DESCRIPTION OF FOOD INTAKE AND PHYSICAL ACTIVITY RELATED TO THE EVENT OF OBESITY IN ADOLESCENT AGES 16-18 YEARS OLD

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ARTICLE INFO	ABSTRACT
	Obesity is a health problem caused by excessive fat accumulation which causes a person to gain weight far above normal. Adolescence is also a period that is vulnerable to obesity, because in adolescence biological, psychosocial and cognitive changes begin to occur which begin during puberty and have a direct effect on the nutritional status and needs of adolescents. Unexpected health problems occur around the world which have resulted in a pandemic, namely the Covid-19 pandemic. This pandemic has changed several habits that can lead to health problems, namely the occurrence of being overweight above normal as happened to teenagers in the Sendangmulyo Village area. To find out the description of food intake and physical activity related to the incidence of obesity in adolescents aged 16-18 years in Sendangmulyo Village during the Covid-19 pandemic. Included in the nutritional research field of society using a cross sectional approach. The sample used in the study was 35 teenagers who live in Sendangmulyo Village. Intake data was collected twice 24 hours using the recall method and physical activity data was collected once by filling out a questionnaire. Most respondents have overweight nutritional status as many as 16 people (42.9%) with adequate energy intake (40%), with sufficient protein adequacy (45.7%), excess fat adequacy (60%) carbohydrate adequacy which is still lacking (57.1%) accompanied by low activity (54.3%). The majority of respondents have overweight nutritional status with sufficient energy and protein, but fat adequacy is still classified as excess, carbohydrate adequacy is still lacking and physical activity is still classified in the low category.
KEYWORDS	

INTRODUCTION

Nutritional problems in Indonesia enter a dual nutritional problem, namely undernutrition and overnutrition which can lead to obesity which can occur in children to adulthood (Sartika, 2011). Obesity is a condition where there is excessive fat accumulation which causes a person to gain weight far above normal and can cause several health problems (Vlachos et al., 2015). It was also written that overweight and obesity have become serious health problems since the beginning of the 21st century (Lipsky et al., 2012).

In Indonesia itself, according to the results of basic research or Riskesdas 2018 that the obesity rate in adolescents and adults in Indonesia increased to 21.8 percent. While in Central Java Province the proportion of obesity aged 15 years was 21.5% and the proportion of obesity aged 15 years in Semarang City was 29.14% and the proportion of obesity at age 15 years in the Kedungmundu Public Health Center area was 8.3% and the largest proportion in Sendangmulyo village with a percentage of 34.7%. The international classification of anthropometric measurement methods to determine the degree of obesity is based on Body Mass Index (BMI) (Putri, Decroli, & Nasrul, 2015) The Indonesian Ministry of Health wrote that obesity itself refers to a condition where the Body Mass Index (BMI) value is above 27.

Adolescence (10-18 years) is a period of nutritional vulnerability due to various causes and factors. Factors causing obesity in adolescents are multifactorial. Increased consumption of fast food (fast food), low physical activity, genetic factors, the influence of advertising, psychological factors, socioeconomic status, diet program, age, and gender are factors that contribute to changes in energy balance and lead to obesity (Kurdanti et al., 2015).

Adolescence is also a period that is vulnerable to obesity, because in adolescence biological, psychosocial and cognitive changes begin to occur which begin during puberty and have a direct effect on the nutritional status and needs of adolescents (Suryandari & Widyastuti, 2015). Obesity in adolescents is closely related. with intake that can affect body weight. Obesity is the result of an imbalance between energy intake and energy output in the long term, resulting in excessive accumulation of fat tissue. High energy intake is caused by excessive food consumption, while low energy output is caused by low physical activity (Pramono & Sulchan, 2014). Fast food consumption in adolescents is categorized as frequent and very often associated with an increase in BMI in adolescents.

At this time the world is experiencing an unexpected life-changing event due to the Covid-19 pandemic. Due to the very fast spread and the absence of a vaccine, the government has made a policy to reduce the spread of Covid-19. The Indonesian government makes a policy for the community to implement the implementation of Large-Scale Social Restrictions in which people are encouraged to reduce outdoor activities and stay at home (Ardella, 2020). This causes a lot of people to work from home or online school so that people spend more time at home (Jiménez-Pavón, Carbonell-Baeza, & Lavie, 2020). In a study conducted by Widayati, et al revealed that there were significant changes in students, namely increased food intake with less activity. Efforts to reduce the spread of the Covid-19 virus, the government also recommends implementing physical distancing where there are restrictions on activities outside the home which then have an impact on physical activity that can be done for health such as decreased exercise (Nurhadi, 2020).

This situation does not rule out the possibility to carry out balanced physical activity, because sufficient physical activity will increase endurance so that it can

suppress excessive inflammatory reactions so that balanced physical activity is needed in accordance with health protocols (Bull et al., 2020) (Kemenkes RI, 2019).

Based on the description above, the researcher is interested in conducting a study with the title "Overview of Food Intake and Physical Activity related to the incidence of Obesity in Adolescents aged 16-18 years in Sendangmulyo Village during the Covid-19 Pandemic".

RESEARCH METHOD

This research is a research in the field of community nutrition that focuses on the description of food intake and physical activity related to the incidence of obesity in adolescents aged 16-18 years in the Sendangmulyo Village area, Semarang. The location of the research was carried out in the working area of the Kedungmundu Health Center in adolescents aged 16-18 years who lived in Sendangmulyo Village, Tembalang, Semarang City, Central Java.

The type of research used in this study is descriptive, namely the type of research conducted to describe how intake and activity in adolescents are related to the incidence of obesity in Sendangmulyo Village, Tembalang District, Semarang City. This research is a cross-sectional study, namely research that is carried out at one time without following the development of the variables. The independent variables in this study were food intake (including energy intake, protein intake, fat intake and carbohydrate intake) and physical activity while the dependent variable was adolescents.

The population in this study were adolescents aged 16-18 years who were in the working area of the Kedungmundu Health Center and resided in Sendangmulyo Village, Tembalang District, Semarang City. The sample used in this study were adolescents aged 16-18 years who lived in the Sendangmulyo Village area and were recorded in the register records of the Kedungmundu Health Center, Tembalang District, Semarang City in March-April. The samples taken were determined using the following cross sectional formula:

$$n = \frac{Z^2_{1-a/2} * P(1-P)N}{d^2(N-1) + Z^2_{1-a/2} * P(1-P)}$$

Information :

n = number of samples
$Z_{f-a/2}$ = Z value at alpha 0.10 (1.64)
P = the proportion of obese adolescents in Sendangmulyo Village   at the Kedungmundu Health Center (34.7%)
d = *The degree of precision used is 0.1*
N = the recorded population of teenagers in Sendangmulyo Village
n = minimum sample

Calculation :

$$n = \frac{1,64^2 \; X \; 0,347 \; (1-0,347)84}{0,1^2(83) + 1,64^2 \; X \; 0,347(1-0,347)}$$

n = 35,4

(rounded up to 35 respondents)

In this study, univariate analysis was used to describe research variables which included energy intake, protein intake, fat intake, carbohydrate intake and physical activity.

RESULT AND DISCUSSION

A.   RESEARCH LOCATION DESCRIPTION

The research was conducted in the Sendangmulyo Village, Tembalang District, Semarang City. Sendangmulyo Village oversees 32 RW and 278 RT with an area of ± 358.57 hectares with the boundaries of the area as follows:

1. North side   : Kedungmundu Village
2. East side   : Pedurungan District, Demak Regency.
3. South side   : Meteseh Village
4. On the west side   : Sambiroto Village, Mangunharjo Village..

B.   RESPONDENTS OVERVIEW

The sample in this study were adolescents aged 16-18 years who lived in the Sendangmulyo village area, Tembalang District, Semarang City. The number of samples in this study were 35 samples.

The results in this study are presented in the frequency distribution of adolescents based on age, nutritional status, food intake which includes energy, protein, fat and carbohydrates, as well as physical activity.

The following are the characteristics of the sample overview:

1.   Age

The age of the teenagers who became the respondents was 16-18 years old. The youngest age in this study was 16 years old and the oldest was 18 years old. Most of the respondents in this study were 16 years old. For more details regarding the distribution of respondent data, it is presented in the following table:

Table 1 – Distribution of Respondents by age

Age (years)	n	%
16	16	45.7
17	11	31.4
18	8	22.9
Total	35	100

Based on table 1, it was found that there were more respondents aged 16 years with a total sample of 16 people (45.7%). While the respondents aged 17 years were 11 people (31.5%) and those aged 18 years were 8 people (22.9%).

2.   Gender

The gender of the respondents used in this study were male and female adolescents. For more details, it is presented in the following table

Table 2- Distribution of Respondents by Gender.

Gender	n	%
Male	12	34.3
Woman	23	65.7
Total	35	100.0

Based on table 2 it can be seen that the female sex is more dominant in this study as many as 23 people (53.4%) and the male sex in this study as many as 12 people (34.3%).

C.   DESCRIPTION ANALYSIS

1. Overview of Nutritional Status

Nutritional status obtained by calculating the value of BMI (Body Mass Index) in measuring body weight against height is useful for assessing body fat. The following are

the results of the distribution of the nutritional status of adolescents who were sampled in this study.

Table 3- Distribution of Nutritional Status

nutritional status	n	%
Underweight	1	2.9
Normal	14	40
Overweight	15	42.9
Obesity I	4	11.4
Obesity II	1	2.9
Total	35	100.0

Based on table 3, it can be concluded that most of the nutritional status of the adolescent respondents who were sampled were overweight with 15 teenagers (42.9%). While the rest, adolescents with normal nutritional status as many as 14 people (40%), adolescents with underweight nutritional status as many as 1 person (2.9%), adolescents with obesity nutritional status I as many as 4 people (11.4%) and adolescents with obese nutritional status II as many as 1 person (2.9%). Adolescents with overweight nutritional status are due to frequent consumption of fried foods, consumption of junk food, infrequent consumption of vegetables and fruit and low levels of activity.

2. Frequency Distribution of Energy Adequacy Based on Adolescent Nutritional Status

Energy intake is the average amount of food and drink consumed every day and is expressed in kcal units and the incoming energy intake must be balanced, if there is an imbalance it will cause nutritional problems (Rachmayani, Kuswari, & Melani, 2018)

Table 4 - Energy Adequacy Distribution

Energy Intake	Status Gizi										Total	
	Underweight		Normal		Overweight		Obesity I		Obesity II			
	N	%	N	%	N	%	N	%	N	%	N	%
Not enough	1	100	10	71.4	1	6.7	0	0	0	0	12	34.3
Enough	0	0	4	28.6	8	53.3	1	25	1	100	14	40
More	0	0	0	0	6	40	3	75	0	0	9	25.7
Total	1	100	14	100	15	100	4	100	1	100	35	100

Table 4 shows that one out of one teenager with underweight nutritional status has insufficient energy (100%) because food intake is still lacking with a total energy of only 1126kcal when compared to the energy adequacy which should be 2650kcal. Adolescents with normal nutritional status have insufficient energy adequacy as many as 10 people (71.4%) because the portion consumed is still lacking and those who have sufficient energy adequacy are 4 people (28.6%). Adolescents with overweight nutritional status who have insufficient energy are 1 person (6.7%) while those who have sufficient energy are 8 people (53.3%) and those who have more energy adequacy are 6 people with overweight nutritional status (40.0%). because the intake exceeds the energy adequacy rate that should be, adolescents with obesity I nutritional status are more dominant in having more energy adequacy as many as 3 people (75%) and the rest having sufficient

energy as much as 1 person (25%). And one teenager from one with obesity nutritional status II has sufficient energy sufficiency (100%).

Excess energy adequacy is because teenagers like to consume food more than the proper portion so that the caloric value that comes in exceeds the energy adequacy rate set, namely in women as much as 2100kcal and men as much as 2650kcal. Meanwhile, the lack of energy adequacy is caused by the frequency of eating infrequently with a small portion of food so that the incoming caloric value is not sufficient than what it should be.

3. Frequency Distribution of Protein Adequacy Based on Nutritional Status

Protein intake also affects nutritional status because protein also has a risk of obesity in the future (Qualls et al., 2017). The following is a description of the protein adequacy of the respondents in this study

The following is the distribution of the frequency of protein adequacy on nutritional status.

Table 5- Distribution of Protein Adequacy

Protein Intake	nutritional status										Total	
	Underweight		Normal		Overweight		Obesity I		Obesity II			
	N	%	N	%	N	%	N	%	N	%	N	%
Not enough	1	100	6	42.9	1	6.7	0	0	0	0	8	22.9
Enough	0	0	8	57.1	7	46.7	1	25	0	0	16	45.7
More	0	0	0	0	7	46.7	3	75	1	100	11	31.4
Total	1	100	14	100	15	100	4	100	1	100	35	100

Based on the level of protein adequacy according to the 2019 RDA, adolescents with underweight nutritional status still have insufficient protein, which is obtained from protein intake of only 33.5gr, this figure is still far from the protein adequacy which should be 75gr. Meanwhile, insufficient protein adequacy was also found in 6 adolescents with normal nutritional status (42.9%) and adolescents with other normal nutritional status had sufficient protein adequacy as many as 8 people (57.1%). Adolescents with overweight nutritional status have less protein adequacy as much as 1 person (6.7%) and those who have sufficient protein adequacy and more each as many as 7 people with their respective percentages (46.7%). Meanwhile, adolescents with obesity I nutritional status were more dominant in having more protein adequacy as many as 3 people (75%) and the remaining 1 person had sufficient protein adequacy (25%). Adolescents with obesity II nutritional status have more protein adequacy (100%)

The lack of protein adequacy owned by the respondents in the study was due to the lack of intake of protein sources, both vegetable and animal, so that the total value of protein intake had not reached the adequacy of protein according to the RDA. And it was also found that adolescents who have a protein adequacy rate are more likely to have a habit of consuming side dishes of vegetable and animal protein sources, especially animal protein, namely seafood and other animal meats, while the habit of eating vegetable protein sources is more consuming snacks with the basic ingredients of nuts. Foods that are high in animal protein contain high cholesterol and saturated fatty acids, which have a negative impact on health and are associated with obesity. (Suryandari & Widyastuti, 2015).

4. Frequency Distribution of Fat Adequacy Based on Nutritional Status

The following is the distribution of the frequency of fat adequacy based on the nutritional status of the respondents in the study

Table 6- Distribution of Adequate Fat

Fat Intake	nutritional status										Total	
	Underweight		Normal		Overweight		Obesity I		Obesity II			
	N	%	N	%	N	%	N	%	N	%	N	%
Not enough	1	100	4	100	0	0	0	0	0	0	5	14.3
Enough	0	0	5	35.7	4	26.7	0	0	0	0	9	25.7
More	0	0	5	35.7	11	73.3	4	100	1	100	21	60
Total	1	100	14	100	15	100	4	100	1	100	35	100

Table 6 shows that fat adequacy in 35 respondents has the category of excessive fat intake with a total of 21 adolescents (60%) of adolescents with normal nutritional status as many as 5 (35.7%) adolescents with overweight nutritional status as many as 11 people (73.3) adolescents with nutritional status. obesity I all had excess fat intake as many as 4 people (100%) and one in one obese teenager II also had more fat intake (100%). While the rest had adequate fat intake in adolescents with normal nutritional status as many as 5 people (35.7%), adolescents with overweight nutritional status as many as 26.7%. Adequate fat is also lacking in adolescents with normal nutritional status as many as 4 people (28.6%) and one in one teenager with underweight nutritional status (100%).

From the results of intake recall data, the average fat intake for 35 respondents was 93.1gr. The average fat intake of respondents exceeds the recommended fat adequacy rate of 70 grams for teenage girls and 85 grams for teenage boys. The excess fat intake was due to the sample's diet that preferred foods with high fat content such as fried foods and junk food. Junk food itself is fast food that contains high fat. If junk food is consumed in excess it can cause health problems such as obesity. (Martien, Adhyatmika, Irianto, Farida, & Sari, 2012)

5. Frequency Distribution of Carbohydrate Adequacy Based on Nutritional Status

The following table shows the distribution of protein adequacy on nutritional status.

Table 7- Distribution of Protein Adequacy

Kh intake	nutritional status										Total	
	Underweight		Normal		Overweight		Obesity I		Obesity II			
	N	%	N	%	N	%	N	%	N	%	N	%
Not enough	1	100	13	92.9	5	33.3	0	0	1	100	20	57.1
Enough	0	0	1	7.1	9	60	3	75	0	0	13	37.1
More	0	0	0	0	1	6.7	1	25	0	0	2	5.7
Total	1	100	14	100	15	100	4	100	1	100	35	100

Based on table 10, it was found that the carbohydrate adequacy of the 35 samples was still classified as lacking with the number of adolescents being 20 people (57.1%) and the carbohydrate adequacy which was classified as sufficient as many as 13 people (37.1%) and the remaining 2 people having more carbohydrate intake. overweight (6.7%) and one teenager with obesity nutritional status I (25%). Carbohydrates are a source of

energy that plays an important role, the source of carbohydrates itself, especially in the form of simple sugars that are easily soluble in water and easily carried to all cells to provide energy. This is related to carbohydrate intake in the sample that consumes less high-carbohydrate foods compared to fat consumption which also contributes the most energy to intake. However, it was also found in adolescents with obesity nutritional status I in women who had a carbohydrate intake of 364.4gr/day. This figure exceeds the recommended carbohydrate intake. The recommended carbohydrate intake for men is 430gr/day while for women it is 300gr/day.

6. Overview of Physical Activity

If there is an imbalance between physical activity expended and energy intake, it will also affect the nutritional status of obesity. The following is a description of physical activity in adolescents aged 16-18 years:

Table 8- Distribution of Physical Activity

Physical activity	nutritional status										Total	
	Underweight		Normal		Overweight		Obesity I		Obesity II			
	N	%	N	%	N	%	N	%	N	%	N	%
Low	0	0	7	50	7	46.7	4	100	1	100	19	54.3
Currently	0	0	3	21.4	7	46.7	0	0	0	0	10	28.6
Heavy	1	100	4	28.6	1	6.7	0	0	0	0	6	17.1
Total	1	100	14	100	15	100	4	100	1	100	35	100

In table 8 it can be concluded that most of the adolescents who were respondents still had low levels of physical activity, as shown in 19 out of 35 adolescents who had low physical activity (54.3%). Adolescents with normal nutritional status had low physical activity as many as 7 people (50%) with moderate physical activity 3 people (21.4%) and teenagers with normal nutritional status who had heavy physical activity as many as 4 people (28.6%). Adolescents with overweight nutritional status who had low and moderate activity were 7 people with each percentage (46.7%) and one teenager with overweight nutritional status had strenuous activity. Meanwhile, adolescents with obesity nutritional status all have low activity.

The low activity of the respondents mostly have activities in the house. Due to the government's policy regarding the online learning system, the teenagers who were the sample participated in the learning process from inside the home. So that the activities carried out by teenagers are included in the activities of the low category. With an online learning system, it is possible for teenagers to take part in learning while eating and drinking. This also affects the level of intake because usually in face-to-face learning at school it is not allowed to take part in learning while eating or drinking in class.

There are also some teenagers who spend their time playing gadgets, watching movies and relaxing. It affects low levels of physical activity. The influence of government policies on large-scale social restrictions during the COVID-19 pandemic is also slowly affecting the habits of teenagers who usually spend their time shopping or just walking around the mall now prefer to shop at online shops. Here it can be concluded that an imbalance in intake and physical activity can affect a person's nutritional status, shown in obese adolescents who all have low activity because they often do light activities, namely sitting, sleeping without being balanced with heavy physical activity such as exercising. Especially when the Covid-19 pandemic in Indonesia is one of the factors in carrying out social restrictions outside the room, so that outdoor physical activity such as before the Covid-19 pandemic is reduced and the time that should be used for exercise is spent playing cellphones, watching TV and relaxing.

CONCLUSION

Based on the results and discussion of the research above, it can be concluded that: Most of the adolescents in this study were overweight as many as 15 people (42.9%). Of the 35 samples, most of the adolescents had sufficient energy in the sufficient category (40%). Adequacy of protein from 35 samples was sufficient as many as 16 people (45.7%). Adequate fat intake in 35 samples of adolescents still dominates the more category in 21 adolescents (60%). Physical activity in 35 adolescents is still low in 19 adolescents (54.3%).

REFERENCES

Ardella, Karina Belinda. (2020). Risiko kesehatan akibat perubahan pola makan dan tingkat aktivitas fisik selama pandemi covid-19. *Jurnal Medika Hutama*, *2*(01 Oktober), 292–297.

Bull, Fiona C., Al-Ansari, Salih S., Biddle, Stuart, Borodulin, Katja, Buman, Matthew P., Cardon, Greet, Carty, Catherine, Chaput, Jean Philippe, Chastin, Sebastien, & Chou, Roger. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine*, *54*(24), 1451–1462.

Jiménez-Pavón, David, Carbonell-Baeza, Ana, & Lavie, Carl J. (2020). Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people. *Progress in Cardiovascular Diseases*, *63*(3), 386.

Kemenkes RI, Kemenkes R. I. (2019). *Pedoman Gizi Seimbang*. Stikes Perintis.

Kurdanti, Weni, Suryani, Isti, Syamsiatun, Nurul Huda, Siwi, Listiana Purnaning, Adityanti, Mahardika Marta, Mustikaningsih, Diana, & Sholihah, Kurnia Isnaini. (2015). Faktor-faktor yang mempengaruhi kejadian Obesity pada remaja. *Jurnal Gizi Klinik Indonesia*, *11*(4), 179–190.

Lipsky, Benjamin A., Berendt, Anthony R., Cornia, Paul B., Pile, James C., Peters, Edgar J. G., Armstrong, David G., Deery, H. Gunner, Embil, John M., Joseph, Warren S., & Karchmer, Adolf W. (2012). 2012 Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. *Clinical Infectious Diseases*, *54*(12), e132–e173.

Martien, Ronny, Adhyatmika, Adhyatmika, Irianto, Iramie D. K., Farida, Verda, & Sari, Dian Purwita. (2012). Perkembangan teknologi nanopartikel sebagai sistem penghantaran obat. *Majalah Farmaseutik*, *8*(1), 133–144.

Nurhadi, Jihan. (2020). Pengaruh Pandemi Covid-19 terhadap Tingkat Aktivitas Fisik pada Masyarakat Komplek Pratama, Kelurahan Medan Tembung. *Jurnal Health Sains*, *1*(5), 294–298.

Pramono, Adriyan, & Sulchan, Mohammad. (2014). Kontribusi makanan jajan dan aktivitas fisik terhadap kejadian Obesity pada remaja di kota Semarang. *Gizi Indonesia*, *37*(2), 129–136.

Putri, Andi Fadilah Yusran, Decroli, Eva, & Nasrul, Ellyza. (2015). Hubungan Derajat Obesity dengan Kadar Gula Darah Puasa pada Masyarakat di Kelurahan Batung Taba dan Kelurahan Korong Gadang, Kota Padang. *Jurnal Kesehatan Andalas*, *4*(3).

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Qualls, Noreen, Levitt, Alexandra, Kanade, Neha, Wright-Jegede, Narue, Dopson, Stephanie, Biggerstaff, Matthew, Reed, Carrie, Uzicanin, Amra, Group, C. D. C. Community Mitigation Guidelines Work, & Group, C. D. C. Community Mitigation Guidelines Work. (2017). Community mitigation guidelines to prevent pandemic influenza—United States, 2017. *MMWR Recommendations and Reports*, *66*(1), 1.

Rachmayani, Siti Andina, Kuswari, Mury, & Melani, Vitria. (2018). Hubungan Asupan Zat Gizi dan Status Gizi Remaja Putri di SMK Ciawi Bogor. *Indonesian Journal of Human Nutrition*, *5*(2), 125–130.

Sartika, Ratu Ayu Dewi. (2011). Faktor risiko Obesity pada anak 5-15 tahun di Indonesia. *Makara Kesehatan*, *15*(1), 37–43.

Suryandari, Beti Dwi, & Widyastuti, Nurmasari. (2015). Hubungan Asupan Protein dengan Obesity pada Remaja. *Journal of Nutrition College*, *4*(4), 492–498.

Vlachos, Ioannis S., Paraskevopoulou, Maria D., Karagkouni, Dimitra, Georgakilas, Georgios, Vergoulis, Thanasis, Kanellos, Ilias, Anastasopoulos, Ioannis Laertis, Maniou, Sofia, Karathanou, Konstantina, & Kalfakakou, Despina. (2015). DIANA-TarBase v7. 0: indexing more than half a million experimentally supported miRNA: mRNA interactions. *Nucleic Acids Research*, *43*(D1), D153–D159.