

CHAPTER IV RESEARCH METHODOLOGY

A. Research Type and Design

The type of research used in this study is quantitative with an analytical observational design. The quantitative method was chosen because this study aims to test the hypothesis that has been determined using data in the form of numbers and statistical analysis (Sugiyono, 2020). The approach used is *Cross Sectional*, which is a research design in which measurements or observations of independent variables (consumption habits of artificially sweetened beverages and *junk food*) and dependent variables (risk of hyperglycemia) are carried out simultaneously or at the same time (Kadang et al., 2025).

The chart of this research design can be described as follows:

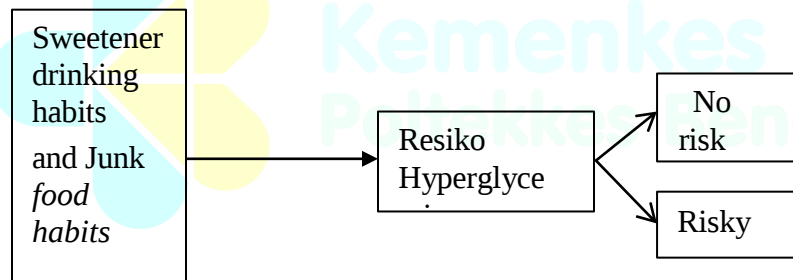


Chart 4. 1 Research Design

B. Research Variables

In this study, independent variables (independent variables) and dependent variables (bound variables) were used. The independent variables in this study were Artificial Sweetened Beverage Consumption Habits and *Junk Food Consumption* Habits. Meanwhile, the dependent variable in this study is the Risk of Hyperglycemia.

C. Research Location and Time

This research was conducted at SMA Negeri 1 Bengkulu City. This location was chosen because it is one of the high schools with a large enough number of adolescents to represent the adolescent population to research the consumption habits of artificially sweetened beverages and *junk food* that have the potential to affect the risk of hyperglycemia. This research was carried out in May 2026.

D. Population and Sample

1. Populasi

Population is a generalized area consisting of objects and subjects that have certain characteristics that are determined by the researcher to be studied and then drawn conclusions. The population in this study is grade 11 students who attend SMA Negeri 1 Bengkulu City.

2. Sample

A sample is a fraction of the number of individuals with characteristics that represent the population to be studied (Kadang et al., 2025). The sample in this study is adolescents who attend State High School 1 Bengkulu City. Sample selection was determined using *Non-Probability Sampling* with *Accidental Sampling Technique*. The calculation of the minimum sample size in this study uses a single proportion estimation formula, namely:

$$n = \frac{Z^2 \times D \times Q}{d^2}$$

as described in the guidelines for calculating sample sizes for prevalence studies (Naing et al., 2022).

Known:

- Z= Degree of confidence (e.g. 1.96 to 95%)
- P= proportion of the prevalence of the variable being studied (if unknown, use 0.5)
- Q=1-P=0.5
- d=margin of error or absolute precision level (e.g. 0.10)
- n = Minimum number of samples required

Based on data obtained from SMA Negeri 1 Bengkulu City, the total population in this study is 390 students who meet the research criteria. Therefore, the value N = 390 is used as the basis in the large calculation of the sample. Furthermore, the sample size was calculated using the Lemeshow formula with *finite population correction* so that a sample of 194 respondents was obtained to be used as the subject of the study.

$$\begin{aligned}
 n &= \frac{Z^2 \times P \times Q}{d^2} \\
 n &= \frac{1,96^2 \times 0,5 \times 0,5}{(0,05)^2} \\
 n &= \frac{38.416 \times 0,25}{0,0025} \\
 n &= \frac{0,9604}{0,0025} \\
 &= 384,16 = 385
 \end{aligned}$$

Limited population correction (due to $N = 390$)

$$n = \frac{n_0}{d_2}$$

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

$$n = \frac{385}{1 + \frac{385 - 1}{390}}$$

$$n = \frac{385}{1,9846} = 193,99 = 194$$

Based on the results of the calculation of the sample size using the proportion estimation formula, a minimum sample number of 194 respondents was obtained. This number was used as a total sample in this study which aimed to analyze the relationship between the consumption habits of artificially sweetened drinks and *junk food* to the risk of hyperglycemia in adolescents at State High School 1 Bengkulu City.

The inclusion and exclusion criteria in this study are as follows:

1. Criteria Inclusion

- a. Teenagers who are active students at SMA Negeri 1 Bengkulu City.
- b. Adolescents who are willing to become respondents and sign an *informed consent* form.
- c. Adolescents who are able to read, understand, and fill out questionnaires independently.

2. Exclusion Criteria

- a. Respondents who were not present at the time of data collection.
- b. Respondents who resigned during the research process.
- c. Respondents who fill out the questionnaire incomplete or inappropriately.
- d. Respondents who were experiencing severe illness at the time of data collection were unable to follow the research process.

E. Data Collection

1. Data Source

a. Data Primer

- 1) Blood glucose levels are measured while (GDS) using a digital glucometer to assess the risk of hyperglycemia.
- 2) Filling out a questionnaire of respondents' characteristics (age, gender, weight, height).
- 3) Filling out a questionnaire to assess the consumption habits of sweetened drinks and *junk food*:
 - a) For Consumption of Sweetened Drinks:
 - b) Using a modified *Beverage Intake Questionnaire* (BEVQ). This questionnaire is used to measure the habits or frequency of consumption of sweetened drinks over the past month, including several types of drinks such as sweet or fruit-flavored juices, soft drinks, sports drinks, tea, coffee, and sweetened milk. The assessment was carried out based on the amount or frequency of consumption of sweetened beverages in the past month, then categorized based on the median consumption value, which was ≥ 20 times per month and < 20 times per month.
 - c) For *Junk Food Consumption Habits*: Using the *Food Frequency Questionnaire* (FFQ). This questionnaire contains a list of fast food/junk food and is assessed based on median consumption scores to categorize habits of "Rare" (median $\leq$ score) or "Frequent" (median $>$ score).

d) Data Seconds

Secondary data was obtained from school administration data at SMA Negeri 1 Bengkulu City, in the form of data on the number of registered students and general information about student characteristics. The data is used to assist researchers in determining the population and tracking

potential research respondents in accordance with the established inclusion criteria.

2. Data Collection Tools and Research Instruments

a. Demographic Data Form

This sheet contains data on the identity and characteristics of the respondents, including initials of name, age, gender, weight, height (for the calculation of Body Mass Index/BMI), and smoking habits.

b. Blood Glucose Level Observation Sheet

This sheet is used to record the results of the respondents' Blood Glucose Levels (GDS) which are measured using a digital glucometer and test strip.

c. Questionnaire for Artificially Sweetened Beverages (BEVQ)

This instrument was used to assess the consumption habits of sweetened beverages in respondents. The tool used is a modified *Beverage Intake Questionnaire* (BEVQ). This questionnaire is used to measure the frequency or habit of consuming sweetened drinks in the past month. The types of drinks measured included several categories of sweetened drinks such as sweet juice or fruit-flavored drinks, soft *drinks*, sports *drinks*, tea, coffee, and sweetened milk.

d. Questionnaire for Junk Food Consumption Habits (FFQ)

This instrument was used to assess respondents' *junk food* consumption habits in the last one month period. The tool used is *the Food Frequency Questionnaire* (FFQ). This questionnaire contains a specific list of *fast food/junk food* and is used to categorize respondents' consumption habits into "Rare" or "Frequent" based on the total consumption score compared to the sample median value.

3. Data Collection Procedure

The data collection procedure is carried out with the following steps:

- a. The researcher takes care of the research permit from the educational institution and submits it to the Principal of SMA Negeri 1 Bengkulu City as the research location.
- b. The researcher approaches prospective respondents, providing explanations about the objectives, benefits, research procedures, and rights of respondents during the research.
- c. The researcher asked for the respondent's consent by providing an *Informed Consent* sheet. Respondents who agree are welcome to sign an agreement sheet before proceeding with the research process.
- d. The researcher conducted initial screening to ensure respondents met the inclusion and exclusion criteria.
- e. Anthropometric measurements (weight and height) were carried out to calculate the Body Mass Index (BMI) of each respondent.
- f. Blood Glucose Current (GDS) levels are measured using a digital glucometer to assess the risk status of hyperglycemia.
- g. Respondents were asked to fill out a *modified Beverage Intake Questionnaire* (BEVQ) with the assistance of researchers to ensure the accuracy of filling the frequency of beverage consumption. This questionnaire was used to assess the consumption habits of sweetened drinks in the past month, including several types of drinks such as sweet or fruit-flavored juices, soft drinks, sports drinks, tea, coffee, and sweetened milk. The data obtained was then calculated based on the frequency of consumption of sweetened beverages per month and then categorized based on the median value of consumption, which was ≥ 20 times per month and < 20 times per month.
- h. Respondents were asked to fill out the *Food Frequency Questionnaire* (FFQ) questionnaire with the assistance of researchers to ensure the

accuracy of filling in the frequency and type of junk food consumption over the past month. The results of filling out the FFQ were then assessed based on the total score, where the median $>$ score (median $>$ score) was categorized as Frequent consumption, and the median $\leq$ score (median $\leq$ score) was categorized as Frequent consumption.

- i. After all instruments are completed, the researcher conducts a data completeness check (*editing*) to ensure that there are no blank, inappropriate, or illogical parts before the data enters the processing and analysis stage using SPSS.

4. Test Data Collection Tools

a. Questionnaire for Artificially Sweetened Beverages (BEVQ)

The *Beverage Intake Questionnaire* (BEVQ) instrument was used to assess the consumption habits of sweetened beverages in respondents.

This questionnaire measures the frequency and amount of consumption of various types of sweetened beverages in the past month, such as sweet or fruit-flavored juices, soft drinks, sports drinks, tea, coffee, and sweetened milk. Respondents were asked to fill in the frequency of consumption (per day, per week, or per month), the amount of consumption per drink (ml), and the estimated sugar content consumed.

- 1) The validity test of the questionnaire was carried out on 30 respondents using the Pearson correlation test with a table r -value of 0.361 at a significance level of 5%. The results of the validity test show that most of the question items have a calculated r value $>$ r table so that it is declared valid.
- 2) The reliability test of the instrument was carried out using Cronbach's Alpha, with a value of 0.694, which indicates that the questionnaire has a good level of reliability and can be used as a measuring tool in the study.

b. Questionnaire for *Junk Food* Consumption Habits (FFQ)

The *Food Frequency Questionnaire* (FFQ) instrument was used to assess junk food consumption habits. Angeline & Wartiningsih Journal, (2023) using an FFQ questionnaire developed to measure the level of *junk food consumption* among college students.

- 1) Interpretation of Results: This questionnaire is assessed based on the total consumption score which is then compared to the median value. Respondents were categorized as "Frequent" consumption if their total score exceeded the median ($\text{median} > \text{score}$) and "Rare" if their score was less than or equal to the median ($\text{median} \leq \text{score}$). Although this journal does not report the primary validity and reliability tests of FFQ, the median score interpretation method used indicates that the instrument serves to segment consumption patterns based on habitual frequency.

F. Data Processing

According to Hardani et al., (2020), data processing is a series of activities to collect and organize data from each research variable so that the data is in a form that is ready to be analyzed and evaluated. The following are the stages of data processed in this study:

1. *Editing*

At this stage, the researchers re-examined all the data that had been collected, including the BEVQ questionnaire, the FFQ *Junk Food questionnaire*, and the blood glucose level observation sheet. The check is carried out to ensure that each question item has been filled in completely, the data is unambiguous, and the respondent's identity code is written correctly.

2. *Coding*

The edited data is then coded so that it can be entered into the statistics program. The coding is done as follows:

a. Sweetened Beverage Consumption Habits (BEVQ)

The coding was done based on the estimated sugar intake calculated from the BEVQ questionnaire (Total SSB in x/month):

- 1) 0 = High (For example, $>20x/\text{month}$)
- 2) 1 = Low (For example, $\leq 20x/\text{month}$)

b. Junk Food Consumption Habits (FFQ)

Coding is done based on the total FFQ consumption score compared to the median:

- 1) 0 = Frequent / Risky (median $>$ score)
- 2) 1 = Rare/Not At Risk (median $\leq$ score)

c. Risk of hyperglycemia (GDS)

- 1) 0 = Hyperglycemia (≥ 140 mg/dL)
- 2) 1 = Normal (< 140 mg/dL)

d. Gender

- 1) 0 = Female
- 2) 1 = Male

e. Other variables such as age, BMI, and smoking habits are also coded according to operational definitions.

3. *Sorting* (Tabulasi Data)

After coding, the data is organized and grouped based on independent and dependent variables. This process is carried out to facilitate classification, category checking, and preparing data for univariate and bivariate analysis.

4. *Entry and Processing*

The encoded data is entered into the SPSS statistical program, then converted into numerical form for analysis. This process includes input of

BEVQ scores, FFQ *Junk Food* scores, and blood sugar test results, so that all data can be processed systematically.

5. *Cleaning*

The data cleanup stage is carried out by re-checking the data that has been entered to ensure that there are no typos, data duplication, code inconsistencies, or missing *data*. If an error is found, the researcher makes corrections before entering the analysis stage.

G. Data Analysis

1. Univariate Analysis

Univariate analysis is used to describe the characteristics of each variable studied. This analysis provides an overview of frequency and percentage distributions for categorical variables, such as sweetened beverage consumption habits, *junk food consumption*, hyperglycemia risk, gender, and BMI status. For numerical variables such as age (if not categorized), the results of the analysis are presented in the form of mean, median, standard deviation, and minimum and maximum values. The goal is to provide a general description of the characteristics of the respondents before the bivariate analysis is carried out. Then determine the categories according to the interpretation guidelines as follows: 0% = None of the respondents 1% - 25% = Very few of the respondents 26% - 49% = A small part / almost half of the respondents 50% = Half of the respondents 51% - 75% = Most of the respondents 76% - 99% = Almost all of the respondents 100% = All respondents (Arikunto, 2017).

2. Bivariate Analysis

Bivariate analysis is used to determine the relationship between independent variables and dependent variables. In this study, the analysis was carried out to test two main hypotheses:

- a. The relationship between the consumption of sweetened beverages (based on *the Beverage Intake Questionnaire* (BEVQ) questionnaire and the risk of hyperglycemia.
- b. The relationship between *junk food* consumption (based on *the Food Frequency Questionnaire* (FFQ) questionnaire and the risk of hyperglycemia.

Because all variables are categorical-scale (dicolon/ordinal), the statistical test used is the *Chi-Square Test* at a confidence level of 95% ($\alpha = 0.05$).

Interpretation of test results:

- 1) $p \leq 0.05 \rightarrow$ there was a significant relationship between independent variables and the risk of hyperglycemia.
- 2) $p > 0.05 \rightarrow$ there was no significant relationship.

In addition to the p-value, this study also uses *Odds Ratio* (OR) to determine the risk of consumption of sugary drinks/*junk food* to the incidence of hyperglycemia, in accordance with the *characteristics of the cross-sectional* design.

- 1) $OR > 1$: variables are risk factors.
- 2) $OR = 1$: there is no association.
- 3) $OR < 1$: protective factors.

H. Research Flow

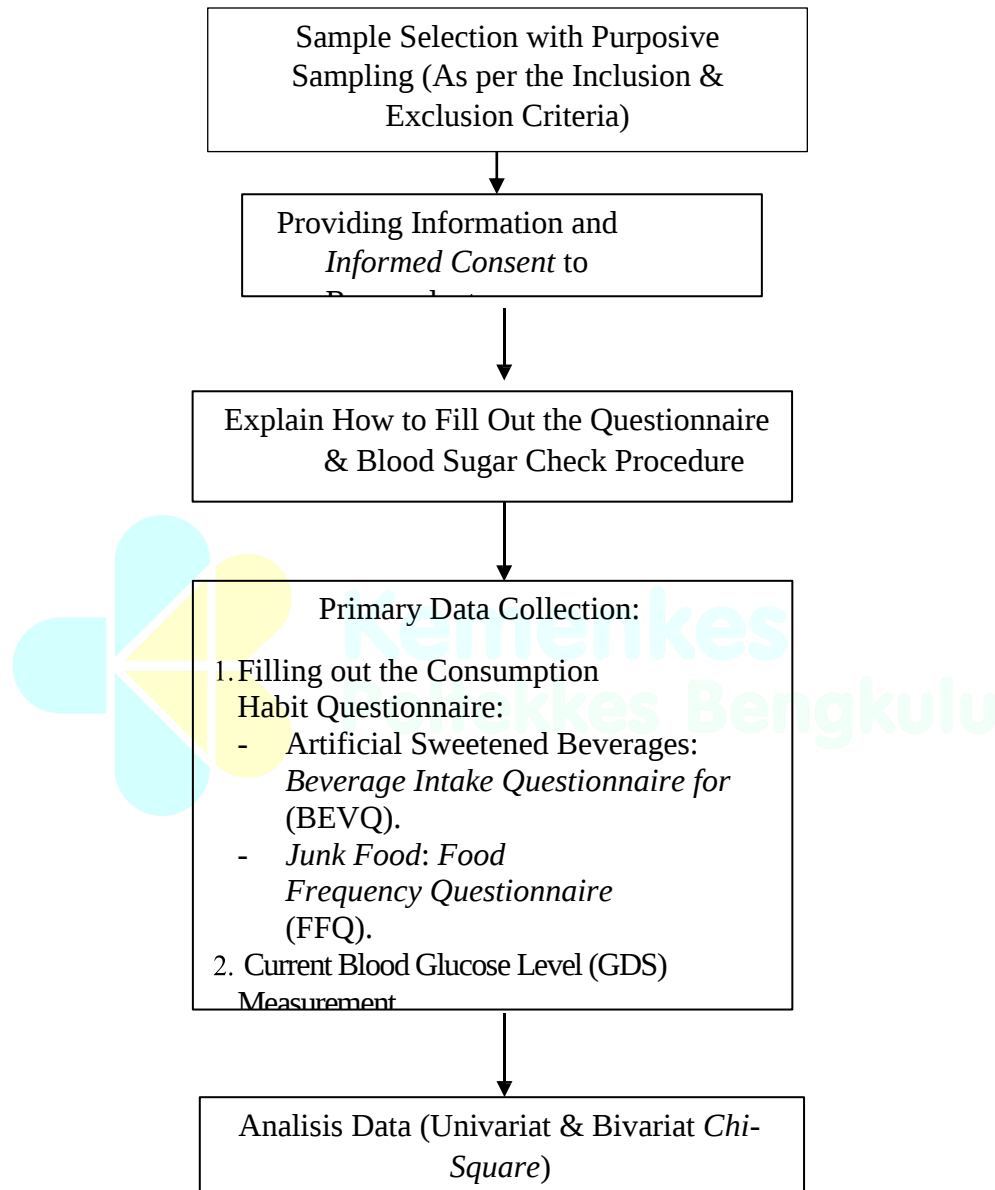


Chart 4. 2 Research Flow

I. Research Ethics

The researcher considers the ethics and legality of the research to protect respondents to avoid all physical and psychological dangers and inconveniences. By paying attention to the following ethical principles (Kadang et al., 2025):

1. *Self Determinant*

In this study, respondents were given freedom when choosing and deciding whether or not to participate without coercion. The researcher respected the decision of the adolescent who refused to have a blood sugar test.

2. *Anonymity*

The respondents' names were not included in full on the results of the research and questionnaire. The researcher only used numerical codes (e.g.: R1, R2) to maintain the privacy of the respondents' identities.

3. *Kerahasiaan (Confidentiality)*

All information obtained from respondents (diet data and blood sugar test results) is guaranteed to be confidential and not disseminated to others. The researcher stores the data in the form of *a soft file* with a password on the researcher's laptop and is only used for the purpose of thesis.

4. *Keadilan (Justice)*

The researcher treats respondents fairly, without partiality or giving special treatment to certain respondents. All respondents received the same standard examination procedure (using new sterile needles and the same tools).

5. *The Principle of Beneficence*

Respondents who participated in this study benefited from knowledge about their blood sugar level status (early detection) and brief education about the dangers of sweetened drinks and *junk food* for adolescents' health

6. *Non-Maleficence*

This research ensures that it does not harm respondents. The capillary blood collection procedure (fingertips) is carried out with the principle of sterility (*safety*) to prevent infection and excessive pain, solely for the safety of the respondents.

