnaire for taking data. This study showed that there was a difference in household food security between the pre-pandemic of Covid-19 and during the pandemic of Covid-19. The hunger scale in DIY at the pre-pandemic of Covid-19 was 6% and increased during the pandemic of Covid-19 to 11%. It is shown that the financial crisis because of Covid-19 also influenced at increasing household food insecurity. As far as future research is concerned, the impact of food insecurity in vulnerable groups within the studied communities needs to be determined.

**Keywords:** households; food security; Covid -19 pandemic; hunger scale; Yogyakarta

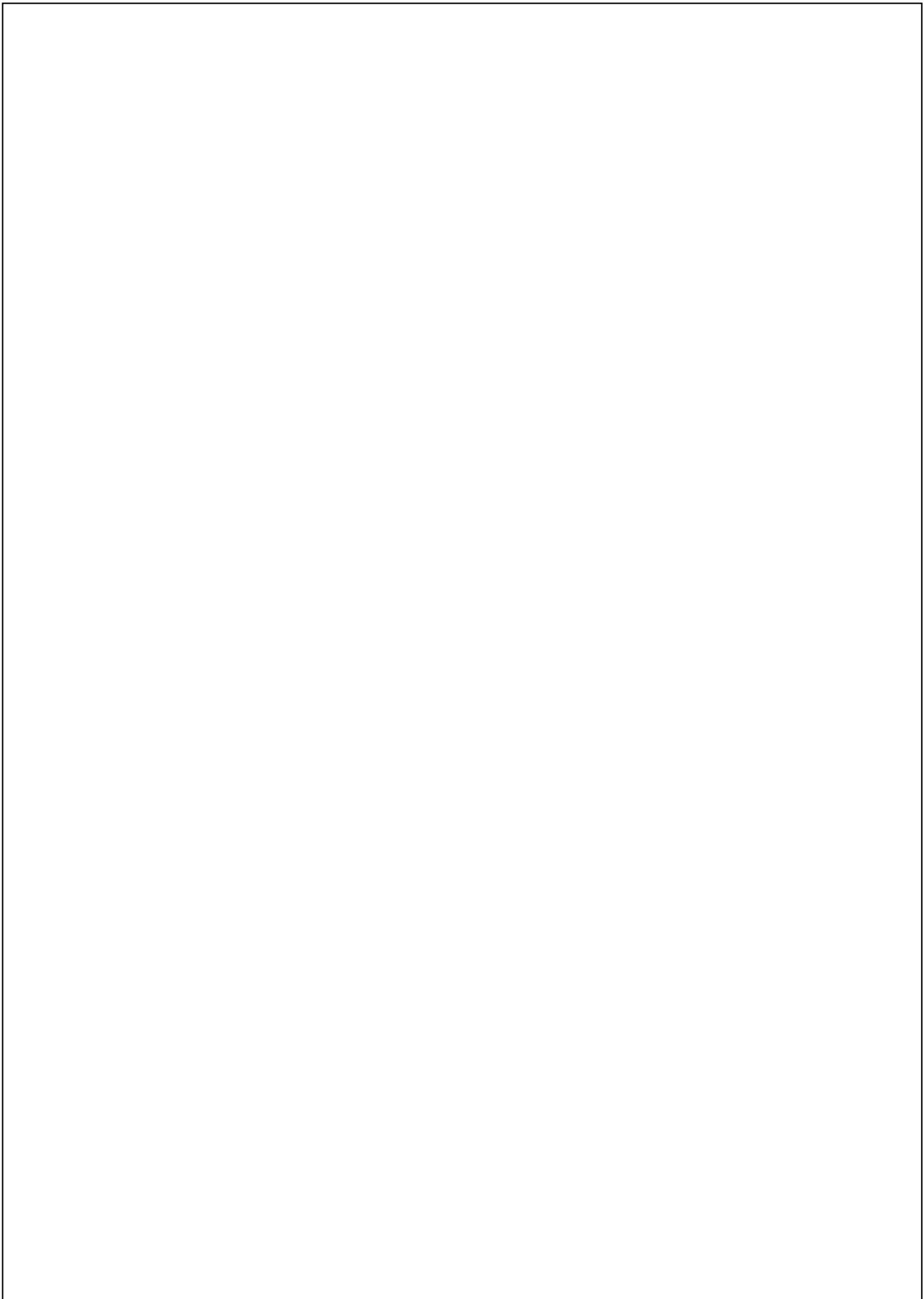
### 1. Introduction

According to WHO (2011), a pandemic is an epidemic condition that spreads across countries and continents and involves a large number of people. When a pandemic spreads, the role of the food supply chain must be considered in order to maintain price stability and access to food by the community (Cullen, 2020). The problem of food security becomes a very vulnerable thing in the condition of the Covid-19 pandemic.

Asmanto and Adji (2020) stated that the food security of Asian countries is affected by the Covid-19 pandemic. In Thailand, Sriring and Staporncharnchai (2020) estimated that seven million people (nearly 20 percent of the labour force) have already lost their jobs, with more losses expected. In Bangladesh, around Cox's Bazaar, large numbers of refugees remain in camps where food has been inadequate and in short supply (FAO, 2020). The people of Bangladesh have also been affected by reduced access to land and lower wages. In Pakistan, ongoing drought in Sindh and Balochistan have pushed more than three million people into IPC Phase 3 or above,

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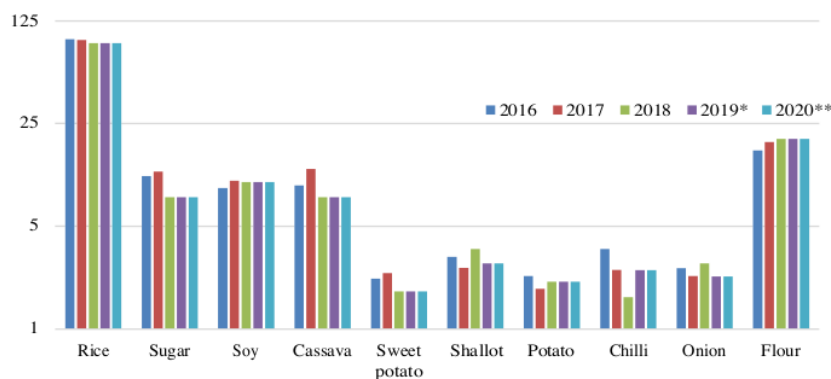
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and desert locust infestations will exacerbate the situation (FAO, 2020). The spread of COVID-19 will worsen food insecurity and malnutrition in all of these countries.

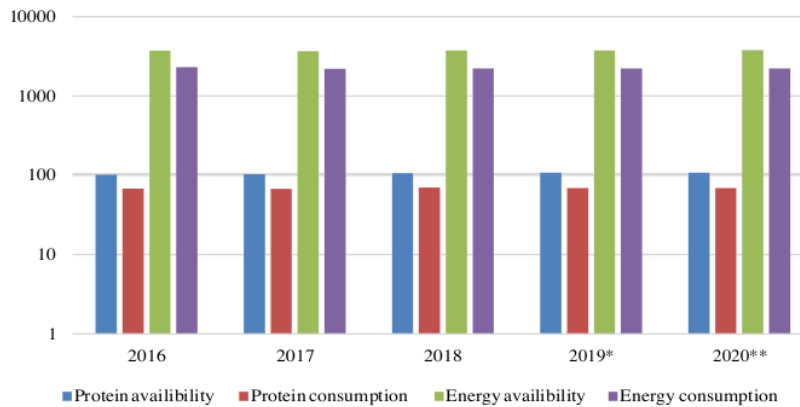
<sup>30</sup> In Law No.18 of 2012, it is stated that <sup>3</sup> food is anything that comes from biological sources of the agricultural, plantation, forestry, fishery, livestock, aquatic, and water products that are processed or not processed which are intended as food or drinks for human consumption, including food additives, food raw materials, and other materials used in the preparation, processing and/or manufacturing of food or beverages (Government of Indonesia, 2012). In that sense, every country is obliged to guarantee the availability of food as a basic need for its people. As one of the human rights, the ability of humans to meet their food needs will result in the stability and integrity of a country (Bulog, 2018). The smaller a country's food supply to the needs of its people, the greater the social and economic turmoil in society. Therefore, it needs food security in order to realize national security (Bulog, 2018).

<sup>44</sup> Based on the concept of food <sup>28</sup> security, it is a condition where food can be fulfilled, affordable, equitable, safe, nutritious, and does not conflict with religion, culture, and beliefs for the community. In a more concise sense, food security includes availability, affordability, and stability (Damayanti, 2007). The deciding factor in food security, according to Damayanti (2014) is the purchasing power or income of the community to meet their living costs. Also, other factors such as livelihoods and access to food, nutrition and <sup>37</sup> health, and factors of food vulnerability influence (Damayanti, 2007). Bulog (2018) also states that there are factors that affect food security, namely regarding food production fluctuations that are influenced by climate/weather. The data is also supported by research by Saliem and Ariani (2016) that food security is influenced by factors of distribution and people's purchasing power. Based on research conducted by Rohman and Maharani (2018), the projected availability of rice commodities in DIY Province in 2020 and 2021 is 345,420.83 kg/year and 348,073.12 kg/year. Figure 1 explains the data on stocks and the needs of some food commodities in Yogyakarta Special Province.



**Figure 1.** Stocks and needs data of food commodities in DIY Province

\*) temporary, \*\*) very temporary, Source: BAPPEDA DIY (2020)



**Figure 2.** Protein and energy availability and consumption in DIY

\*) temporary, \*\*) very temporary , Source: BAPPEDA DIY (2020)

National food security must begin with household food security. From Figure 2, we can see the disparity between availability and consumption in food and energy in the Special Province of Yogyakarta. This year, 2020, the protein availability is stated 107.86 kg/capita/year and the consumption is stated 68.7 kg/capita/year. Daerah Istimewa Yogyakarta (DIY) Province is one of the provinces with the lowest rank in Indonesia in the Covid-19 case as of July 2020 (Kemenkes RI, 2020). The Covid-19 pandemic does not only have an impact on health but also various aspects of socio-economic life, including food needs fulfillment. To meet food needs, domestic production plays a key role although there is an option to import. However, in pandemic conditions, imports can be constrained. Because of this, a number of countries withhold food exports for the sake of domestic needs fulfillment (Asmanto & Adji, 2020). The Ministry of Agriculture and Food work together in the distribution and supply of food in areas of stock deficits, as well as absorption and distribution of horticulture (Adelayanti, 2020).

On the other hand, this province has an uneven distribution of the economic level of the people in five districts (Nurwitasari et al., 2019). Due to the lack of this scientific and its importance for further development of DIY province's household food security studied, this study aims to assess the level of household food security in five districts as a whole in DIY province during the COVID-19 pandemic. This study can be valuable information in further research and also information for the government mainly to prevent food insecurity during the pandemic.

## 2. Research methods

This study aimed to determine whether the Covid pandemic influences household food security. Qualitative method is implemented for this study. A stratified proportional cluster sampling was selected, stratified by area and formal plot/squatter households in open areas. Proportional cluster sampling was chosen because the researcher could not information about the population as a whole, but could get information about the clusters. Using randomly selected X and Y coordinates, 122 starting points were selected in this way. Subjects in this study were family in DIY using proportional random sampling, which were chosen from five districts

include Sleman, Kulon Progo, Bantul, Gunung Kidul, and city of Yogyakarta. The total number of respondents was 122 families among DIY. A structured questionnaire was used in this study.

### 2.1 Data collection technique

The data performed using a questionnaire (google form) with open and closed type questions. Research design, a cross-sectional descriptive study, was undertaken. The questionnaire variables included were socio-demographic status (i.e., employment status, ages, family member), accessibility of food (i.e., household income, and the proportion of income spent on food) and also household food security (i.e., the degree of hunger in the household).

### 2.2 Data analysis technique

The first step in the statistical analysis was to explore the household demographic and socio-economic. The analysis primarily involved Descriptive statistics, including frequencies and percentages for categorical data, which were calculated to explore the prevalence of food security. Mann-Whitney-Wilcoxon tests were used to assess the significant differences between the pre-pandemic (PP) of Covid-19 and during the pandemic (P) of Covid-19 groups with a 5% level of significance. This test was used because it allows us to draw different conclusions about the data depending on the assumptions we make about our data distribution. All the analyses were performed using SPSS, version 24. For this study, household food security was defined based on the answers to four of the questions included in the hunger scale. It is important to note that certain aspects of food security, such as food safety and adequacy, have not been included in the definition of food security applied in this study.

### 2.3 Results and Discussion

This study aims to assess the level of household food security in 5 districts as a whole in the DIY Province during the pandemic of Covid-19. Table 2 shows descriptive statistics from respondents. Based on the region, it is seen that respondents were dominated by Sleman as follows Bantul, Gunung Kidul, Kulon Progo, and the last Yogyakarta city. Proportional random sampling was applied in this study.

**Table 2.** Characteristics of Respondent Households

	Percentage (%)
<b>District</b>	
Bantul	26.2
Gunung Kidul	18.0
Kulon Progo	12.3
Sleman	32.8
Yogya city	10.7
<b>Age</b>	
21-30	20.5
31-40	49.2
41-50	18.9
>51	11.5
<b>Number of Families</b>	
2	9.0
3	17.2
4	36.1
≥5	37.7

Most of the respondents were 31-40 years old (48.2%), which shows that most of the respondents who were the heads of family were in productive age. This data supported the fact that more than 73% of Yogyakarta's people were in productive age (BPS Provinsi DIY, 2019). It was assumed that the family could do anything in their power to meet the needs of the household. The number of families in this study was various, the number of families that was  $\geq 5$  was 37.7% and followed with 4 (36.1%), 3 (17.2%), and the last was 2 (9.0%). The number of families included husband, wife, son, and another relative in the house. The number of families is one characteristic associated with increasing income, include household food consumption. The bigger number of families, the more money needed to spend on food and else. From the data, we could see that more than half of the respondents were big families with the number of families more than 3. The big number of families could be affected by the presence of another relative in the house like mother/father in law, grandparents, etc. The contraceptive prevalence rate in Yogyakarta was more than 70% (Bappeda DIY, 2018) could mean that Yogyakarta's households liked to follow the government's rule about family planning with the number of children not more than two.

**Table 3.** Socio-demographic status of respondents in the COVID-19 prepandemic and during pandemic

	Percentage (%)		p-value
	Prepandemic	Pandemic	
<b>Employment status of the respondent</b>			0.010
Employed	17.2	22.1	
Self-employed	9.0	9.8	
Full-time wage earner (receive a salary)	70.5	65.6	
Other	3.3	2.5	
<b>Household income per month</b>			0.010
<Rp. 1.000.000	6.6	13.1	
Rp. 1.000.001 - Rp. 2.500.000	18.9	24.6	
Rp. 2.500.001 - Rp 4.000.000	32.0	23.8	
Rp. 4.000.001 - Rp 6.500.000	17.2	14.8	
>Rp. 6.500.001	25.4	23.8	
<b>How much money is spent on food for household monthly?</b>			0.317
< Rp. 500.000	8.2	11.5	
Rp. 500.001 - Rp. 1.500.000	51.6	42.6	
Rp. 1.500.001 - Rp. 3.000.000	31.1	34.4	
>Rp 3.000.001	9.0	11.5	
<b>How much money is spent on medicine and personal health?</b>			0.000
< Rp. 500.000	84.4	58.2	
Rp. 500.000 - Rp. 1.500.000	13.9	36.9	
Rp. 1.500.001 - Rp. 3.000.000	1.6	4.1	
>Rp 3.000.000	0.0	0.8	

In Table 3, the socio-demographic status of households is described. In the prepandemic-Covid-19 condition, most respondents (70.5%) were full-time wage earners followed with (17.2%) unemployed, included freelancers or part-time workers, 9% was self-employed, and 3.3% in retirement. The pandemic- Covid-19 changed the employment status, full-time wage earner respondents decreased to 65.6%. This finding is agreed by Silpa (2020). His research explained that more than 1,5 million people were fired due to the Covid-19 pandemic effect. Retirement respondents also decreased to 2.5%; it was caused by a crucial crisis during the

Covid-19 pandemic, which forced both unemployed or self-employed to go back to work. This result was followed by unemployed and self-employed status, which both of them increased to 22.1% and 9.8%. The loss of job and low-income level were the most important factors affecting food security (Loopstra & Tarasuk, 2013), on the other hand, poverty and food insecurity were closely linked in Indonesia, low income is one of the main factors that drive households into food insecurity, especially in rural areas (Sleet, 2020). It was also found that food insecurity was significantly caused by unemployment (Abdullah et al., 2019). If the worker is working full-time, their income will be higher rather than part-time; this increased income enables the households to buy food items and other services. Increasing the income of the households may be an attempt to overcome food insecurity in this region. For the employment status of the respondent, the alteration is statistically significant ( $p$ -value = 0.01), this means that the Covid-19 pandemic affects the employment status.

On the other hand, household income is the amount of money earned from work in a month. In this study, household incomes include primary work and part-time work. There was an economic impact because of Covid-19, it also affected household income (Femandes, 2020). The economic impacts had dramatic effects on the wellbeing of families and communities, for vulnerable families, lost income due to an outbreak could translate to spikes in poverty, missed meals for children, and also reduced access to healthcare (Evans & Over, 2020).

Household income changed during the Covid-19 pandemic. Household income in rate Rp 4,000,001 – Rp 6,500,000 and more than Rp 6,500,001 decreased from 17.2% and 25.4% to 14.8% and 23.8%. Of course, it affected their household expenses, especially in the food sector. Although the income of the households could not alone explain the food security status, many households were food insecure even though their income was high (Coleman-Jensen et al., 2014). The drops of the household income are statistically significant ( $p$ -value = 0.01). This condition, once again, was affected by the Covid-19 pandemic, agreed by Evans and Over (2020).

Household expenses consist of the food sector and the non-food sector. Household expenses for the food sector were calculated on average in a month. Most respondents spent money on food monthly in rate Rp 500,001-Rp 1,500,000 both in the prepandemic and during pandemic were 51.6% and 42.6%, food expenses in rate more than Rp 500,000 increased in prepandemic, from 8.2% to 10.2%. It means the households had to reduce their food expenses because it was affected by Covid-19 pandemic. During the pandemic, from the data, many households reported income losses which affected fewer food expenses. Otherwise, for the food expenses of households, the drop is not statistically significant ( $p$ -value = 0.317). This could happen because food expenses were the important ones, although not the highest portion of their budget, which means the respondents preferred to reduce another budget rather than food expenses. This finding is agreed by Coibion et al. (2020) that explained consumer spending dropped by 31 log percentage points with the largest drops in travel and clothing.

However, the different results showed in rate Rp 1,500,001 – Rp 3,000,000 which seemed to increase during the Covid-19 pandemic from 1.6% to 4.1%. However, the negative association found between household food expenses and food insecurity supporting the hypothesis that household food expenses may play a protective role against food insecurity during the Covid-19 pandemic. The negative association could occur because prices of basic foods have begun to rise at a time that affected respondents to prefer to spend more money to get their usual food



rather than to buy another cheaper one. This data also explained that households tried to survive during the Covid-19 pandemic by avoiding hunger. This finding agrees by Nicola et al. (2020) that the food sector was facing increased demand due to panic-buying and also stockpiling of food products. These respondents had the purchasing power to increase their food purchases. It was also explained by Firdaus & Cahyono (2017) that purchasing power is one factor that influences food security. In the food security situation, fear that food will run out shortly will influence the proportion of food spent (Abdullah et al. 2019). Food security encompasses access to nutritious, safe food, and sufficient calories but not every person has the same dietary needs (Bunji & De Muro, 2016). There are interrelations between food security, food consumption and addressing in particular, and the labeling of food items, which help households to choose their groceries properly, as well as may assist sustainable consumption patterns (Ramos & Squeff, 2020). The Covid-19 pandemic crisis forced the respondents to think about household consumption wisely.

Mothers have an important role in making household consumption decisions. Also, it is expected that mothers can always carry out sustainable consumption behaviours and teach and educate children about sustainable consumption behaviours (Prastiwi & Rabia, 2019).

On the other hand, the need for non-food expenses which increasing was medicine and sanitizer. In the medicine and sanitizer expenses of households, the number is statistically significant ( $p$ -value = 0.00). This finding agrees by Nicola et al. (2020) that the need for medical supplies has significantly increased. It is because Covid-19 was forcing people to improve their health conditions and personal hygiene by always providing medicine and sanitizers. Health conditions are considered important in causing food insecurity among households (Abdullah et al., 2019).

**Table 4.** Accessibility of food during prepandemic and pandemic in DIY

	Prepandemic		During pandemic		<i>p</i> -value
	Number	Percentage	Number	Percentage	
<b>Carbohydrates dietary</b>					0.317
Rice	121	99.2	119	97.5	
Others	1	0.8	3	2.5	
<b>Protein dietary</b>					0.000
Meat products	25	20.5	14	11.5	
Egg	53	43.4	46	37.7	
Fish	11	9	6	4.9	
Tempeh or tofu	31	25.4	51	41.8	
Others	2	1.6	5	4.1	
<b>Households food sources</b>					0.006
Markets purchase	102	83.6	90	73.8	
Own production	11	9	16	13.1	
Others	9	7.4	16	13.1	
<b>Food preparation</b>					0.000
Self preparation	91	74.6	116	95.1	
Restaurant purchase	20	16.4	0	0	
Others	11	9	6	4.9	
<b>Personal hygiene during the food process</b>					0.011
Yes	109	89.3	117	95.9	
No	13	10.7	5	4.1	

Table 4 describes the accessibility of foods as reported by the households included in the study. Most respondents during prepandemic and pandemic consumed rice with the percentage of 99.2% and 97.5%, respectively. This result indicates that there was no difference in their carbohydrates dietary, even though dietary diversity is the reflection of food security and this measurement is useful to describe food consumption patterns at the micro-level (Firdaus & Cahyono, 2017). This data is affected by the fact that rice is the Indonesian staple food, given the high dependency on rice. This is also affected by the belief that consuming rice gives a fulfilled feeling than consuming non-rice. This statement is agreed by Widyanti et al (2014) who explained wrong beliefs in Indonesians that eating non-rice staples makes them dizzy, gives a feeling of have not eaten yet, and makes someone weak. This fact forced respondents to always consume rice both in the prepandemic and pandemic.

Household protein dietaries in the prepandemic-Covid-19 were egg (53%), meat (20.5%), and tempeh or tofu (25.4%). However, it changed in the pandemic which were tempeh or tofu (41.8%), egg (37.7%), and meat (11.5%). The changing of protein sources could be affected by food expenses changes. Respondents preferred to spending their money on protein sources with low prices due to income losses. The "Lockdown" period during the Covid-19 pandemic changed the dietary and lifestyle of the adult. The overweight due to bodyweight changed during the Covid-19 pandemic which means higher intake of carbohydrates following by less workout (He et al., 2020). This result implies low dietary diversity, especially carbohydrates, which has been linked in other studies with an increased risk of overweight and its related comorbidities. Food insecurity and obesity are positively associated with adult women but not men (Frongillo & Bernal, 2014).

Consumption patterns and dietary diversity influence food security, but diversified food consumption patterns are determined by some factors (Firdaus & Cahyono, 2017). De Cock et al. (2013) explained that a higher dietary diversity score indicates better food security status. It was found that there is a strong association between food security with diet quality; that derives from intrahousehold differences in food allocation and/or intake (Bouis et al., 2011). Dietary diversity can be a proxy for nutritional adequacy measurement (Jones et al., 2014) and also can measure food and nutrition security (Orne-Lyman et al., 2010). For the carbohydrates dietary of the respondents, the alteration is not statistically significant ( $p\text{-value} = 0.317$ ), but for the protein dietary, the alteration is statistically significant ( $p\text{-value} = 0.00$ ). The majority of the sample was 83.6% and 73.8%, both had access to food including fruit and vegetables sold by local farmers and shop; this does not, however, indicate that these foods were routinely purchased.

This study also showed that less than half of both prepandemic and pandemic almost in five districts provided their food source by own (9% prepandemic; 13.1% during pandemic). Based on food security basic concepts by FAO (2008) that providing food sources by own means that they could cope with the pandemic, and the risk of food insecurity could still below. Whereas family farming has been promoted as a means to overcome rural poverty and food insecurity worldwide (IFAD, 2013), also evidence suggests that family farming practices play an essential role in sustainable food security (MacGregor & Abrams, 1996). The different results showed in food preparation. More than 74.6% of respondent in the prepandemic had self-preparation, and 16.4% purchased from the restaurant, and 9% was catering-buyer. However, during pandemic, mostly 95.1% of respondent chose self-preparation, and only 4.9% chose

catering-buyer. In this situation, housewives' education is important, especially because food preparation and serving are done by them (Asghar & Muhammad, 2013). Which must be considered, Indonesian households indicate that they still focus on the quantitative adequacy of foods, and not yet on nutritional content and quality (Saediman et al., 2019). This fact is also explained by Prasetya, et al. (2014), that Indonesian food consumption is characterized by three factors. First, the low level of diversification, lack of quality, and being dominated by carbohydrate dietary. And second, a low level of consumption of fruits, vegetables, and beans. The last is inadequate nutrient intake.

The changing of food preparation was because the pandemic forced the respondents to be more hygienic, and considered the health factor. Besides, this study also showed that more than 89.3% of respondents considered the hygiene system during food processing in the pre-pandemic and increased to 95.9% during the pandemic. Again, it was because people realized that the concept of personal hygiene included food processing. For the households, the alteration of food sources is statistically significant ( $p$ -value = 0.006) and food preparation and personal hygiene during food processing are statistically significant ( $p$ -value = 0.00 and 0.011).

**Table 5.** Hunger scale of pre-pandemic and pandemic COVID 19 in DIY

	Pre-pandemic		Pandemic	
	Number	Percentage	Number	Percentage
<b>The family currently experiencing a food shortage</b>				
Yes	8	6.6	16	13.1
No	114	93.4	106	86.9
<b>Runs out of money to buy food</b>				
Yes	10	8.2	14	11.5
No	112	91.8	108	88.5
<b>Skip meals because no enough food in the house</b>				
Yes	4	3.3	9	7.4
No	118	96.7	113	92.6
<b>Eat less because there is not enough money for food</b>				
Yes	10	8.2	25	20.5
No	112	91.8	97	79.5

For this study, household food security was defined based on the answers to four of the questions included in the hunger scale. First, does the family currently experience food shortage? Second question, does the household run out of money to buy food? Third question, does the family cut the size of meals or skip meals because there is not enough food in the house? Fourth question, does the family eat less because there is not enough money for food? A score of more than 2 out of the possible 4 classified the household as having a high risk for food insecurity (Walsh & van Rooyen, 2015). The hunger scale also explained that Covid-19 affected the increase in food insecurity, especially in the DIY Province.

Based on Table 5, it showed that the household hunger scale in the DIY Province was 6% in the pre-pandemic and increased during pandemic to 11%. Food shortage during pandemic-Covid-19 was getting worse because the Covid-19 crisis was generating spillover effects throughout supply chains, especially food (Fernandes, 2020). This result also proved that the

financial crisis because of Covid-19 also influenced the increasing household food insecurity. Household food insecurity means that welfare level or food security has is still low. This result showed that during pre-pandemic and pandemic-Covid-19, households were either at risk for food insecurity. Although the results of this study cannot be generalized to all districts in DIY, this study provides evidence that all other factors are remaining constant, the hunger scale may affect food insecurity.

Concerns about food running out mean that vulnerable populations who can not afford to stockpile, may not find food (Nicola et al., 2020). Food insecurity was prevalent in both the pre-pandemic and pandemic, although the problem was getting worse in the pandemic. Relief measures needed to be implemented and also adjusted for those that might fall through the cracks immediately. Various coping strategies were used to overcome hunger in times of food shortage (Walsh & van Rooyen, 2015). Preventing food insecurity; households could experience such concern; by reducing the variety of foods consumed and by borrowing food and money. Selling assets, accepting gifts, and collecting food from the wild was also reported by food-insecure households (Ghattas et al., 2013).

#### 2.4 Conclusion

This study aims to assess the level of household food security in 5 districts as a whole in the DIY Province during the pandemic of Covid-19. Food insecurity was prevalent in both in the pre-pandemic and pandemic included in this study, although the problem was getting worse at the pandemic situation. Economic development is the most obvious strategy to address the problem of food insecurity, although it does not offer an immediate solution. In the shorter term, interventions to improve food availability and access to food in the communities included in this study, need to be emphasized. As far as future research is concerned, the impact of food insecurity in vulnerable groups within the studied communities needs to be determined. This study can be valuable information in further research and also information for the government, mainly to prevent food insecurity during the pandemic. Furthermore, implementation and evaluation of interventions to address these issues could go a long way to finding relevant and sustainable solutions to food insecurity during the Covid-19 pandemic situation.

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