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RESEARCH **Open Access**

Comparison of Body Mass Index and Behavior of CERDIK of Individuals as Risk Factors of Suffering from Non-Communicable Diseases

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Abstract

Non-communicable diseases (NCDs) occur in individuals of the productive age and its risk can be diminished if such individuals possess healthy behaviors. BMI is a calculation which is frequently administered to express individuals at risk of suffering from NCDs. Predicting the risk of an individual from suffering from non-communicable diseases is possible by employing CERDIK behavioral (knowledge, attitude, and actions) questionnaires, but it does not yet elaborate the role of body mass index (BMI). The objective of this study is to compare the body mass index and behavior with individuals' risk factors suffering from non-communicable diseases. The study administered a cross-sectional design. The sample amounted to 200 individuals in the productive age who generally fast-food establishments in Blitar from April to June of 2022. Sample was selected by administering the simple random sampling method. The results demonstrated that merely few individuals experienced a high risk of contracting non-communicable diseases. Behavioral factors are no longer used to determine an individual's risk of developing non-communicable diseases when body mass index is taken into account as a contributing factor. Therefore, body mass index is not a risk factor. According to research, adopting healthy lifestyle habits can lower the risk of developing non-communicable diseases.

Keywords: NCDs, Body Mass Index, Knowledge, Attitude, Actions, CERDIK.

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1. INTRODUCTION

The four major non-communicable diseases (NCD) in Indonesia are cardiovascular disease, diabetes mellitus, cancer, and chronic obstructive pulmonary disease, responsible for 60% of the nation's total deaths, with the underlying causes being poor diet (unbalanced diet, low consumption of vegetables and fruits, high consumption of sugar, high salt intake, and high fat intake), lack of physical activity, smoking, and alcohol consumption (Kementerian Kesehatan Republik Indonesia, 2017). On the other hand, non-communicable diseases because of lifestyle changes which tend to occur at the age of 15 encompass cardiovascular disease, diabetes mellitus, and chronic obstructive pulmonary disease. Individual effort to prevent non-communicable diseases is possible through the practices of CERDIK: Cek kesehatan secara berkala (routine medical checkups), Enyahkan rokok (stop tobacco use), Rajin berolahraga (exercise regularly), Diet sehat seimbang (have a healthy and balanced diet), Istirahat cukup (adequate sleep), and Kelola stres (manage stress well) (Kementerian Kesehatan Republik Indonesia, 2019a),(Kementerian Kesehatan Republik Indonesia, 2019b).

According to the WHO, risk factors for non-communicable diseases incorporate poor diet, tobacco consumption, air pollution, alcohol consumption, and lack of physical activity (Kamaruddin, 2020; P2PTM Kemenkes RI, 2021; WHO, 2022), which can be employed as an indicator of an individual physical condition. Several studies have uncovered the correlation between physical activity (or lack thereof) and body mass index (Ariani & Masluhiya, 2017; Candrawati, 2011; Mahali & Indahsari, 2019). Research in Tangerang Selatan revealed that aged 15-18 years who consume fast food and drinks and lack activity possess an expanded risk of being overweight and obese (Nisa et al., 2020).

One aspect of CERDIK with regard to one's physical condition is regular exercise. However, studies conducted on individual risk factors for non-communicable diseases embody behavioral indicators (knowledge, attitude, and actions) towards CERDIK and did not become the major factor their body mass index, which is signified as body weight in kilograms divided by height in square meters and administered to measure an individual's nutritional status in relation to their blood pressure (Andalangi, Warouw & Umboh., 2013; Dewi, Rimbawan & Agustino, 2013). High blood pressure is one of the non-communicable diseases in the cardiovascular category (Sagaro, Caniob, & Amenta, 2021).

A study on the impact of body mass index on behavioral risk factors for people with non-communicable diseases is required for the aforementioned reasons above. Although factors of contemporary lifestyle changes and the body in terms of body mass index (BMI) are frequently employed to elaborate the risk of non-communicable diseases, the behavior that can cause these diseases has never been examined. Knowledge, attitudes, and behaviors associated with the prevention and reduction of suffering from non-communicable diseases, particularly CERDIK, are examples of behavior that can be changed. The objectives of this well-designed study are to compare body mass index with a person's behavior, or their knowledge, attitude, and behavior toward CERDIK, with risk factors of people who possess non-communicable diseases.

2. RESEARCH METHOD

The study administered a cross-sectional design. The population of the study was obtained from individuals aged of 15-59 years old at risk of non-communicable diseases who consume fast food regularly in Blitar. The sampling method employed was simple random sampling which amounted to 200 subjects. The data collection was conducted in April to June 2022.

The calculation of body mass index employed the BMI formula with measurements of weight and height, meanwhile, individual behavior about CERDIK administered a questionnaire (Suprajitno & Mugianti, 2020). Analysis of body mass index data employed the

implementation of categorical data analysis, meanwhile, logistic regression was administered for the analysis of the body mass index data in reference with the individual's behavior towards CERDIK against the risk of non-communicable diseases. Ethical approval of the research was granted by the Ethics Committee of Poltekkes Kemenkes Malang Number: 304/KEPK-POLKESMA/2022 dated January 17, 2022.

3. RESULTS AND DISCUSSION

Table 1. Respondents' profiles and behavior (knowledge, attitude, and actions) towards CERDIK.

Profiles and behavior towards CERDIK	Minimum	Maximum	Mean	SD
Age (year old)	15	57	26.16	11.27
Body weight (kg)	36	140	58.85	15.26
Stature (cm)	142	187	161.28	8.40
Body Mass Index	14.87	51.42	22.51	4.98
Systolic Pressure (mmHg)	80	190	113.92	15.25
Diastolic Pressure (mmHg)	60	109	76.86	9.74
Knowledge	35	60	51.91	5,05
Attitude	59	116	94.63	10.19
Actions	30	60	46.15	5.97
Risk of NCD	44.89	85.93	67.73	8.56

The profiles and behavior in Table 1 describe the conditions of the 200 respondents. Based on gender, there were 86 male respondents (43.0%) and 114 female respondents (57.0%). Based on the city of origin, 64 (32.0%) were from Blitar City, 75 (37.5%) from Blitar Regency, 19 (9.5%) from Kediri City/District, 22 (11.0%) from Tulungagung Regency, and 20 (10.0%) from Jombang Regency.

Table 2. Behavior Category of CERDIK,

Variable	f	%
Body mass index		
Severe underweight	19	9.5
Underweight	23	11.5
Normal	109	54.5
Overweight	16	8.0
Obese	33	16.5
Knowledge		
High	140	70.0
Moderate	55	27.5
Low	5	2.5
Attitude		
Positive	132	66.0
Negative	68	34.0
Action		
Good	60	30.0
Moderate	104	52.0
Poor	36	18.0

Table 2 show that the risk of non-communicable diseases in accordance with the individuals' behavior (knowledge, attitude, and action) towards CERDIK in the low-risk group amounted to 40 (20.0%) respondents, 148 (74.0%) respondents in the moderate risk group, and 12 (6.0%) respondents in the high-risk group. Calculation of respondent behavior (knowledge, attitude, and actions) by employing the questionnaire of CERDIK behavior (Suprajitno & Mugianti, 2020).

Table 3. Results of logistic regression analysis on the behavioral variables and BMI

Variable	Coefficient	df	sign
Knowledge	.075	1	.117
Attitude	.020	1	.374
Actions	-.105	1	.006
BMI	.021	1	.599
Constant	-3.312	1	.224

df: degrees of freedom; sign: significance level.

The results of logistic regression analysis (Table 3) show the individual risk of suffering from non-communicable diseases by adding the BMI factor results in the regression coefficient values on knowledge, attitudes, and actions being not significant. But asthma, cancer, diabetes mellitus, heart conditions, hypertension, stroke, chronic kidney failure, and joint disease are the recognized non-communicable diseases in Indonesia (Kementerian Kesehatan Republik Indonesia, 2019). Modifiable behaviors may contribute to NCDs. Diet, body mass index, exercise, sleep, sexual behavior, substance use, and use of information technology are the influencing factors (Farhud, 2015).

The average age of 26.16 ± 11.27 years (Table 1) reflected the highly diverse age of the respondents, considered to be in the productive age group. Individuals in the productive aged group must be supervised as they are prone to NCDs. Today's productive aged population owns a tendency to change their lifestyle because of the influx of the latest cultures and technology. Some of the identifiable consequences incorporate a westernized lifestyle, late night gatherings, and consumptive behaviors. Cultural shifts and technological sophistication affect a sedentary lifestyle which potentially result in the piling up of calories, that, in turn, causes formation of body fat.

The large spectrum of origins of the respondents indicates that people's mobility is no longer restricted to the distance and amount of time required to travel to other cities. Each individual, as solitary beings, possesses particular needs that can only be fulfilled through movement. According to the article, mobility is possible due to a number of factors in the area of the destination that enable it to fulfill the needs of the person, with the reason being that the place of destination has significantly larger utility value than the place of origin (Agusta, 2013). Another factor that might influence mobility is the travel distance and time, which, in their case, amounted to merely about an hour's drive.

In accordance with their weight and height, about half (54.5%) of the respondents owned their body mass index (BMI) in the normal range, while the ones in the underweight and overweight were of equal proportions (Table 2). Body mass index was acquired through the $BMI = \frac{Weight\ (kg)}{(Height\ (m))^2}$ formula but with different classifications, since Indonesia categorized BMI into five classifications: severely underweight, underweight, normal, overweight, and obese (P2PTM Kemenkes RI, 2021) and in accordance with the Center for Disease Control and Prevention, and the BMI is categorized into four classifications: underweight, normal, overweight and obese (CDC, 2022). Therefore, when categorizing an individual's BMI, it is necessary to take into account the individual's factors, which are race, and ethnicity. BMI can also be administered to predict levels of obesity. A tremendous high BMI generally

encompasses high body fat. However, a relatively high BMI can also possibly be affected by high body fat or high lean body mass (muscles and bones) (CDC, 2022). Therefore, providers of medical services must be trained in performing health assessments in order to assess the health status and risks of an individual.

The gender of an individual cannot be employed when calculating BMI. Some factors in considering when the BMI value is identical incorporate: (1) women tend to possess more body fat than men, (2) the amount of body fat may be higher or lower depending on the individual's race or ethnicity, (3) young adults tend to possess more body fat than older individuals, and (4) athletes own less body fat than non-athletes (CDC, 2022). In accordance with the explanations above, BMI is not an absolute calculation of individual obesity as there are other factors that should be considered.

Although some respondents - within the productive aged range - had their systolic and diastolic pressure beyond the normal range, which can be attributed to high blood pressure, the respondents' blood pressure, which was recorded as 113.92 15.25 mmHg for the systolic pressure and 76.86 9.74 mmHg for the diastolic pressure (Table 1), was interpreted to be within the normal range (hypertension). According to the Basic Health Research report from 2018, 8.01% of East Java residents and 8.36% of people nationwide over the age of 18 (the productive age range) had hypertension (Kementerian Kesehatan Republik Indonesia, 2019). Thus, stakeholders and individuals should concern this situation in order to prevent non-communicable diseases.

Knowledge about NCDs as much as 70.0% (Table 2) is classified as high because respondents have acknowledged of NCDs from information sources, which are television, radio, and health workers. Information escalates perception and self-awareness to behave and act. The results of this study are consistent with research in Ethiopia which elaborates the factors influencing self-awareness and knowledge about NCDs being affected by information sources (Legesse et al., 2022). In fact, knowledge is the basis for everyone to behave and act (Notoatmojo, 2011). Knowledge in the low category (Table 2) because of an erroneous perception of NCD. The level of knowledge in accordance with Bloom's taxonomy is modified into three, which are low, medium, and high (Adesoji, 2018). Individual perception after receiving information is highly influential in managing the information obtained by the senses (Gibson et al., 2011; Irani et al., 2022).

Attitude is identified as an intermediary factor between knowledge and action. Individuals act if they possess a positive attitude. Two thirds (66.0%) of respondents who are productive aged own a positive attitude (Table 2). Respondents' attitudes are affected by internal processes encompassing attention, understanding, and acceptance (Azwar, 2022). A positive attitude makes respondents able to act well to do CERDIK (Azwar, 2022; Mahali & Indahsari, 2019; Notoatmojo, 2011; Ojo et al., 2017).

Actions or practices are the major crucial part of behavior. A healthy lifestyle by administering CERDIK can be employed as a daily habit to prevent and decrease the risk of suffering from NCDs. The actions of respondents classified as high risk of suffering from NCDs were 36 (18.0%) respondents (Table 2). Action in this study is the primary risk factor for suffering from NCDs (Suprajitno & Mugianti, 2020). Bloom's taxonomy elaborates that hierarchical behavior comprises of knowledge, attitude, and actions or practices or psychomotor (Adams, 2015; Adesoji, 2018; Hackert et al., 2022).

Health behaviors are the responses of an individual to a stimulus, or object, which is associated with illness, disease, health care, food, beverage, and the environment. Behavioral domains are classified into three major parts: knowledge, attitude, and actions (skills) (Notoatmojo, 2011). Knowledge, attitudes, and actions influence behavior and efforts which can be generated to enhance the health education efforts (Pratiwi et al., 2021) on CERDIK.

Preventing non-communicable diseases is possible through the practices of CERDIK: *Cek kesehatan secara berkala* (routine medical checkups), *Enyahkan rokok* (stop tobacco use), *Rajin berolahraga* (exercise regularly), *Diet sehat seimbang* (have a healthy and balanced diet), *Istirahat cukup* (adequate sleep), and *Kelola stres* (manage stress well). CERDIK is referred to as an Indonesian healthy lifestyle that requires attention (Kementerian Kesehatan Republik Indonesia, 2018).

The measurements employed the CERDIK behavioral questionnaire and obtained a Goodness of Fit Index (GFI) score of 0.70. Meanwhile, the influence value of every behavioral domain, encompassing knowledge of 0.011 (95% CI: 0.007 to 0.015; p = 0.001), attitude of -0.008 (95% CI: -0.014 to -0.003; p = 0.001), and actions of 0.067 (95% CI: 0.060 to 0.073; p = 0.001) (Suprajitno & Mugianti, 2020). Respondents' behavioral scores were calculated by employing the CERDIK behavioral questionnaire, which are: a knowledge score of 51.91 ± 5.05, an attitude score of 94.63 ± 10.19, and an action score of 46.15 ± 5.97 (Table 1). Meanwhile, the risk of NCD, in accordance with the respondents' behavior towards CERDIK, was 67.73 ± 8.56; merely 6.0% were in the high-risk group. The body mass index values were then taken into account in the risk calculation for non-communicable diseases. When body mass index was examined along with the behavioral variables (knowledge, attitude, and actions), the results of the logistic regression analysis (Table 3) produced a probability value of 0.599, which also rendered the behavioral variables insignificant. According to other studies, body mass index filters' weight categories can be employed to screen for health issues (CDC, 2022). A research in a hospital in Karachi on outpatients revealed that body mass index is correlated negatively to high blood pressure (Sagaro, Caniob, & Amenta, 2021), to high blood pressure being one type of non-communicable disease. Moreover, a research in Bali from 2017 uncovered that excess body mass index merely influences blood pressure in the elderly (Rastiti et al., 2018), while in this study, the respondents were 26.16 ± 11.27 years old (Table 1), categorized as being in the productive age range. Based on the analysis, BMI with p value 0.599 (Table 3) is not a factor administered to calculate an individual's risk of suffering from NCDs. The reason being that BMI is the result of a calculation between weight and height. If, it is recommended to compare with other measurements and not insert a variable to the existing formula (Gupta et al., 2021). Thus, BMI only illustrates an individual condition which requires attention so that individuals do not suffer from NCDs.

4. CONCLUSION

Body mass index cannot be utilized as a factor affecting risk of non-communicable diseases when combined with behavioral factors (knowledge, attitude, and actions), as it is the result of a measurement between weight and height. In accordance with the research, in preventing and reducing the risk of suffering from non-communicable diseases, it is recommended to behave in a healthy life by reducing the consumption of fast food and drinks, not smoking, and exercising regularly for at least 30 minutes a day.

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