

# Impact of Virtual Education on Obesity Knowledge, Attitude, and Practice

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## Abstract

**Background:** Obesity has been one of the most concerning world-wide health problems due to its increase in number every year. In order to raise public awareness, direct face-to-face education is one of the methods that can be implemented. Ongoing COVID-19 pandemic and government's countermeasures, however, limit offline activities, driving people to use online educational platforms instead, which has not been explored as much. Therefore, this study aims to examine the impact towards knowledges, attitudes and practices of productive age-population after receiving virtual education regarding obesity.

**Methods:** A quasi-experimental study was conducted to a group of productive-age-population in Surabaya, Indonesia. The population received an intervention through virtual education, and results were collected using a questionnaire, comparing the pre-test to the post-test results.

**Results:** Results from 19 participants who met the eligibility criteria were analysed using paired t-test for knowledge and Wilcoxon signed-rank test for attitude and practice. Despite no significant differences in knowledge and attitude domains ( $p = 0.077$ ;  $p = 0.640$ ), the result shows a significant increase in the attitude domain ( $p = 0.038$ ) after intervention.

**Conclusion:** This study showed an improvement of attitude regarding obesity after receiving online education. However, the results were not the same in knowledge and practice domains. Therefore, further studies regarding the impact of online education method are necessary to confirm the current findings.

*Keywords:* obesity; attitude; knowledge; practice; online education; pandemic

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## 1. Introduction

Obesity is considered as one of the world's health problems (Engin and Engin 2017). In 2016, around 650 million people of the world's population aged eighteen years and over suffer from obesity. The number of this non-communicable disease has reached three times the number of obesity incidents in 1975 (World Health Organization 2021). In Indonesia, based on Baseline Health Research 2018, around 21.8% of the adult population are obese, and as many as 31% of the population aged fifteen years have central obesity. This number has increased compared to Baseline Health Research's data in 2013 (Ministry of Health of the Republic of Indonesia 2018). Results from the obesity examination in 2018 on 1 million residents in Surabaya showed that the number of obese people was 15.51% with a proportion of 14.6% in men and 16.0% in women (Surabaya City Health Office 2019). Obesity, especially central obesity, is strongly associated with the incidence of various non-communicable diseases such as cardiovascular disease (Engin and Engin 2017; Inoue et al. 2018). In addition, there is also a correlation between body mass index (BMI) and insulin resistance as a pathological mechanism for various metabolic diseases and cancer (Stefan et al. 2013).

A study has proven that there was a negative association between the level of public education and obesity. In contrast, socioeconomic conditions actually provide a positive association (Mosli et al. 2020). Another study also demonstrated that there is a correlation between knowledge and physical activity with the incidence of obesity in female employees. A person's knowledge about nutrition affects the act of selecting food for daily intake. Public knowledge regarding adequate nutrition is a major factor to prevent an increase in morbidity and in mortality from various diseases catalyzed by obesity (Jaminah and Mahmudiono 2018). In order to improve the community's knowledge and concern regarding obesity, efforts that aim to raise public awareness are required, for example, using face-to-face education methods to promote ideal weight loss (Hurkmans et al. 2018).

However, since the first report of a novel pneumonia disease outbreak (COVID-19) in December 2019, social activities involving direct person-to-person communication have become more limited. In 2021, COVID-19 cases are still high in number across the world. Preventive measures for the transmission of COVID-19, including lockdown, quarantine, and social distancing, have been implemented widely in many countries (Wang et al. 2021). However, these restrictions have also affected person-to-person educational and counseling activities. Due to this situation during a pandemic, online educational platforms have become more favored. (Ariani and Tawali 2021; Hermanto and Srimulyani 2021). A study by (Driscoll et al. 2012) showed that online and face-to-face learning have no significant differences in terms of their satisfaction. Furthermore, the study also argued that online learning with an appropriate design will be as effective as the conventional learning method. However, in contrast, another study discussing the effectiveness of online learning for students showed that online learning continues to be more ineffective (Dewantara and Nurgiansah 2020). Therefore, in this study, we further examined the impact of virtual education in the knowledge, attitudes, and lifestyle practices regarding obesity of the productive-age population in Surabaya, East Java, Indonesia.

## 2. Materials and Methods

This study is a part of a bigger research conducted by the RADIALIS Research Group with the title of "Impact of interactive virtual education on knowledge, attitude, and practice regarding metabolic syndrome of productive age population in Surabaya". The study was approved by the Health Research Ethics Committee,

Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia (48/EC/KEPK/FKUA/2021) and was performed based on the relevant guidelines and regulations

### *2.1. Study design*

This study was conducted using a quasi-experimental method with pre-test and post-test for a single group from 20 February to 6 March of 2021.

### *2.2. Study site, sampling, and study participants*

This study took place in Surabaya in East Java, Indonesia, in which Ketabang and Pacar Keling sub-districts were selected for the purpose of this study, following the social education event held by AMSA-Unair. Participants were selected with a non-randomized total sampling method. Participants with the age of 15 to 64 years (productive age) who had given their consent and has an access to the Zoom Cloud Meetings platform will be included, while participants who did not attend nor complete the educational program or participants who did not complete the given pre-test and post-test.

### *2.3. Measurement tool and data collection procedure*

Demographic variables and three domains including knowledge, attitude, lifestyle practice regarding obesity were recorded using a self-reported pre-test and post-test survey. The questionnaires were developed using Google Forms ([docs.google.com/forms](https://docs.google.com/forms)) and was originally written in Bahasa Indonesia. Before the data collection, participants were provided with a summary guidebook regarding the complete study procedures. Participants were contacted one day before starting an educational intervention to obtain the pre-test data and consent to participate. On 21 February 2021, an educational intervention consisting of two primary sessions was conducted through the Zoom Cloud Meetings (Zoom Video Communications, Inc., San Jose, CA, USA). The participants were educated using one-way teaching method and interactive videos regarding knowledge, attitude, lifestyle practice needed related to obesity in the first 40-minutes session. The second session was a 15-minutes question-and-answer session where the participants could discuss regarding the provided education. The sessions were presented virtually online by an expert in the related field. A post-test was then performed using the same questionnaire in a period of up to 6 March 2021.

### *2.4. Assessment of participants' knowledge, attitude, and practice*

Demographic variables and three domains including knowledge, attitude, lifestyle practice regarding obesity were recorded using a self-reported pre-test and post-test questionnaires. The questionnaires were developed using Google Forms ([docs.google.com/forms](https://docs.google.com/forms)) and was originally written in Bahasa Indonesia. Before the data collection, participants were provided with a summary guidebook regarding the complete study procedures. Participants were contacted one day before starting an educational intervention to obtain the pre-test data and consent to participate. On 21 February 2021, an educational intervention consisting of two primary sessions was conducted through the Zoom Cloud Meetings (Zoom Video Communications, Inc., San Jose, CA, USA). The participants were educated using one-way teaching method and interactive videos regarding knowledge, attitude, lifestyle practice needed related to obesity in the first 40-minutes session. The second session was a 15-minutes question-and-answer session where the participants could discuss regarding the provided education. The sessions were presented virtually online by an expert in the related field. A post-test was then performed using the same questionnaire in a period of up to 6 March 2021.

## 2.5. Data processing and statistical analysis

Collected responses from Google Forms were transferred to the Microsoft Excel ver. 2019 (Microsoft Corporation, Redmond, WA, USA) for cleaning and coding. The IBM SPSS Statistics version 26.0.0 (SPSS Inc., Chicago, IL, USA) was used to analyze the data. Dichotomous data were presented as frequencies and proportions, whereas continuous data were presented in mean  $\pm$  standard deviation (SD) or median (interquartile range [IQR]) depending on the data's normality.

The pre-test and post-test scores for each domain were compared using the paired t-test or Wilcoxon signed-rank test, based on the data assumptions. The Shapiro-Wilk test was used to test the data normality. To determine the association between the demographic variables with the increase in post-test scores in each domain, we performed univariate analyses using the logistic regression. Statistical significance was set at  $p < 0.05$  for all analyses using SPSS software (SPSS Inc., Chicago, IL, USA).

## 3. Result

### 3.1. Characteristics of study participants

Nineteen valid participants with a mean age of 45.8 years (SD: 12.1) were included in this study for analyses. Most of the participants were female (68.4%), and a majority had college degree (63.2%). The characteristics of study participants are summarized in **Table 1**.

Table 1. Characteristics of the study participants

|                | Participants (N = 19) |
|----------------|-----------------------|
| Age            | 45.8 $\pm$ 12.1       |
| Gender         |                       |
| Male           | 6 (31.6)              |
| Female         | 13 (68.4)             |
| Education      |                       |
| College Degree | 12 (63.2)             |
| High School    | 7 (36.8)              |

Data are presented as mean  $\pm$  standard deviation (SD) or  $\Sigma$  (%).

### 3.2. Comparison of pre-test and post-test scores

The scores and comparison results between pre-test and post-test of the knowledge, attitude, and practice domain are showed in Table 2. From the paired t-test analysis, no significant difference was observed ( $p = 0.077$ ) between pre-test and post-test mean scores (83.16 vs. 88.95) of knowledge comprehension about obesity. Based on the Wilcoxon signed-rank test, there were significant differences ( $p = 0.038$ ) in the pre-test and post-test median scores (33 vs. 34) for the attitude domain. However, significant difference was not observed ( $p = 0.640$ ) between pre-test and post-test median scores (30 vs. 30) for the practice domain. The score details of each item in the knowledge, attitude and practice domains are provided in Table 3, Table 4, and Table 5, respectively.

Table 2. Comparison of the knowledge, attitude, and practice pre-test and post-test scores

| Domain    | Pre-Test (N = 19) | Post-Test (N = 19) | p-value    |
|-----------|-------------------|--------------------|------------|
| Knowledge |                   |                    |            |
| Mean      | 83.16             | 88.95              | p = 0.077  |
| Median    | 80                | 90                 |            |
| Good      | 14 (73.7)         | 17 (89.5)          |            |
| Moderate  | 5 (26.3)          | 2 (10.5)           |            |
| Poor      | 0                 | 0                  |            |
| Attitude  |                   |                    |            |
| Mean      | 32.05             | 34.11              | p = 0.038* |
| Median    | 33                | 34                 |            |
| Good      | 14 (73.7)         | 17 (89.5)          |            |
| Moderate  | 5 (26.3)          | 2 (10.5)           |            |
| Poor      | 0                 | 0                  |            |
| Practice  |                   |                    |            |
| Mean      | 30.05             | 29.32              | p = 0.640  |
| Median    | 30                | 30                 |            |
| Good      | 10 (52.6)         | 10 (52.6)          |            |
| Moderate  | 9 (47.4)          | 9 (47.4)           |            |
| Poor      | 0                 | 0                  |            |

Data are presented as  $\Sigma$  (%).\* $p < 0.05$ 

Table 3. Comparison of the knowledge pre-test and post-test scores

| Items   | Scores         | Pre-Test (N = 19) | Post-Test (N = 19) |
|---|----------------|-------------------|--------------------|
| 1. Definition of obesity                      | Correct answer | 15 (78.9)         | 17 (89.5)          |
|   | Mean           | 7.89              | 8.95               |
|   | Median         | 10                | 10                 |
| 2. Measurement and index to determine obesity | Correct answer | 18 (94.7)         | 19 (100.0)         |
|   | Mean           | 9.47              | 10.00              |
|   | Median         | 10                | 10                 |
| 3. Risk factor of obesity                     | Correct answer | 19 (100.0)        | 19 (100.00)        |
|   | Mean           | 10.00             | 10.00              |
|   | Median         | 10                | 10                 |
| 4. Long term cause of obesity                 | Correct answer | 18 (94.7)         | 17 (89.5)          |
|   | Mean           | 9.47              | 7.37               |
|   | Median         | 10                | 10                 |

|     |   |                |             |             |
|-----|---|----------------|-------------|-------------|
| 5.  | Waist circumference value to determine obesity                            | Correct answer | 9 (47.4)    | 14 (73.7)   |
|     |   | Mean           | 4.47        | 7.37        |
|     |   | Median         | 0           | 10          |
| 6.  | Other disease with obesity as a risk factor                               | Correct answer | 18 (94.7)   | 18 (94.7)   |
|     |   | Mean           | 9.47        | 9.47        |
|     |   | Median         | 10          | 10          |
| 7.  | Relationship between consuming sugar-containing food and risk for obesity | Correct answer | 14 (73.7)   | 16 (84.2)   |
|     |   | Mean           | 7.37        | 8.42        |
|     |   | Median         | 10          | 10          |
| 8.  | Prevention of obesity   | Correct answer | 19 (100.00) | 19 (100.00) |
|     |   | Mean           | 10.00       | 10.00       |
|     |   | Median         | 10          | 10          |
| 9.  | Management of obesity   | Correct answer | 19 (100.00) | 18 (94.7)   |
|     |   | Mean           | 10.00       | 9.47        |
|     |   | Median         | 10          | 10          |
| 10. | Types of nutrients most susceptible to cause obesity                      | Correct answer | 19 (100.0)  | 12 (63.2)   |
|     |   | Mean           | 4.74        | 6.32        |
|     |   | Median         | 0           | 10          |

Data are presented as  $\Sigma$  (%).

Table 4. Comparison of attitude pre-test and post-test scores

| Items |  | Scores | Pre-Test<br>(N = 19) | Post-Test<br>(N = 19) |
|-------|--|--------|----------------------|-----------------------|
| 1.    | High-fat food consumption can increase the risk of obesity                       | Total  | 69                   | 74                    |
|       |  | Mean   | 3.63                 | 3.89                  |
|       |  | Median | 4                    | 4                     |
| 2.    | Obese individuals need to reduce their physical activities to avoid exhaustion   | Total  | 56                   | 60                    |
|       |  | Mean   | 2.95                 | 3.16                  |
|       |  | Median | 3                    | 4                     |
| 3.    | Individuals with body mass index $\geq 25$ should lose their weight              | Total  | 51                   | 61                    |
|       |  | Mean   | 2.68                 | 3.21                  |
|       |  | Median | 3                    | 3                     |
| 4.    | Frequent meals with small portions can lead to weight loss                       | Total  | 48                   | 49                    |
|       |  | Mean   | 2.53                 | 2.58                  |
|       |  | Median | 2                    | 3                     |
| 5.    | Taking weight-loss drugs without adjusting diet is effective in treating obesity | Total  | 61                   | 69                    |
|       |  | Mean   | 3.21                 | 3.63                  |
|       |  | Median | 4                    | 4                     |

|     |   |        |      |      |
|-----|---|--------|------|------|
| 6.  | Repeated consumption of saturated fat content in fried food can lead to obesity | Total  | 67   | 68   |
|     |   | Mean   | 3.53 | 3.58 |
|     |   | Median | 4    | 4    |
| 7.  | Obesity medications can be used for all obese patients                          | Total  | 56   | 63   |
|     |   | Mean   | 2.95 | 3.32 |
|     |   | Median | 3    | 3    |
| 8.  | Regular exercise three times per week can improve obese individuals' lifestyle  | Total  | 68   | 70   |
|     |   | Mean   | 3.59 | 3.68 |
|     |   | Median | 4    | 4    |
| 9.  | Obese individuals are only allowed to do vigorous exercises                     | Total  | 64   | 67   |
|     |   | Mean   | 3.37 | 3.53 |
|     |   | Median | 3    | 4    |
| 10. | Consulting to physicians is necessary for obese individuals                     | Total  | 69   | 67   |
|     |   | Mean   | 3.63 | 3.53 |
|     |   | Median | 4    | 4    |

Table 5. Comparison of practice pre-test and post-test scores

| Items |   | Scores | Pre-Test<br>(N = 19) | Post-Test<br>(N = 19) |
|-------|---|--------|----------------------|-----------------------|
| 1.    | I consume more than 2 tablespoons of sugar per day                            | Total  | 57                   | 53                    |
|       |   | Mean   | 3.00                 | 2.79                  |
|       |   | Median | 3                    | 3                     |
| 2.    | I eat coconut milk  | Total  | 58                   | 54                    |
|       |   | Mean   | 3.05                 | 2.84                  |
|       |   | Median | 3                    | 3                     |
| 3.    | I am doing regular physical activities, work, and household chores            | Total  | 75                   | 75                    |
|       |   | Mean   | 3.95                 | 3.95                  |
|       |   | Median | 4                    | 4                     |
| 4.    | I eat more meals whenever I feel stressed                                     | Total  | 64                   | 55                    |
|       |   | Mean   | 3.37                 | 2.89                  |
|       |   | Median | 4                    | 3                     |
| 5.    | I consult a doctor or nutritionist to obtain information on ideal body weight | Total  | 32                   | 39                    |
|       |   | Mean   | 1.68                 | 2.05                  |
|       |   | Median | 1                    | 2                     |
| 6.    | I eat sweet foods and drinks  | Total  | 49                   | 51                    |
|       |   | Mean   | 2.58                 | 2.68                  |
|       |   | Median | 3                    | 3                     |
| 7.    | I eat fried foods   | Total  | 52                   | 48                    |

|     |  |        |      |      |
|-----|--|--------|------|------|
|     |  | Mean   | 2.74 | 2.53 |
|     |  | Median | 3    | 3    |
| 8.  | I eat three meals a day with balanced nutrition according to the Indonesian Health Ministry recommendation | Total  | 59   | 50   |
|     |  | Mean   | 3.11 | 2.63 |
|     |  | Median | 3    | 3    |
| 9.  | I exercise regularly three times a week  | Total  | 49   | 56   |
|     |  | Mean   | 2.58 | 2.95 |
|     |  | Median | 3    | 3    |
| 10. | I am taking over-the-counter weight-loss drugs to achieve my ideal body weight                             | Total  | 76   | 76   |
|     |  | Mean   | 4.00 | 4.00 |
|     |  | Median | 4    | 4    |

### 3.3. Association between demographic factors and the increase in post-test scores

The age, male gender as compared to female, and college educational level as compared to high school level were not associated with the increase in post-test scores in all domains ( $p > 0.05$ ).

## 4. Discussion

This study provides novel findings in the knowledge, attitude, and practice about obesity among productive-age people after online education through the Zoom Cloud Meetings platform. The post-test results were significantly different from the pre-tests for the attitude domain. However, there was no significant difference in the knowledge and practice domain after intervention. During a pandemic, the use of online platforms to provide an educational program is considered an alternative. Several studies stated that education regarding obesity, specifically on the knowledge, attitude, and practice domains, is essentially needed to be improved (Waghmare et al. 2019; Zhou et al. 2017).

The results of this study indicate that there is no significant increase in participants' knowledge. This result is in contrast to several studies that have shown a significant improvement in the educational intervention group (Jafar et al. 2020; Khaw, Ebora-Calbayan, and Pondi 2021; Mazloomi-Mahmoodabad et al. 2017). Nevertheless, most of the assessments of each respondent's knowledge items were considered as "good" after being given the intervention (Table 3).

Our findings showed an increase in participants' attitude significantly after virtual health education program. If the analyses were performed for each item, the results in the attitude domain showed a significant improvement in some items (Table 4). Other studies also showed a similar result with a significant positive correlation between the increase in attitude value and the educational intervention given (Khaw, Ebora-Calbayan, and Pondi 2021; Mazloomi-Mahmoodabad et al. 2017).

Contrary to the attitude result, our study demonstrated no significant increase in the post-test scores of the practice domain. If the results are analyzed specifically per item, none of them showed a significant increase in the post-test scores in both domains. A study by (Jafar et al. 2020) demonstrated opposite findings with a significant positive result from providing educational interventions to the practices of respondents.

According to (Izham, Hartayu, and Sri 2012), changes in attitude and practice scores were not only influenced by the provision of education, but also influenced by several other factors including cultural background, religious teachings, school education, groups, peers, parents, and life experiences.

Different findings in knowledge and practice domains can also be caused by different intervention methods comparing to other studies. Providing online education through the Zoom Cloud Meetings platform as an intervention in this study mostly did not have a significant impact in providing a positive effect to the respondents. The intervention factor itself that was carried out online also had an influence on the results of this study. Virtual education has several drawbacks. In online educational activities, there are often obstacles in communication from educators to respondents, and vice versa. In addition, the nature of the respondents, for example, not being focus, could also influence the results of the study. Providing online interventions to respondents who are uncomfortable with online activities could cause confusions (Dhawan 2020). Another study has also shown that the participants had difficulty in maintaining focus and concentration during online educational activities (Wilcha 2020). This could lead to a misunderstanding of the respondents, giving rise to an insignificant result as in the fourth practice item.

The difference in the duration of implementation, the number of interventions, and the auxiliary instruments used also affected the discrepancy of the results in this study. The research of (Khaw, Eboracalbay and Pondi, 2021) provides an intervention in the form of one education accompanied by seven days of education via text message so as to provide a significant increase in knowledge, attitude and practice scopes. Likewise, in the research of (Mazloomi-Mahmoodabad et al. 2017) also gave significant results by providing the Theory of Planned Behavior intervention with five educational sessions.

Previous study by (Saleh et al. 2012) found that educational level was associated with the knowledge, attitude, and practice regarding obesity, while gender was associated to only the practice domain. However, if an educational intervention was introduced, our results showed that level of education and gender were not associated with the increase in knowledge, attitude, and practice scores. Some limitations exist in our study. First, our study did not incorporate a control arm; hence, the highest possible evaluation in this study could not be further established. Second, the number of samples was still minimal. This might be responsible for insignificant statistical results in several items. Lastly, this study only conducted virtual education in a short period survey, thus, further studies to find out the impact of virtual education to the knowledge, attitudes, and practice about obesity are need to be done in a longer period with two-armed randomized sample. Despite the limitations, studies discussing on the effect of virtual education to the knowledge, attitudes, and practice about obesity in Indonesia are still scarce; therefore, this study could be used further as a reference for future research and implementation of online education.

## 5. Conclusion

Our study found an improvement in the attitude of the productive-age population regarding obesity after receiving virtual education. However, the results did not show a significant change in the participants' knowledge and practices. Given the limitations in our study, larger and well-designed studies which include a control group would be warranted to further confirm the current findings.

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